

APPENDIX 6

Air Quality Impact Assessment





Mount Owen Continued Operations Modification 2

Mt Owen Pty Limited

Air Quality Impact Assessment

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Contents

Executive Summary.....	1
1. Introduction.....	4
2. Modification Description.....	6
3. Air Quality Issues.....	10
4. Air Quality Criteria	11
5. Existing Environment	14
5.1 Meteorological Conditions	15
5.2 Air Quality Conditions.....	19
5.2.1 Particulate Matter (as PM ₁₀).....	19
5.2.2 Particulate Matter (as PM _{2.5})	28
5.2.3 Particulate Matter (as TSP).....	29
5.2.4 Deposited Dust.....	30
5.2.5 Nitrogen Dioxide (NO ₂)	30
5.3 Summary of the Existing Environment.....	31
5.4 Assumed Background Levels	31
6. Emissions to Air.....	33
7. Approach to Assessment	38
7.1 Overview.....	38
7.2 Meteorological Modelling.....	38
7.3 Dispersion Modelling	42
8. Assessment of Impacts	46
8.1 Particulate Matter (as PM ₁₀)	46
8.2 Particulate Matter (as PM _{2.5}).....	57
8.3 Particulate Matter (as TSP)	62
8.4 Deposited Dust	65
8.5 Post-Blast Fume (NO ₂).....	68
8.6 Diesel Exhaust Emissions	68
8.6.1 Particulate Matter (as PM ₁₀ and PM _{2.5}).....	68
8.6.2 Nitrogen Dioxide (NO ₂)	68
8.7 Construction.....	71
9. Management and Monitoring.....	72
10. Conclusions	75
11. References	77

Appendix A. Wind-roses for all meteorological stations

Appendix B. Emissions Calculations

Appendix C. Peer Review Outcomes

Appendix D. Model Receptors

Appendix E. Sensitive Receptor Labels and Tabulated Results

Appendix F. Additional Model Performance Evaluations

Appendix G. Comparison of Approved Operation and Proposed Modification

List of tables

Table 1 Key changes between the Approved Operations and the Proposed Modification.....	9
Table 2 EPA air quality assessment criteria.....	11
Table 3 Mitigation criteria for particulate matter	13
Table 4 Acquisition criteria for particulate matter.....	13
Table 5 Annual statistics from meteorological data collected between 2012 and 2016	18
Table 6 Summary of measured PM ₁₀ concentrations	21
Table 7 Summary of measured PM _{2.5} concentrations.....	29
Table 8 Summary of measured TSP concentrations	29
Table 9 Summary of measured deposited dust levels	30
Table 10 Summary of measured NO ₂ concentrations.....	30
Table 11 Assumed non-modelled background levels that apply at sensitive receptors	32
Table 12 Assumed ROM coal production from each operation in the model domain	34
Table 13 Estimated TSP emissions due to the Proposed Modification and other operations.....	35
Table 14 Estimated PM ₁₀ emissions due to the Proposed Modification and other operations.....	36
Table 15 Estimated PM _{2.5} emissions due to the Proposed Modification and other operations	36
Table 16 Model settings and inputs for TAPM.....	39
Table 17 Model settings and inputs for CALMET	39
Table 18 Model settings and inputs for CALPUFF.....	45
Table 19 Estimated NO _x emissions from diesel exhausts.....	69
Table 20 Emission management measures.....	72

List of figures

Figure 1 The Mount Owen Complex and nearest receptors.....	7
Figure 2 Proposed Modification Overview	8
Figure 3 Location of air quality and meteorological monitoring sites	14
Figure 4 Annual wind-roses for data collected at Glendell meteorological station.....	16
Figure 5 Wind speed and rainfall for data collected between 2012 and 2016	17
Figure 6 Measured 24-hour average PM ₁₀ concentrations.....	20
Figure 7 Spatial variation in maximum 24-hour average PM ₁₀ concentrations (µg/m ³)	22
Figure 8 Spatial variation in the number of days per year above 50 µg/m ³ PM ₁₀ (days).....	23
Figure 9 Spatial variation in annual average PM ₁₀ concentrations (µg/m ³).....	24
Figure 10 Measured PM ₁₀ concentrations by time of day and wind speed (2014 data)	26
Figure 11 Measured PM ₁₀ concentrations by wind direction and wind speed (2014 data).....	27
Figure 12 Measured 24-hour average PM _{2.5} concentrations.....	28
Figure 13 Model grid, land-use and terrain information	40
Figure 14 Example of CALMET simulated ground-level wind flows.....	41
Figure 15 Location of modelled sources for Mount Owen Mine Proposed Modification operations.....	43
Figure 16 Location of modelled sources for other mining operations.....	44
Figure 17 Predicted maximum 24-hour average PM ₁₀ concentrations due to all sources in 2014.....	48
Figure 18 Predicted maximum 24-hour average PM ₁₀ concentrations due to the Proposed Modification.....	49
Figure 19 Predicted maximum 24-hour average PM ₁₀ concentrations due all sources (cumulative)	50
Figure 20 Predicted number of days above 50 µg/m ³ PM ₁₀ due to all sources (cumulative) in 2014	51
Figure 21 Predicted number of days above 50 µg/m ³ PM ₁₀ due to the Proposed Modification.....	52
Figure 22 Predicted number of days above 50 µg/m ³ PM ₁₀ due all sources (cumulative)	53
Figure 23 Predicted annual average PM ₁₀ concentrations due to all sources (cumulative) in 2014	54
Figure 24 Predicted annual average PM ₁₀ concentrations due to the Proposed Modification.....	55
Figure 25 Predicted annual average PM ₁₀ concentrations due to all sources (cumulative).....	56
Figure 26 Predicted maximum 24-hour average PM _{2.5} concentrations due to the Proposed Modification	58
Figure 27 Predicted maximum 24-hour average PM _{2.5} concentrations due to all sources (cumulative).....	59
Figure 28 Predicted annual average PM _{2.5} concentrations due to the Proposed Modification	60

Figure 29 Predicted annual average PM _{2.5} concentrations due to all sources (cumulative).....	61
Figure 30 Predicted annual average TSP concentrations due to all sources (cumulative) in 2014	62
Figure 31 Predicted annual average TSP concentrations due to the Proposed Modification.....	63
Figure 32 Predicted annual average TSP concentrations due to all sources (cumulative).....	64
Figure 33 Predicted annual average deposited dust levels due to all sources (cumulative) in 2014	65
Figure 34 Predicted annual average deposited dust levels due to the Proposed Modification.....	66
Figure 35 Predicted annual average deposited dust levels due to all sources (cumulative)	67
Figure 36 Predicted maximum 1-hour average NO ₂ concentrations due to the Proposed Modification diesel exhausts in Year 2.....	70
Figure 37 Predicted annual average NO ₂ concentrations due to the Proposed Modification diesel exhausts in Year 2	71

Executive Summary

This report provides an assessment of the air quality impacts of a Proposed Modification to the Approved Operations at Mount Owen Mine. The air quality impact assessment has been carried out in accordance with the EPA's "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW" (EPA 2016). The 2016 version of the EPA's "Approved Methods" introduces revised, more stringent criteria for particulate matter concentrations, compared to the criteria used to assess the Approved Operations.

The potential air quality issues for the Proposed Modification were identified as:

- Dust from the general mining activities;
- Fume from blasting; and
- Emissions of substances from machinery exhausts.

A detailed review of the existing environment was carried out. The following conclusions were made in relation to the existing air quality:

- There are seasonal and daily variations in particulate matter concentrations.
- Most monitoring sites in the vicinity of Mount Owen Mine have experienced at least one day per year above the EPA's 24-hour average criterion (for PM₁₀) in the past five years, but annual averages have complied with the criteria.
- TSP and NO₂ concentrations are below their respective EPA criteria.
- Deposited dust levels have exceeded EPA criteria at some locations.
- PM_{2.5} concentrations are close to or have exceeded the EPA criteria in recent years. Wood smoke from domestic heating was identified as one of the main factors influencing PM_{2.5} concentrations, especially in winter (OEH 2013b).

The computer-based dispersion model known as CALPUFF was used to predict the potential air quality impacts of the Proposed Modification, including cumulative impacts. The dispersion modelling accounted for meteorological conditions, land use and terrain information and used dust emission estimates to predict the off-site air quality impacts.

An updated approach to predicting the potential air quality impacts of the Proposed Modification was adopted, compared to the assessment approach used for the Approved Operation. This update was made to address queries on the assessment process for the Approved Operation and in an effort improve the simulation of existing conditions. The performance of the model was reviewed by comparing predictions to measured results for a representative year. It was found that the model predictions for annual average concentrations were typically within 10 per cent of the measured results.

The predicted area of impact in relation to private residences (not currently subject to acquisition) for the Proposed Modification was found to be consistent with that predicted for the Approved Operations. The main conclusions of the assessment were as follows:

- Excluding community or private infrastructure, or properties subject to existing acquisition rights, there are no private sensitive locations which are predicted to experience a 'Proposed Modification' contribution of greater than 50 µg/m³ for maximum 24-hour average PM₁₀ concentrations.
- Excluding community or private infrastructure, or properties subject to existing acquisition rights, there are no private sensitive locations which are predicted to experience exceedances of the annual average PM₁₀ criterion at any stage of the Proposed Modification.
- Excluding community or private infrastructure, or properties subject to existing acquisition rights, there are no private sensitive locations which are predicted to experience exceedances of the maximum 24-hour or annual average PM_{2.5} criterion at any stage of the Proposed Modification.

- Excluding community or private infrastructure, or properties subject to existing acquisition rights, there are no private sensitive locations which are predicted to experience exceedances of the annual average TSP or dust deposition criteria at any stage of the Proposed Modification.
- There would be no change to the extent of potential impact of post-blast fume due to the Proposed Modification.
- Emissions from diesel exhausts associated with off-road vehicles and equipment are not predicted to result in any adverse air quality impacts.

The modelling indicated that the Proposed Modification has the potential to cause adverse air quality impacts at some mine owned properties, consistent with the outcomes of the Continued Operations Project (now the Approved Operations). These impacts will need to be managed in accordance with approval conditions and existing management processes as outlined in the approved Air Quality Management Plan.

A comparison was made between the Approved Operation and the Proposed Modification, in terms of the maximum predicted extent of potential impacts. This comparison showed that the predicted contribution of the Proposed Modification to off-site air quality on private properties without existing acquisition rights would be within or similar to the predicted contribution of the Approved Operation. All potential changes have been quantified.

The meteorological and air quality monitoring network currently operated by Mount Owen will continue to be operated as part of the Proposed Modification. This network is suitably setup to monitor the effects of mining activities that are the subject of this assessment.

Important note about your report

The sole purpose of this report and the associated services performed by Jacobs is to quantify the potential air quality impacts of the Mount Owen Continued Operations Modification 2 in accordance with the scope of services set out in the contract between Jacobs and the Client. That scope of services, as described in this report, was developed with the Client.

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

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

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1. Introduction

The Mount Owen Complex is located within the Hunter Coalfields in the Upper Hunter Valley of New South Wales (NSW), approximately 20 kilometres (km) north-west of Singleton, 24 km south-east of Muswellbrook and to the north of Camberwell. Mt Owen Pty Limited (Mount Owen), a subsidiary of Glencore Coal Pty Limited (Glencore), currently owns three existing open cut operations in the Mount Owen Complex; Mount Owen (North Pit) and associated infrastructure, Ravensworth East (Bayswater North Pit (BNP)) and Glendell (Barrett Pit). **Figure 1** shows the Mount Owen Complex as well as the locations of receptors.

Mount Owen received development consent (SSD-5850) from the Planning Assessment Commission for the Mount Owen Continued Operations Project (Continued Operations Project) in November 2016. The Continued Operations Project development consent incorporates all previously approved operations at the Mount Owen Mine and Coal Handling and Preparation Plant (CHPP) and Ravensworth East Mine and allows for continued and expanded mining until 2031, now referred to as the 'Approved Operations'. Glendell Mine operates under a separate consent (DA 80/952) and does not form part of the Approved Operations.

In September 2017 Mount Owen modified SSD-5850 (Modification 1) to allow for the construction of a water pipeline from the Integra Underground Mine to the Mount Owen Complex and allow the integration of the Integra Underground Mine into the Greater Ravensworth Area Water and Tailings Scheme (GRAWTS). Mount Owen now proposes to further modify development consent SSD-5850 to allow for the optimisation of the North Pit mine plan to access coal reserves from the mining tenements obtained by Glencore through its acquisition of the Integra Underground Mine (the Proposed Modification).

Approval for the Proposed Modification will be sought under Section 4.55(2) of the *Environmental Planning & Assessment (EP&A) Act*. The Proposed Modification will be supported by a Statement of Environmental Effects (SEE). This Air Quality Impact Assessment (AQIA) has been prepared by Jacobs Group (Australia) Pty Ltd on behalf of Umwelt (Australia) Pty Limited (Umwelt) as part of the SEE. Its purpose is to quantify and assess the potential air quality impacts of the Proposed Modification.

The air quality impact assessment has been carried out in accordance with the EPA's "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW" (EPA 2016). The 2016 version of the EPA's "Approved Methods" introduces revised, more stringent criteria for particulate matter concentrations, compared to the criteria used to assess the Approved Operations.

The main objectives of this assessment were to:

- Identify potential air quality issues;
- Quantify existing and potential air quality impacts; and
- Identify suitable air quality management measures, as appropriate, to minimise impacts.

The assessment was based on the use of an air dispersion model, CALPUFF, to predict concentrations of substances emitted to air due to the mining activities. Model predictions have been compared with air quality criteria referred to by the EPA in order to assess the effect that the Proposed Modification may have on the existing air quality environment.

In summary, the report provides information on the following:

- Approved and proposed modified mining activities (**Section 2**);
- Potential air quality issues (**Section 3**);
- Relevant air quality criteria (**Section 4**);
- Existing meteorological and air quality conditions (**Section 5**);
- Emissions to air from existing and proposed mining activities (**Section 6**);
- Methods used to predict air quality impacts (**Section 7**);

- Expected air quality impacts, as determined by a comparison of model results with air quality assessment criteria (**Section 8**); and
- Management measures to be implemented, and monitoring of potential impacts (**Section 9**).

2. Modification Description

The Proposed Modification will enable access to approximately 35 million tonnes (Mt) of additional run-of-mine (ROM) coal from the North Pit. Recovery of the additional coal reserves will result in approximately 46 hectares (ha) of additional disturbance (Proposed Disturbance Area) (refer to **Figure 2**), representing an increase of approximately 1.8 per cent to the total disturbance area currently approved, and requires an increased depth in the North Pit to provide for mining down to the Hebden Seam. The change to the North Pit mine plan will require the extension of the mine life through to 2037 (an additional 6 years).

Prior to the acquisition of the Integra Underground mining tenements, the mine plan design for the North Pit did not allow access to the deeper coal seams and was restricted to the east of the approved North Pit footprint. This resulted in the pit floor 'stepping up' as it progressed further southwards and the 'stepping in' of the mine plan along its eastern boundary. The acquisition of the Integra Underground Mine and associated mining tenements has removed this previous constraint and allows for deeper and extended coal extraction across the proposed modified North Pit.

The Proposed Disturbance Area extends further east from the Proposed Modification pit boundary to provide for additional infrastructure such as water management structures and access. In addition, the northern extent of the Proposed Disturbance Area is identified to provide for earthworks to shape and improve the final landform of the North Pit to tie into the surrounding topography, these works are located in proximity to the existing approved Bettys Creek diversion. It is not proposed to modify the existing Bettys Creek diversion in this area which continues through the South East Offset and South East Corridor Offset areas into Main Creek.

No changes are proposed to current mining methods, extraction limits, transportation methods, operational hours or workforce numbers. The Proposed Modification will utilise existing and approved infrastructure with the exception of proposed water management structures to manage water from the mining operation.

Table 1 provides a comparison between the Approved Operations and the Proposed Modification.

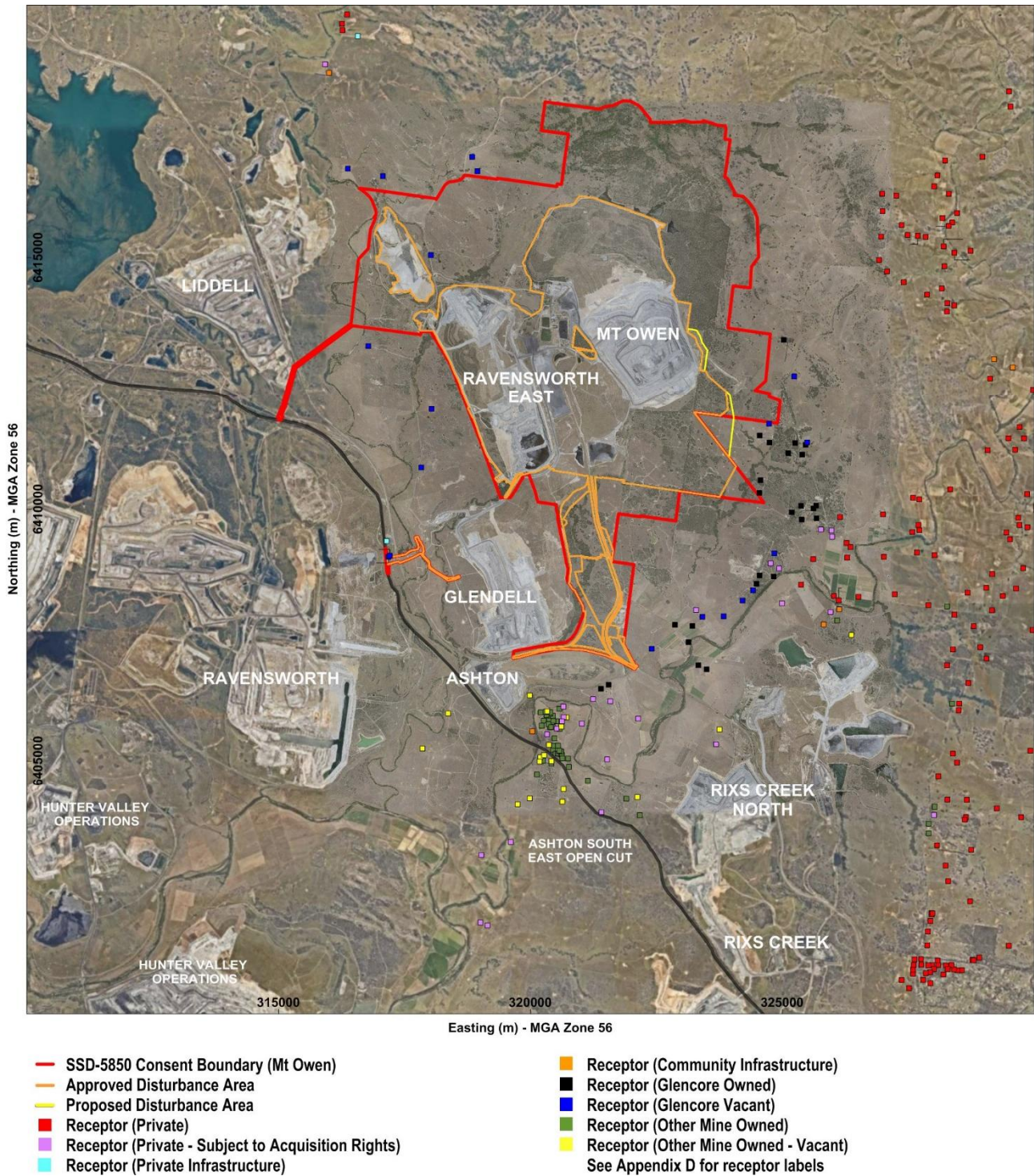


Figure 1 The Mount Owen Complex and nearest receptors

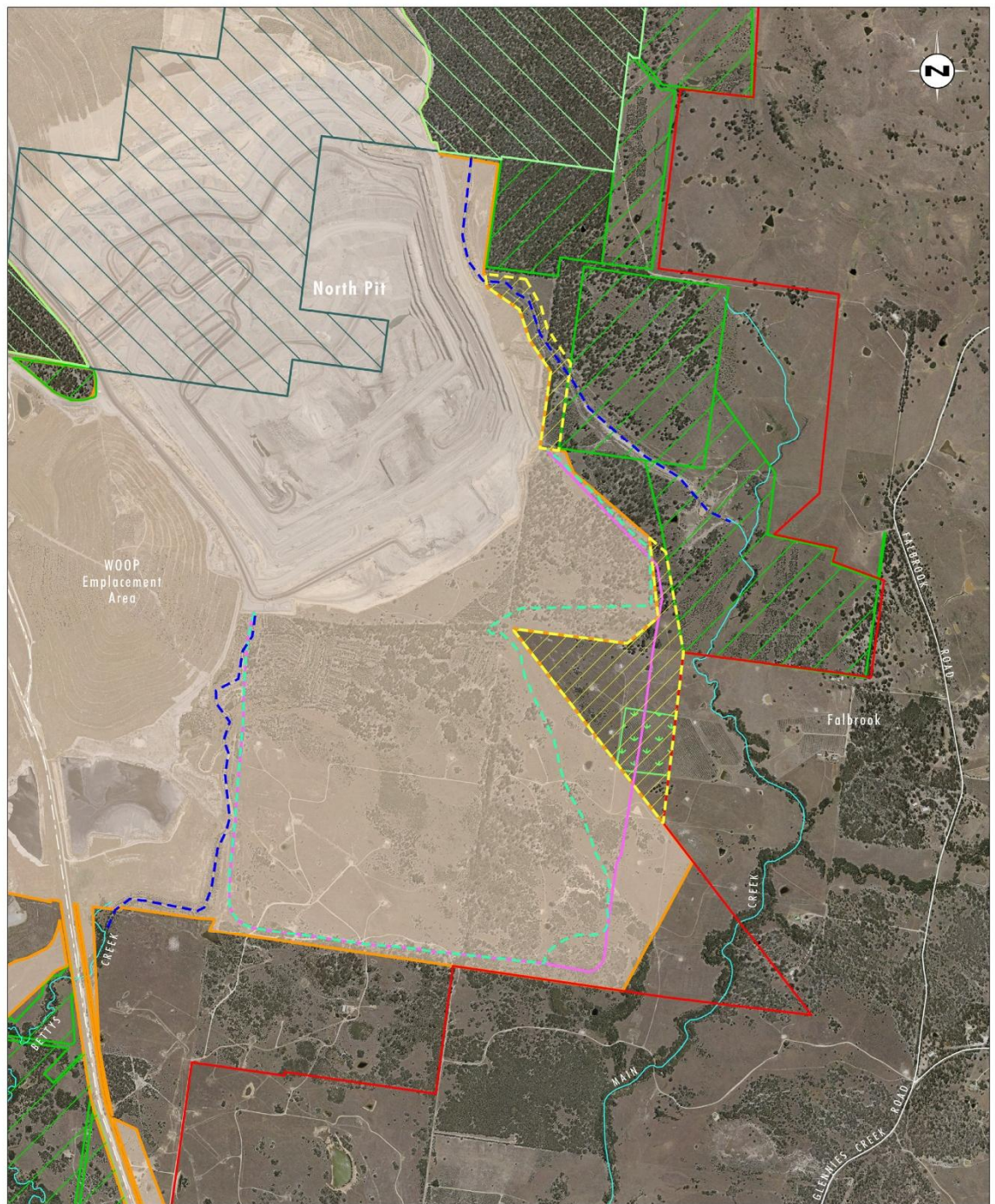


Image Source: Glencore (Feb 2017)
Data Source: Glencore (2018)

0 0.25 0.5 1.0 km
1:25 000

Legend

- Proposed SSD-5850 Modification Consent Boundary
- Approved Operations Pit Boundary
- Approved Disturbance Area
- Proposed Disturbance Area
- Proposed Modification Pit Boundary
- Existing Biodiversity Offset Area
- Ravensworth State Forest
- Ravensworth State Forest within Approved Disturbance Area
- Existing Bettys Creek Diversion
- Drainage Line
- Olive Grove (within the Proposed Disturbance Area)

Proposed Modification Overview

Figure 2 Proposed Modification Overview

Table 1 Key changes between the Approved Operations and the Proposed Modification

Component	Approved Operations	Proposed Modification
Mining Method	Truck and excavator	No change to mining methods
Target Seams	Down to Hebden Seam Down to approximately 300 m depth	No change to target seams Down to approximately 380 m depth (average 340 m)
Total Reserve Recovered	Total of 257 Mt ROM coal (Ravensworth East – 48 Mt Mount Owen – 209 Mt)	Additional approximately 35 Mt ROM coal over the life of the mine (approximately 13% of total approved reserve)
Disturbance Area	Approved Disturbance Area of 2534 ha	Additional 46 ha disturbance (increase of 1.8% of total Approved Disturbance Area) Modification to SSD-5850 consent boundary to include Proposed Disturbance Area
Annual Production	Ravensworth East – 4 Mtpa Mount Owen – 10 Mtpa	No change to annual production limit
Mine Life	2031	2037
CHPP Capacity	Up to 17 Mtpa	No change to CHPP capacity
Management of Mining Waste	Emplacement of waste in-pit and out-of-pit up to maximum existing approved height of 230 m. Tailings emplacement in Ravensworth East voids (including West Pit), within in-pit tailings cells in North Pit and/or BNP, and transfer under the GRAWTS to Liddell (subject to relevant approvals)	Emplacement of waste in Approved Disturbance Areas (up to maximum existing approved height) Tailings emplacement within West Pit, in-pit tailings cells in North Pit and/or BNP, and transfer under the GRAWTS
Water Management	Upper and Middle Bettys Creek Diversions Management of water within the water management system and GRAWTS Works to provide flood attenuation for Yorks Creek	No changes to existing approved creek diversions Extension of water management system to Proposed Disturbance Area and continued management of water within the GRAWTS Proposed amendments to design of existing water management system to provide flood attenuation for Yorks Creek
Operational Workforce	Up to approximately 660 at Mount Owen and up to 260 at Ravensworth East	Continued employment of existing Mount Owen workforce (up to approximately 660) for an additional 6 years
Hours of Operation	24 hours, 7 days per week	No change to hours of operation
Interactions with Integra Underground	Minimum 250 m separation subject to strict safety and operational controls	No change to minimum separation – implementation of safety and operational controls through integration of Glencore owned mining operations
Final Landform	Final voids at BNP and North Pit Final landform approved with commitments relating to landform design (including micro relief), conservation and water management considerations as part of further detailed mine design	No additional void in final landform Proposed changes to the final void arrangement in North Pit Final landform to be designed to incorporate detailed design commitments relating to landform design (including micro relief), conservation and water management considerations and be consistent with the existing progressive rehabilitation objectives in the development consent

3. Air Quality 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 Proposed Modification and associated activities. This identification process has considered the types of emissions to air and proximity of these emission sources to sensitive receptors.

Emissions to air will occur from a variety of activities including material handling, material transport, processing, wind erosion, blasting and potentially, from the spontaneous combustion of coal. These emissions would mainly comprise of particulate matter in the form of total suspended particulates (TSP), particulate matter with equivalent aerodynamic diameter of 10 microns or less (PM₁₀) and particulate matter with equivalent aerodynamic diameter of 2.5 microns or less (PM_{2.5}). There would also be relatively minor emissions from machinery exhausts such as carbon monoxide (CO), oxides of nitrogen (NO_x) and particulate matter, and to a lesser extent sulphur dioxide (SO₂), hydrogen sulphide (H₂S) and potentially odour and other substances from the spontaneous combustion of coal. However, spontaneous combustion of coal has not been an issue at Mount Owen Mine.

In summary, the potential air quality issues associated with the existing and proposed mining activities have been identified as:

- Dust (that is, particulate matter in the form of TSP, deposited dust, PM₁₀ or PM_{2.5}) from the general mining activities;
- Fume (that is, NO_x emissions) from blasting;
- Emissions of substances from machinery exhausts, that is, diesel exhaust emissions.

The issues above are similar to the issues identified for the Approved Operations as assessed for the Continued Operations Project (Pacific Environment 2014 and 2016) and are the focus of this assessment.

It should be noted that there is relatively low potential for material change in the magnitude of air quality impacts from the Proposed Modification, given that:

- It is only increasing the total area of Proposed Disturbance by 1.8%;
- There is no proposed increase to the maximum annual production rate, and equipment types and utilization remain very similar to that assessed for the Approved Operations; and
- To manage noise impacts, there is a proposed reduction in the annual production schedule in the last two years of the mine life.

As discussed in **Sections 5 and 6**, updates have been made to the relevant existing environment data for assessment purposes, in addition to a number of refinements to the modelling process to take account of feedback received during the assessment of the Approved Operations.

4. Air Quality Criteria

Typically, air quality is quantified by the concentrations of air pollutants in the ambient air. Air pollution occurs when the concentration (or some other measure of intensity) of substances known to cause health, nuisance and/or environmental effects, exceeds a certain level. With regard to human health and nuisance effects, the air pollutants most relevant to the Proposed Modification are particulate matter emissions from blasting, excavation works and material handling, transport and processing activities (see **Section 3**).

There are various classifications of particulate matter and the EPA has developed assessment criteria for:

- TSP, to protect against nuisance amenity impacts;
- PM₁₀, to protect against health impacts;
- PM_{2.5}, to protect against health impacts; and
- Deposited dust, to protect against nuisance amenity impacts.

Most of the EPA criteria are drawn from national standards for air quality set by the National Environmental Protection Council of Australia (NEPC) as part of the National Environment Protection Measures (NEPM). To measure compliance with ambient air quality criteria, the Office of Environment and Heritage (OEH) has established a network of monitoring stations across the State and up-to-date records are published on the OEH website.

Air quality impacts from the Proposed Modification will be determined by the level of compliance with the air quality criteria set by the EPA as part of their “Approved Methods for the Modelling and Assessment of Air Pollutants in NSW” (EPA 2016). These criteria are outlined in **Table 2** and apply to existing and potential sensitive receptors such as residences, schools and hospitals. It should be noted that the assessment to support the Approved Operations was based on an earlier version of the “Approved Methods” (see DEC 2005). The 2016 version introduces a revised, more stringent criterion for PM₁₀ as well as new criteria for 24-hour and annual average PM_{2.5}. In addition, the impact assessment criteria for the Approved Operations, as prescribed in the current development consent SSD-5850, are numerically identical to the criteria in the 2005 version of the Approved Methods. The impact assessment criteria from SSD-5850, and their application, are included in **Table 2** for comparison.

Table 2 EPA air quality assessment criteria

Substance	Averaging time	Criterion	Source	Impact Assessment Criteria from SSD-5850
Particulate matter (PM ₁₀)	24-hour	50 µg/m ³	EPA / DoE (2016)	50 µg/m ³ (incremental)
	Annual	25 µg/m ³	EPA / DoE (2016)	30 µg/m ³ (total)
Particulate matter (PM _{2.5})	24-hour	25 µg/m ³	EPA / DoE (2016)	Nil
	Annual	8 µg/m ³	EPA / DoE (2016)	Nil
Particulate matter (TSP)	Annual	90 µg/m ³	EPA / NHMRC (1996)	90 µg/m ³ (total)
Deposited dust	Annual (maximum increase)	2 g/m ² /month	EPA / NERDDC (1998)	2 g/m ² /month (incremental)
	Annual (maximum total)	4 g/m ² /month	EPA / NERDDC (1998)	4 g/m ² /month (total)
Nitrogen dioxide (NO ₂)	1-hour	246 µg/m ³	EPA / NEPC (1998)	Nil
	Annual	62 µg/m ³	EPA / NEPC (1998)	Nil

The EPA air quality assessment criteria relate to the total concentration of air pollutant 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. Further discussion of background levels in the study area is provided in **Section 5**.

In situations where background levels are elevated, the proponent must “demonstrate that no additional exceedances of the impact assessment criteria will occur as a result of the proposed activity and that best management practices will be implemented to minimise emissions of air pollutants as far as is practical” (EPA 2016). In SSD-5850 the determination of impact has been based on either incremental or total concentrations, depending on the substance and averaging time.

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. Specifically, and at the time, *“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.”*

The strengthening of ambient air quality reporting standards for particle pollution is relevant to the Proposed Modification. On 25 February 2016 an amendment to the NEPM entered into force and introduced the new national air quality standards for PM₁₀ and PM_{2.5}, as noted above. The NSW EPA subsequently revised their PM₁₀ and PM_{2.5} assessment criteria as part of an update to the “Approved Methods for the Modelling and Assessment of Air Pollutants NSW” (EPA 2016). These revised criteria are reflected in **Table 2**. There is currently no State legislation regarding the aim to move to more stringent PM_{2.5} criteria by 2025. Accordingly, the Proposed Modification is assessed against the current criteria detailed in the Approved Methods (2016) 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 (VLAMP) (2014) 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 current VLAMP (2014) remains in force at the completion of this assessment and reflects the previous air quality criteria as defined in the Approved Methods (2005). Accordingly, the current VLAMP does not require assessment against the revised criteria defined in the Approved Methods (2016).

A draft revised Voluntary Land Acquisition and Mitigation Policy is currently under review (NSW Government 2017) coupled with amendments to the Mining SEPP to give effect to these changes. Amongst other administrative changes, the draft revisions of the VLAMP intend to bring the air quality criteria in line with the NEPM standards and EPA criteria.

From this draft revised Policy, voluntary mitigation rights may apply where, even with best practice management, the development contributes to exceedances of the criteria in **Table 3** at any residence or workplace.

Table 3 Mitigation criteria for particulate matter

Substance	Averaging time	Mitigation criterion	Impact type
Particulate matter (PM _{2.5})	Annual	8 µg/m ³ *	Human health
	24-hour	25 µg/m ³ **	Human health
Particulate matter (PM ₁₀)	Annual	25 µg/m ³ *	Human health
	24-hour	50 µg/m ³ **	Human health
Particulate matter (TSP)	Annual	90 µg/m ³ *	Amenity
Deposited dust	Annual	2 g/m ² /month**	Amenity
	Annual	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 0 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 4** 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 4 Acquisition criteria for particulate matter

Substance	Averaging time	Acquisition criterion	Impact type
Particulate matter (PM _{2.5})	Annual	8 µg/m ³ *	Human health
	24-hour	25 µg/m ³ **	Human health
Particulate matter (PM ₁₀)	Annual	25 µg/m ³ *	Human health
	24-hour	50 µg/m ³ **	Human health
Particulate matter (TSP)	Annual	90 µg/m ³ *	Amenity
Deposited dust	Annual	2 g/m ² /month**	Amenity
	Annual	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 5 allowable exceedances of the criteria over the life of the development.

The particulate matter levels for comparison with the criteria in **Table 3** and **Table 4** must be calculated in accordance with the EPA's "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW" (EPA 2016).

The draft revised VLAMP also refines the application of this policy to modifications of consent and states:

"The policy commences from the date that it is gazetted, and applies to:

- *Modification applications that involve increases in the approved dust or noise impacts of a development."*

As demonstrated by this assessment, the Proposed Modification is not predicted to result in an increase in impacts relative to the Approved Operations (see **Appendix G**). Accordingly, at the point that the revised VLAMP is gazetted, it will not apply to the Proposed Modification. As such this assessment uses the requirements of the existing VLAMP (2014) to assess the Proposed Modification.

5. Existing Environment

This section provides a description of the environmental characteristics in the area, including a review of the local meteorological and ambient air quality conditions. The review considers data collected from existing meteorological and air quality monitoring networks, the locations of which are shown in **Figure 3**. These locations were amended in the currently approved Air Quality Management Plan however the data reviewed are based on the locations below. One of the objectives for reviewing these data was to develop an understanding of existing air quality issues as well as the meteorological conditions which typically influence the local air quality conditions.

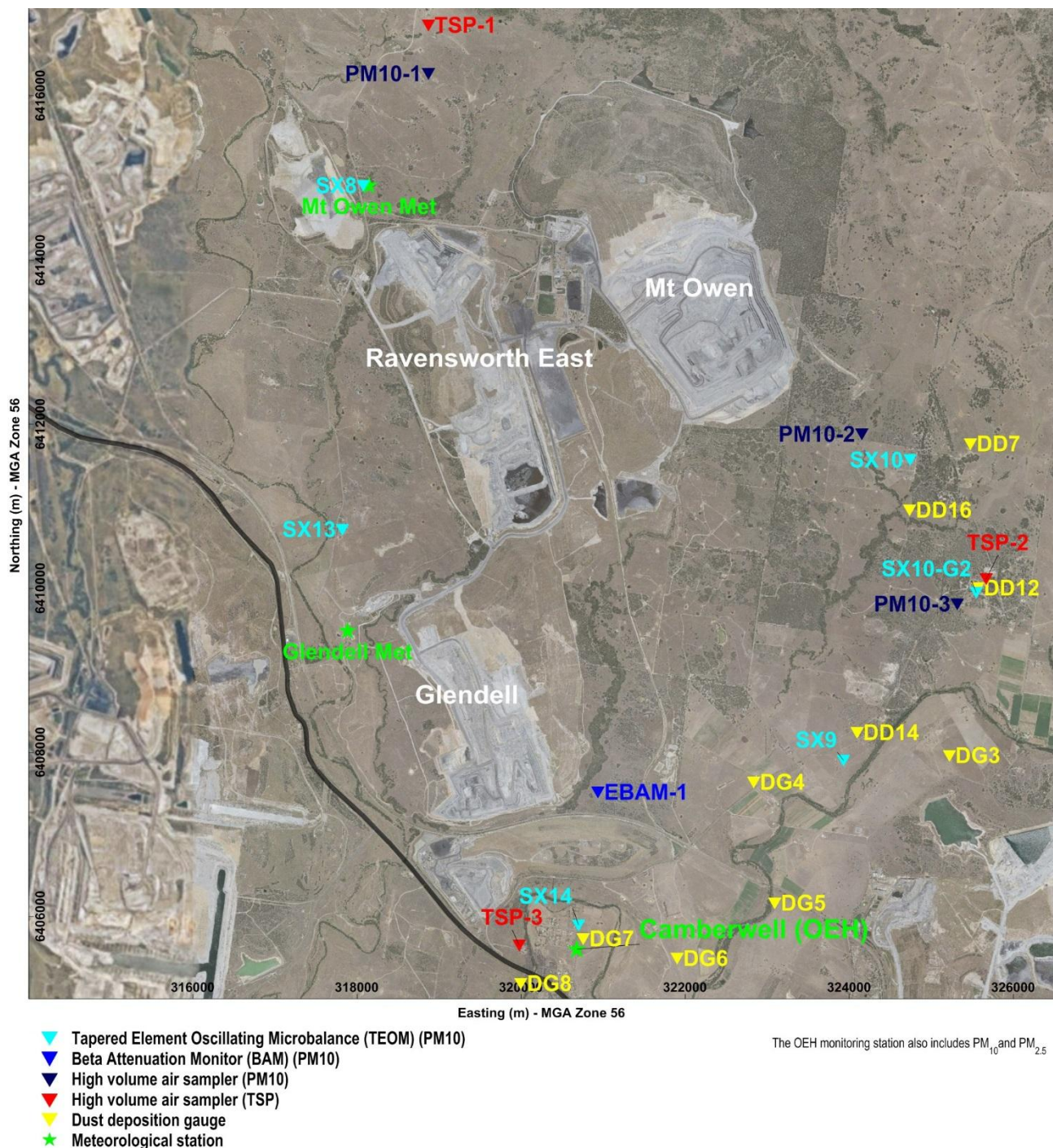


Figure 3 Location of air quality and meteorological monitoring sites

5.1 Meteorological Conditions

Meteorological conditions are important for determining the direction and rate at which emissions from a source will disperse. The key meteorological requirements of air dispersion models are, typically, hourly records of wind speed, wind direction, temperature, and atmospheric stability. For air quality assessments, a minimum one year of hourly data is usually required, which means that almost all possible meteorological conditions, including seasonal variations, are considered in the model simulations.

Three meteorological stations have been identified in a 20 km by 20 km domain around the Mount Owen Complex. These stations, shown in **Figure 3**, are referred to as:

- Glendell (SX13), operated by Mount Owen
- Mt Owen (SX8), operated by the Mount Owen
- Camberwell, operated by the OEH

Meteorological data from five recent years (2012 to 2016 inclusive) have been analysed in order to identify a representative year for the modelling. Hourly records of temperature, wind speed and wind direction were obtained, among other parameters. The procedure for identifying a representative meteorological year involved selecting a meteorological monitoring station and comparing wind patterns for the 2012 to 2016 calendar years. Any of the three meteorological stations could have been chosen for identifying a representative year. For this exercise, data from the Glendell meteorological station (located at SX13) were chosen since this station is closest to the centre of the model domain.

Figure 4 shows the annual wind patterns for, 2012, 2013, 2014, 2015 and 2016. It can be seen from these wind-roses that the most common winds in the area are from the south-southeast, southeast and northwest and north-northwest. This pattern of winds is common for many parts of the Hunter Valley and reflects the northwest-southeast alignment of the valley.

It is also clear from **Figure 4** that wind patterns were similar in all of the past five years. 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 used as a representative year for modelling purposes.



Figure 4 Annual wind-roses for data collected at Glendell meteorological station

Figure 5 shows the wind speed data from the Glendell meteorological station, as well as rainfall data from Singleton. Rainfall data from the Glendell and Mt Owen meteorological stations were only available from 2013 to 2016. In terms of wind conditions, the average and maximum wind speeds exhibited similar ranges across all five years. Maximum wind speeds reached around 12 m/s (as an hourly average) and these winds typically occurred in spring.

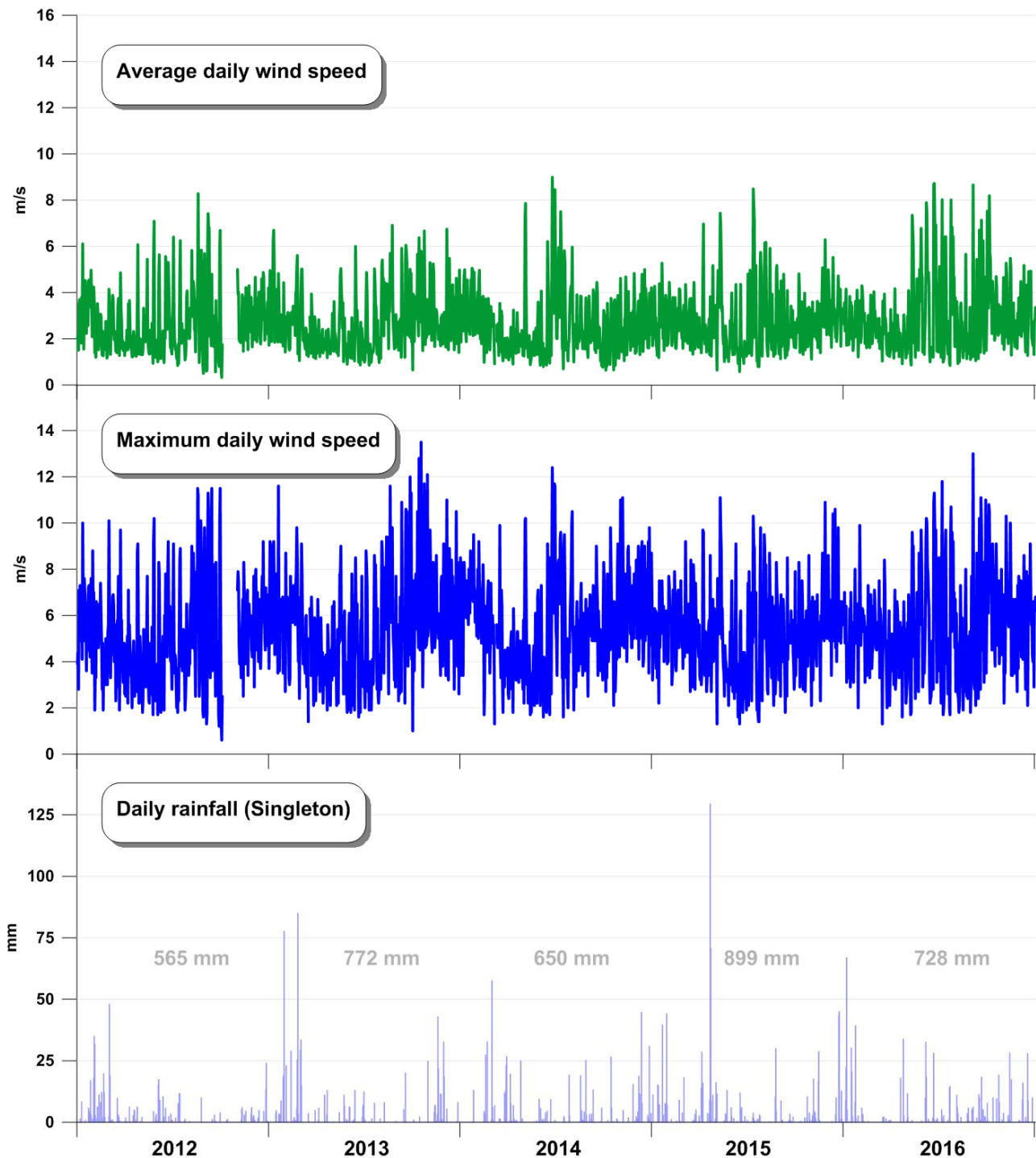


Figure 5 Wind speed and rainfall for data collected between 2012 and 2016

As can be seen from **Figure 5**, rainfall can occur at any time of the year and with varying intensity. Statistically, the annual rainfall (2012 to 2016) has ranged from 565 mm in 2012 to 899 mm in 2015. These annual values can be compared to the longer-term records which are as follows:

- Singleton STP (Bureau of Meteorology) 2002 to 2016 = 677 mm
- Singleton Army (Bureau of Meteorology) 1969 to 1990 = 720 mm

Finally, the annual data statistics for the past five years have been examined to assist with identifying a representative meteorological year. **Table 5** shows the statistics.

Table 5 Annual statistics from meteorological data collected between 2012 and 2016

Location	Statistic	2012	2013	2014	2015	2016
Glendell	Percent complete (%)	88	98	98	96	95
Glendell	Mean wind speed (m/s)	2.7	2.7	2.6	2.7	2.9
Glendell	99 th percentile wind speed (m/s)	8.9	8.9	8.8	8.5	9.3
Glendell	Percentage of calms (%)	5.0	6.1	11.1	4.5	4.7
Glendell	Percentage of winds >6 m/s (%)	7.0	7.4	7.9	6.3	9.8
Singleton	Rainfall (mm)	565	772	650	899	728
Mt Owen (SX8)	Rainfall (mm)	NA	708	819	993	662
Glendell (SX13)	Rainfall (mm)	NA	744	688	962	750

Over these five years, the mean annual wind speed has ranged from 2.6 to 2.9 m/s, and the percentage of calms has ranged from 5 to 11 per cent. None of these years appear to be significantly different to the other years and again, data from any of the years may be considered as representative for the purposes of modelling.

For this assessment the 2014 calendar year has been selected as the meteorological modelling year, based on:

- High data capture rate, relative to other years
- Similar wind patterns to other years
- Rainfall being slightly below the long-term average, and the preference was for a slightly drier than average year
- Air quality conditions which showed similarities to other years and not adversely influenced by bushfire activity (as will be seen in **Section 5.2**)

The air quality assessment for the Continued Operations Project (now the Approved Operations) was based on modelling with meteorological data collected for a one-year period between 2011 and 2012 (Pacific Environment 2014 and 2016). The selection of the 2011/12 data was queried during the assessment process for the Approved Operations on the basis that background particulate matter concentrations for the same period may have been lower than the longer-term averages, thereby having potential for a less conservative assessment. Whilst this issue was further investigated and satisfied during the Approved Operations assessment process, the current selection of 2014 data has considered both the longer-term air quality (see **Section 5.2**) and meteorological conditions in order to identify a representative modelling year.

Methods used for incorporating the 2014 data into the meteorological modelling (CALMET) and air dispersion modelling (CALPUFF) are discussed in detail in **Section 7**. Annual and seasonal wind-roses from all three meteorological stations used in the modelling are provided in **Appendix A**.

5.2 Air Quality Conditions

The EPA air quality criteria refer to levels of substances which generally include the project of interest and existing sources, not just the contribution from local mining activities. To fully assess impacts against all the relevant air quality criteria (see **Section 4**) it is necessary to have information or estimates of the existing air quality conditions. This section provides a description of the existing air quality.

Air quality in the vicinity of the Mount Owen Complex is monitored by Mount Owen and by the OEH. This monitoring includes the measurement of:

- Particulate matter (as PM₁₀)
- Particulate matter (as PM_{2.5})
- Particulate matter (as TSP)
- Dust deposition

Concentrations of NO₂ have not been measured in the vicinity of the Mount Owen Complex, however the OEH measures this substance at other locations as part of its Upper Hunter Air Quality Monitoring Network. **Sections 5.2.1 to 5.2.5** describe the existing air quality conditions, based on a review of monitoring results for the substances listed above, as well as for NO₂.

It should be noted that the measurement 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, the background concentration may contain emissions from many sources such as from mining activities, construction works, bushfires and 'burning off', industry, vehicles, roads, wind-blown dust from nearby and remote areas, fragments of pollens, moulds, and so on.

5.2.1 Particulate Matter (as PM₁₀)

Figure 3 shows the location of monitors which are used to measure PM₁₀ concentrations. The concentrations are measured by a variety of instruments including Tapered Element Oscillating Microbalance (TEOM), high volume air sampler (HVAS) and beta attenuation monitor (BAM).

Figure 6 shows the measured 24-hour average PM₁₀ concentrations from each TEOM monitoring site for data collected between 2012 and 2016. The EPA's air quality assessment criteria for PM₁₀ (50 µg/m³) has also been shown on these graphs. It can be seen from **Figure 6** that all sites recorded at least one day above the 50 µg/m³ criterion in the past five years. There is a seasonal variation in the air quality conditions, with most exceedances of the 50 µg/m³ criterion occurring in spring.

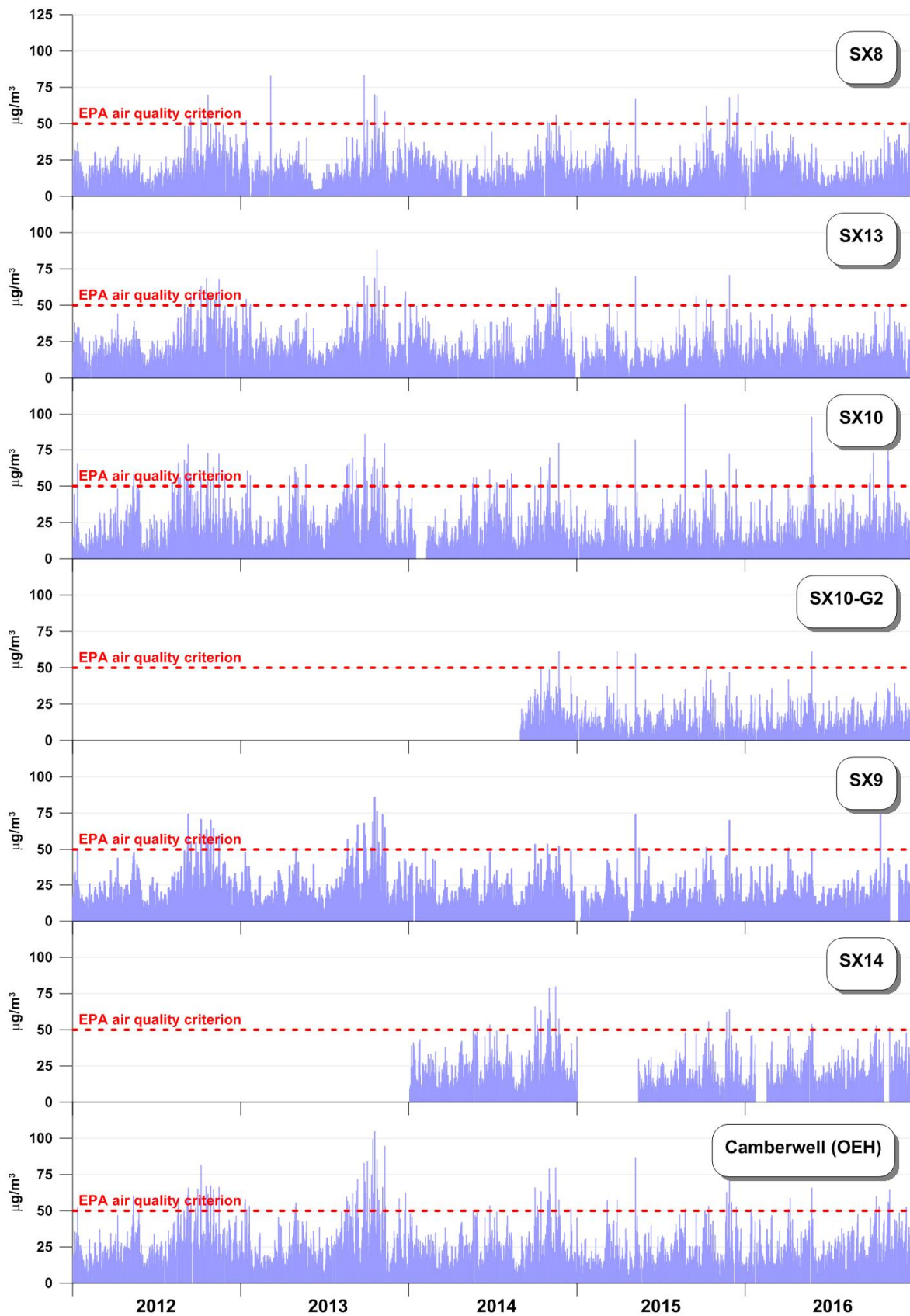
Figure 6 Measured 24-hour average PM₁₀ concentrations

Table 6 summarises the measured PM₁₀ concentration data for each site and for 24-hour and annual average periods, for comparison with the respective EPA criteria. As noted above, most sites have measured at least one day per year above the 50 µg/m³ criterion in the past five years. Annual average PM₁₀ concentrations have not exceeded the 30 µg/m³ criterion (applicable during 2012 to 2016 and in SSD-5850) for all sites. Data from the OEH's monitoring sites at Singleton and Newcastle have also been presented in **Table 6** for comparison. Apart from Camberwell, the average PM₁₀ concentrations in the vicinity of the Mount Owen Complex are similar to the PM₁₀ concentrations in Singleton and Newcastle. At Camberwell PM₁₀ concentrations are higher and as shown in **Table 6**, have been consistently above the revised PM₁₀ annual criterion of 25 µg/m³.

Table 6 Summary of measured PM₁₀ concentrations

Year	SX8	SX13	SX10	SX10-G2	SX9	SX14	PM10-1	PM10-2	PM10-3	Camberwell (OEH)	Singleton (OEH)	Newcastle (OEH)	Criterion
Maximum 24-hour average in µg/m ³													
2012	70	69	79	NA	74	NA	66	75	94	82	64	49	50
2013	83	88	86	NA	86	NA	85	86	68	105	63	69	
2014	56	62	80	61	54	80	89	71	49	80	55	54	
2015	70	71	107	61	74	64	67	54	55	87	85	70	
2016	51	56	98	61	76	54	43	54	48	66	61	89	
Number of days above 24-hour average criteria													
2012	4	10	20	NA	15	NA	6	7	4	23	7	0	-
2013	7	15	26	NA	15	NA	6	6	4	36	12	4	
2014	3	5	15	2	4	11	9	3	0	12	1	2	
2015	7	6	8	2	4	3	3	1	1	11	3	3	
2016	1	2	11	1	2	5	0	2	0	11	1	1	
Annual average in µg/m ³													
2012	21	23	24	-	22	22	18	25	23	27	22	21	30 (now 25)
2013	20	23	25	-	23	24	15	26	21	28	23	23	
2014	20	22	22	21	21	24	19	24	21	25	21	21	
2015	20	18	19	14	18	20	20	18	18	22	19	21	
2016	19	20	22	14	18	23	18	23	19	25	19	22	

The spatial variation in PM₁₀ concentrations has been examined by plotting the measurement data according to the geographical position of each monitor. **Figure 7** shows the maximum 24-hour average PM₁₀ concentrations for the last five years, and according to the position of each monitor. This figure does not show any clear trend in maximum concentrations. At some locations (for example, SX13 and SX14) the maximum concentration has decreased from 2014 to 2016, but at other locations the maximum has been variable, increased or remained steady. The data for Camberwell have been presented in a different colour to reflect the different operator of that monitor (that is, OEH).

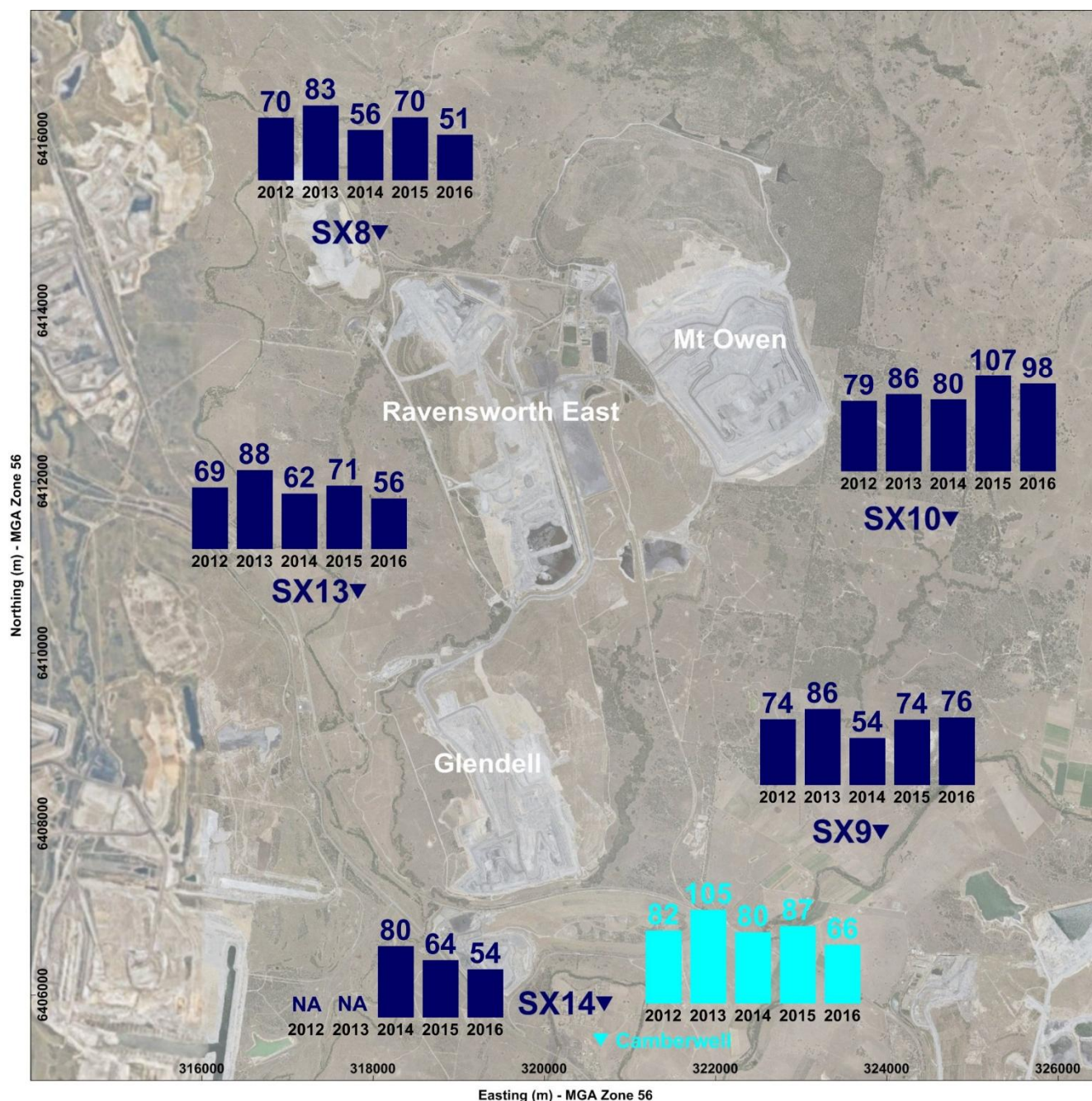


Figure 7 Spatial variation in maximum 24-hour average PM₁₀ concentrations (µg/m³)

Figure 8 shows the number of days above the $50 \mu\text{g}/\text{m}^3$ PM_{10} criterion, for the last five years. From these data, SX10 and Camberwell have typically experienced more days above $50 \mu\text{g}/\text{m}^3$ than the other locations, with 2012 and 2013 standing out as years with more events. Specifically, there were 20 and 26 days above $50 \mu\text{g}/\text{m}^3$ at SX10 for 2012 and 2013 respectively. SX10 is located in the order of one to two kilometres from Mount Owen Mine and is likely to be influenced by sources at that operation. SX9 and SX13 also experienced a higher number of events in 2012 and 2013. Betts et al (2014) and the OEH (2013a) both reported that the higher number of days above $50 \mu\text{g}/\text{m}^3$ in 2013 was due to significant bushfires in the region, mainly in September, October and November. Results for the 2014 calendar year appeared to be around the average for most locations.

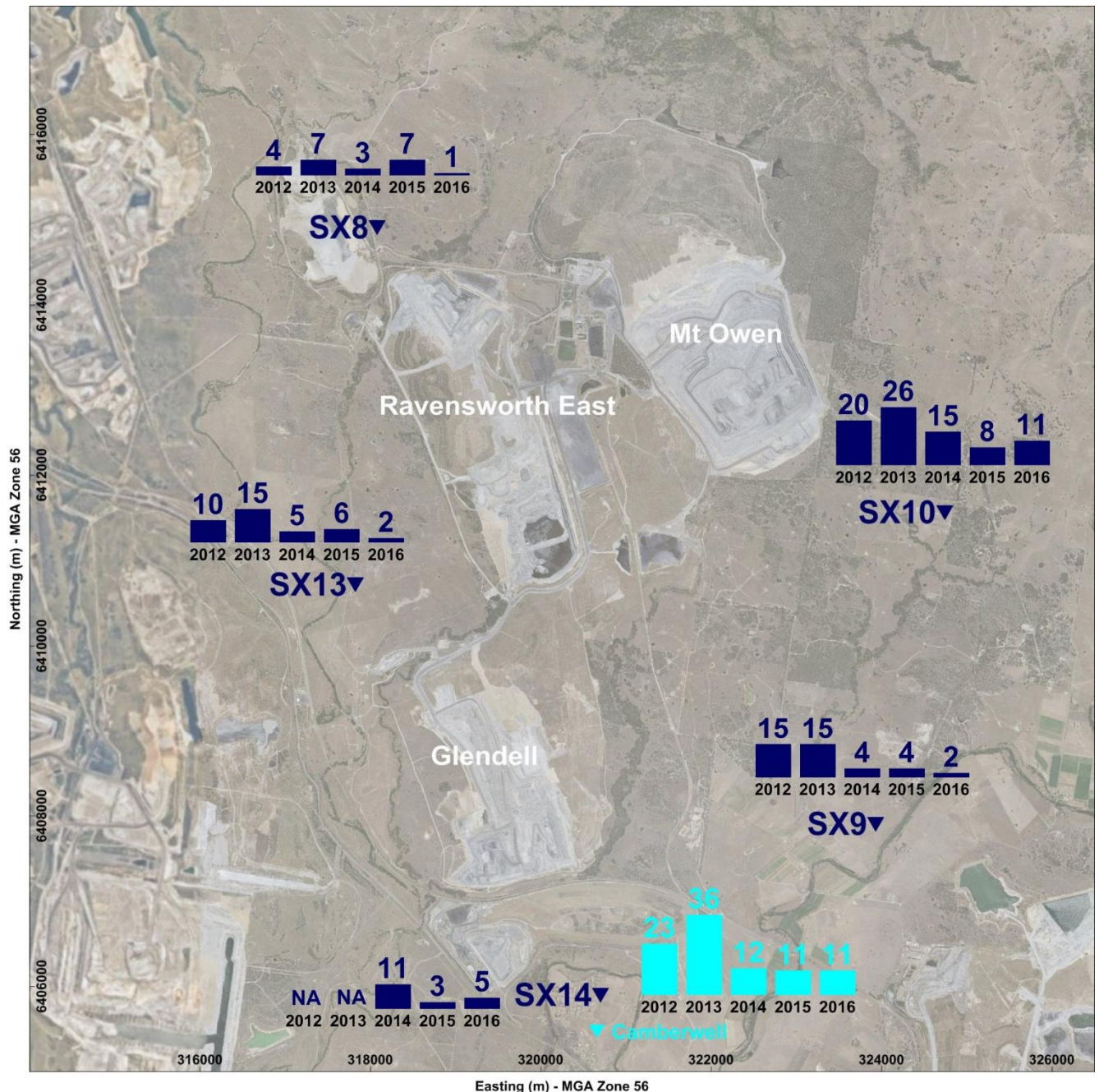


Figure 8 Spatial variation in the number of days per year above $50 \mu\text{g}/\text{m}^3$ PM_{10} (days)

Figure 9 shows the annual average PM₁₀ concentrations for the last five years and presented according to the position of each monitor. No exceedances of the EPA's previous annual average PM₁₀ criterion (30 µg/m³) were recorded at any of the monitoring sites. After 20 January 2017 however the criterion was revised to 25 µg/m³. The highest annual average concentration was measured at the OEH's monitor in Camberwell (28 µg/m³ in 2013). Again, the results for the 2014 calendar year appear to be typical of the longer-term conditions experienced at each site which supports the earlier suggestion (**Section 5.1**) of 2014 being a typical or representative year.

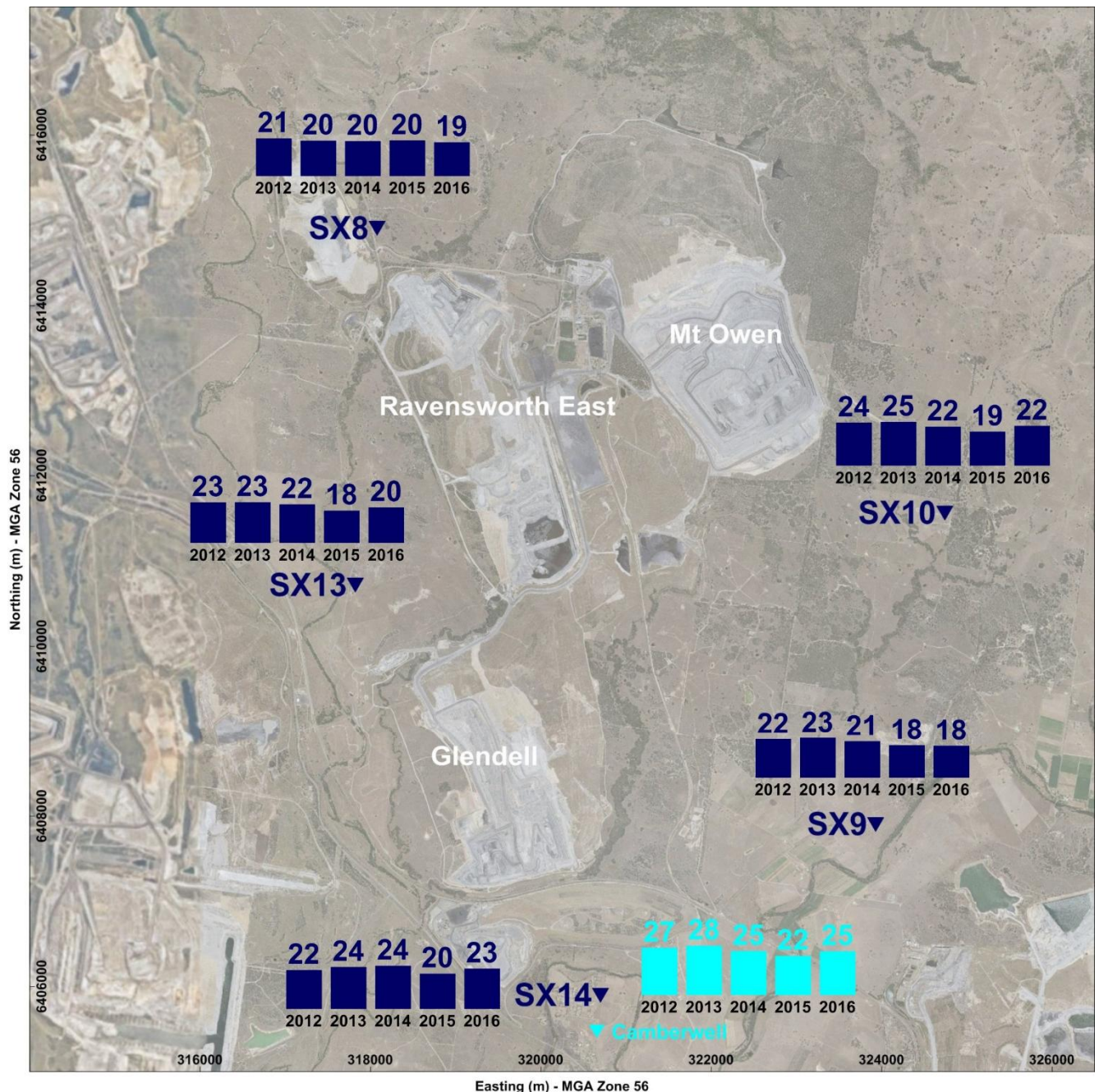


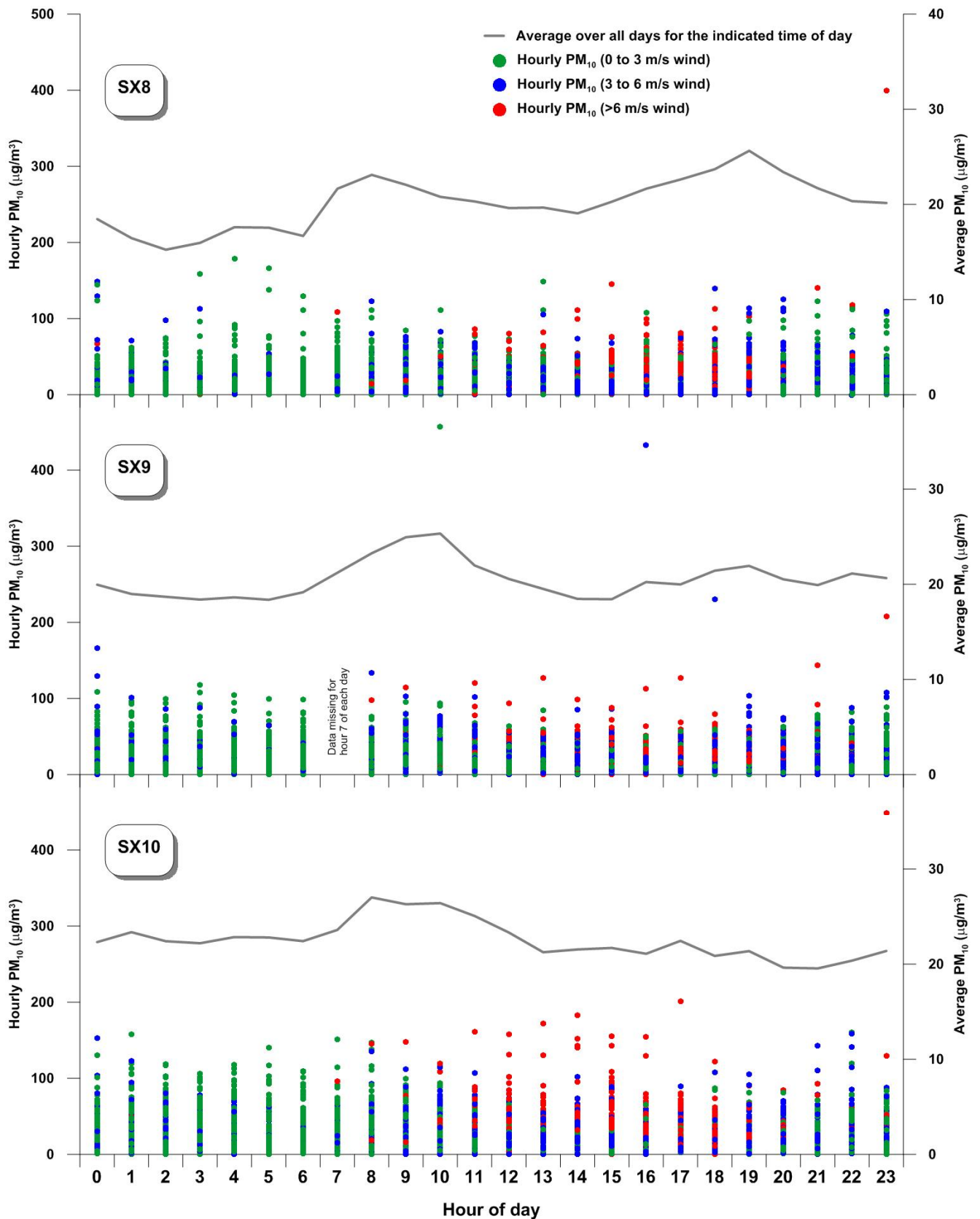
Figure 9 Spatial variation in annual average PM₁₀ concentrations (µg/m³)

The potential conditions which led to elevated PM₁₀ concentrations at SX8, SX9 and SX10 for 2014 have been analysed by the preparation of the following graphs:

- Hourly PM₁₀ concentrations by time of day and wind speed (**Figure 10**).
- Hourly PM₁₀ concentrations by wind direction and wind speed (**Figure 11**).

The information from **Figure 10** shows that, for these monitoring sites in 2014, the highest short-term (1-hour average) PM₁₀ concentrations could be at any time of day. However, on average, the PM₁₀ 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 11 shows the measured hourly average PM₁₀ concentrations by wind direction and wind speed, from 2014 data. It can be seen from these figures that at SX10 some of the highest hourly average PM₁₀ concentrations were associated with stronger winds from the northwest. At all sites, the very highest concentration coincided with a wind from the west to northwest.

Figure 10 Measured PM₁₀ concentrations by time of day and wind speed (2014 data)

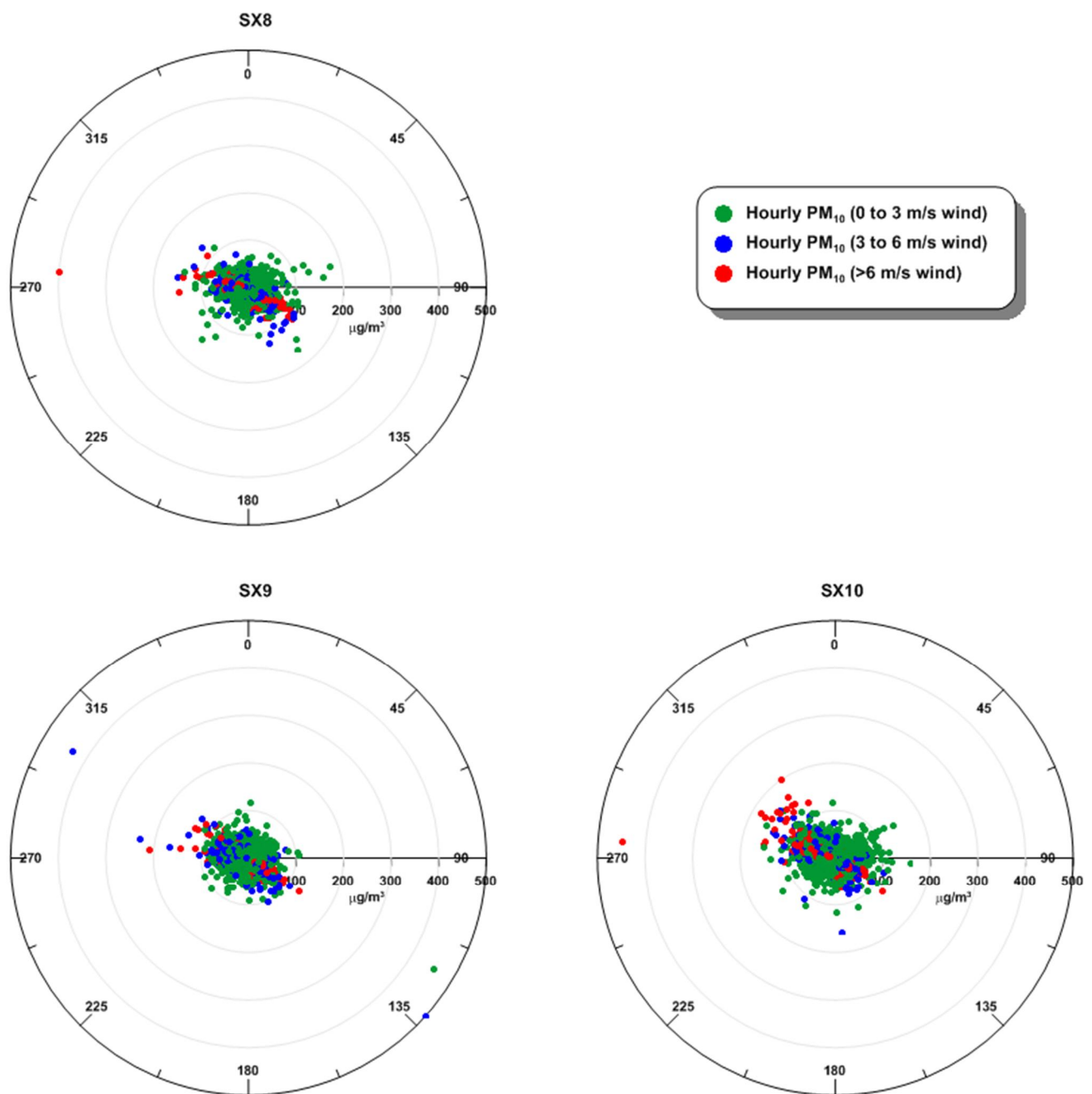


Figure 11 Measured PM₁₀ concentrations by wind direction and wind speed (2014 data)

5.2.2 Particulate Matter (as PM_{2.5})

The closest air quality monitoring stations which record concentrations of PM_{2.5} with publicly available data are located at Singleton and Camberwell. These stations are operated by the OEH and use Beta Attenuation Monitors (BAM) for the measurement of PM_{2.5}. Data from the OEH's Newcastle monitoring site have also been reviewed, for comparison.

Figure 12 shows the measured 24-hour average PM_{2.5} concentrations from the Camberwell monitoring site for data collected between 2012 and 2016. The EPA's current air quality assessment criteria for PM_{2.5} (25 µg/m³) has also been shown, but it should be noted that this criterion came into effect from 20 January 2017 onwards. PM_{2.5} concentrations have been below the EPA criterion for the majority of the time. There was one day in 2013 and one day in 2014 when concentrations exceeded the criterion. A weak seasonal variation is also evident, with the higher concentrations tending to occur in spring.

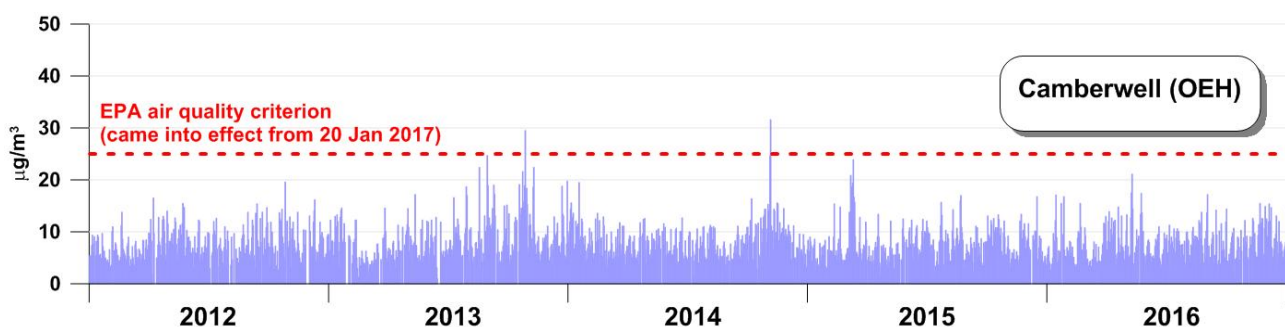


Figure 12 Measured 24-hour average PM_{2.5} concentrations

Table 7 summarises the measured PM_{2.5} results for data collected between 2012 and 2016. It can be seen from these data that the highest 24-hour average PM_{2.5} concentrations have exceeded the 25 µg/m³ criterion on at least one occasion in the past five years, but at that time the 25 µg/m³ criterion was referred to as an advisory reporting goal and not an EPA air quality impact assessment criterion.

Annual averages are close to the 8 µg/m³ criterion, exceeding in some years by 0.1 or 0.2 µg/m³. Again, the 8 µg/m³ level only came into effect as an assessment criterion from 20 January 2017, prior to which it was referred to as an advisory reporting goal. As noted in **Section 5.2.1**, bushfire activity between September and November of 2013 was identified as a major cause of the elevated particulate matter concentrations in this year.

It is also useful to compare the Hunter Valley data with information from other locations. Annual average PM_{2.5} concentrations in Newcastle were similar to those measured in the Hunter Valley. At Cape Grimm, a site in rural Tasmania that is used as a global “baseline” reference for unpolluted air entering Australia, the mean PM_{2.5} concentration was 5.6 µg/m³ for data collected between 1998 and 2008 (ANSTO 2008). Most of Cape Grimm's particulate matter mass is from sea salt.

The Upper Hunter Fine Particle Characterisation Study (OEH, 2013b) 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.

Table 7 Summary of measured PM_{2.5} concentrations

Year	Camberwell (OEH)	Singleton (OEH)	Newcastle (OEH)	Criterion
Maximum 24-hour average in µg/m³				
2012	20	20	-	25 (came into effect as an assessment criterion from 20 Jan 2017 onwards)
2013	30	23	-	
2014	32	29	21	
2015	24	25	28	
2016	21	28	66	
Number of days above 24-hour average criteria				
2012	0	0	-	-
2013	1	0	-	
2014	1	1	0	
2015	0	0	1	
2016	0	2	1	
Annual average in µg/m³				
2012	7.5	8.0	-	8 (came into effect as an assessment criterion from 20 Jan 2017 onwards)
2013	8.2	7.9	-	
2014	7.8	7.8	8.1	
2015	7.2	7.6	7.8	
2016	7.5	7.9	7.8	

5.2.3 Particulate Matter (as TSP)

TSP concentrations have been measured at three locations by high volume air sampler (HVAS). **Figure 3** shows the location of the monitoring sites and **Table 8** shows the annual average concentrations from data collected in the past five years, for comparison with the EPA's 90 µg/m³ criterion. None of the monitoring sites have recorded TSP concentrations above 90 µg/m³.

Table 8 Summary of measured TSP concentrations

Year	TSP-1	TSP-2	TSP-3	Criterion
Annual average in µg/m ³				
2012	59	77	65	90
2013	47	85	73	
2014	58	76	70	
2015	55	61	57	
2016	53	76	62	

5.2.4 Deposited Dust

Table 9 shows the annual average deposited dust levels for each gauge from data collected in the past five years, for locations representative of private properties. **Figure 3** shows the location of the monitoring sites. The results in **Table 9** can be compared with the EPA's 4 g/m²/month criterion. Contaminated monthly samples were excluded from the calculation of these annual averages.

Table 9 Summary of measured deposited dust levels

Year	DD6	DD7 / DG2	DD9	DD11	DD12	DD14	DD15 / DG4	DD16	DG3	DG5	DG6	DG7	DG8	Criterion
Annual average expressed as g/m ² /month														
2012	5.4	3.6	4.2	4.4	2.7	1.7	2.9	2	2.6	3.1	4.8	3.5	3.3	4
2013	5.4	3	4.1	3.5	3	2.2	3	2.7	2.1	2.4	4.1	3.1	3	
2014	7.1	2.6	3.9	3	2.2	1.5	2.7	2.3	1.7	2.3	1.8	5.9	2.4	
2015	2.8	2.1	3.1	3.6	2.1	1.8	2.5	2.5	1.3	1.5	2.8	2.1	2.6	
2016	2	2.1	2.6	5	2.5	1.3	1.8	2.7	1.6	1.6	2.0	2.1	2.7	

It can be seen from **Table 9** that five locations have experienced deposition levels above the EPA's 4 g/m²/month criterion, in one or more years. No monitors have recorded above 4 g/m²/month in the past two years.

5.2.5 Nitrogen Dioxide (NO₂)

Table 10 provides a summary of the measured NO₂ concentrations from Singleton (the closest known air quality monitoring site which records this substance). These data show that the maximum NO₂ concentrations have been well below the EPA's 1-hour average criterion of 246 µg/m³. Annual averages have also been well below the EPA's annual average criterion of 62 µg/m³.

Table 10 Summary of measured NO₂ concentrations

Year	Singleton (OEH)	Criterion
Maximum 1-hour average in µg/m³		
2012	82	246
2013	84	
2014	74	
2015	66	
2016	66	
Annual average in µg/m³		
2012	18	62
2013	18	
2014	16	
2015	16	
2016	16	

5.3 Summary of the Existing Environment

The following conclusions have been made from the review of local meteorological and ambient air quality monitoring data:

- Wind patterns in the vicinity of Mount Owen Mine are similar to other parts of the Hunter Valley, with the prevailing winds being from either the northwest or southeast.
- There are seasonal variations in particulate matter concentrations, with PM₁₀ levels higher in spring and PM_{2.5} levels higher in winter.
- There are daily variations in particulate matter concentrations, with levels typically highest in the morning and evening.
- In terms of PM₁₀ concentrations, most monitoring sites in the vicinity of Mount Owen Mine have experienced at least one day above the EPA's 50 µg/m³ criterion in the past five years, but annual averages have complied with EPA criteria for all locations.
- TSP and NO₂ concentrations are below their relevant EPA criteria.
- Deposited dust levels have exceeded EPA criteria at five of the 13 monitoring locations, but not in the recent two years.
- The two closest PM_{2.5} monitoring stations, Camberwell and Singleton, have measured PM_{2.5} concentrations which are close to or have exceeded the EPA criteria. A study by the OEH (2013b) found that wood smoke from domestic heating was one of the main factors that influenced PM_{2.5} concentrations, especially in winter.
- Conditions in 2014 were representative of the longer-term air quality and meteorological conditions.

5.4 Assumed Background Levels

One of the objectives for reviewing the air quality monitoring data was to determine appropriate background levels to be added to model predictions for the assessment of potential cumulative impacts, that is, mining contribution plus non-mining contribution. For this objective, the approach was to make use of data collected from all real-time air quality monitors in the vicinity of Mount Owen Mine and, at the same time, minimise the potential for adding model predictions to measurements which may already contain contributions from those sources being modelled (i.e. to avoid double counting).

The adopted approach involved developing an hourly variable background dataset that was added to the model predictions. This dataset was created by using the minimum measured non-zero hourly average concentration from SX8, SX9, SX10, SX10-G2, SX13 and SX14 for each hour in the 2014 calendar year. A key assumption to this approach is that the minimum value from these sites will reflect a location that was not being influenced by emissions from the sources to be modelled. The statistics of the resultant dataset (included in **Table 11**) indicate that this approach, and its inherent assumption, produce estimated background levels which are similar to actual measurements in the region.

The estimated background levels that apply at sensitive receptors are shown below in **Table 11**. These levels (or approach adopted) have been added to model predictions to determine the potential cumulative impacts.

Table 11 Assumed non-modelled background levels that apply at sensitive receptors

Substance	Averaging time	Assumed background level that applies at sensitive receptors	Notes
Particulate matter (PM ₁₀)	24-hour and annual	Variable by hour of day	The adopted approach involved developing an hourly variable background dataset that was added to the model predictions. This dataset was created by using the minimum measured non-zero hourly average concentration from SX8, SX9, SX10, SX10-G2, SX13 and SX14 for each hour in the 2014 calendar year. Statistics from the resultant dataset are as follows: - Maximum 24-hour average = 47 µg/m³ - Annual average = 14 µg/m³
Particulate matter (PM _{2.5})	24-hour and annual	Variable by hour of day	Same approach as for PM₁₀. The hourly PM_{2.5} concentration was calculated from the hourly PM₁₀ concentration on the assumption that 40% of the PM₁₀ is PM_{2.5}. The OEH data for Singleton show that PM_{2.5} is in the order of 40% of the PM₁₀. Statistics from the resultant dataset are as follows: - Maximum 24-hour average = 19 µg/m³ - Annual average = 5.4 µg/m³
Particulate matter (TSP)	Annual	68 µg/m ³	Average of the three annual average concentrations measured from TSP-1, TSP-2 and TSP-3 in 2014.
Deposited dust	Annual	2 g/m ² /month	Estimate of background levels that may exist in the vicinity of nearest sensitive receptors without the contribution from modelled sources.
Nitrogen dioxide (NO ₂)	1-hour	74 µg/m ³	Maximum 1-hour average from Singleton in 2014.

6. Emissions to Air

The most significant emission to air from the Proposed Modification will be dust (particulate matter) due to material handling, material transport, processing, wind erosion, and blasting. Estimates of these emissions are required by the dispersion model. Total dust emissions have been estimated by analysing the material handling schedule, equipment listing and mine plans and identifying the location and intensity of dust generating activities. Operations have been combined with emissions factors developed both locally and by the US EPA.

The emission factors used for this assessment have been drawn largely from the following sources:

- *Emission Estimation Technique Manual for Mining* (NPI, 2012);
- AP 42 (US EPA, 1985 and updates); and
- ACARP Project C22027 (ACARP 2015).

Dust emission inventories have been developed for each of the modelled scenarios, namely:

- 2014, representing “existing” conditions (with the operations approved at that time) and for model performance evaluations.
- Year 2, Year 8 and Year 15, representing proposed future conditions, and assuming maximum production.

The “existing” scenario has been developed to evaluate the performance of the model. In this case the model predictions were compared to monitored results to determine the level of confidence that can be assumed for the future scenarios. The assessment focusses primarily on the performance of the model for predicting PM₁₀ concentrations. This approach was driven by the outcome of the existing air quality review (see **Section 5.2**) which showed that PM₁₀ is one of the key air quality issues due to a higher number of historical exceedances of the EPA air quality criteria than other substances. 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 predicted levels.

The three future scenarios have been selected to represent various mine stages in the life of the mine, including at maximum production and for times when operations are close to sensitive receptors. 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 selection of Year 2, Year 8 and Year 15 was therefore based on a review of material handling quantities, haul distances, and location of activities for each year in the proposed mine life, and selecting three years for assessment.

In addition, the model includes predictions of contributions from surrounding existing, and in the case of future operating scenarios, approved mining operations to include the contribution of these mining sources to the total particulate matter levels in the surrounding area. **Table 12** shows the assumed ROM coal production data from each operation in the model domain. The data for 2014 were derived from the Annual Environmental Management Report (AEMR) produced by each mining company and available on their respective websites. The AEMRs also included overburden handling quantities and plans showing the mining locations which are important for determining site dust emissions. For future mining scenarios, the production data and location of mining operations has been sourced from publically 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 consents in place at the time of completing this assessment.

The approved Ashton South East Open Cut (SEOC) open cut mining operation has been included in the future modelling scenarios despite the SEOC not being operational at the time of completing this assessment. The SEOC has been included as the existing development consent enables mining to occur during the life of the Proposed Modification and has the potential to impact on air quality in the surrounding area, as detailed in the AQIA completed for the Continued Operations Project (Pacific Environment 2014 and 2016). For Rix's Creek mine, it has been assumed that the Rix's Creek Continuation Project (Todoroski 2015) will be approved even though, at the time of this current assessment, a decision is still pending.

Estimated production quantities for the Proposed Modification were provided by Mount Owen based on expected mine production schedules.

Table 12 Assumed ROM coal production from each operation in the model domain

Operation	Notes	ROM coal production in Mtpa			
		2014	Year 2 (2020) ²	Year 8 (2026) ²	Year 15 (2033) ²
Mount Owen	-	8.22	8.22	7.16	3.19
Ravensworth East	2014-West Pit. 2020-BNP	1.78	1.72	-	-
Glendell	Approved to 2021	4.37	4.50	-	-
Ashton and SEOC*	Approved – not currently operating	2.8	9.05	9.05	9.05
HVO ¹	Approved until 2030	18.00	26.00	26.00	-
Integra Underground	C&M from Apr 2014 to Feb 2017	0.83	4.50	4.50	4.50
Liddell	2023 is the last planned mining year	6.66	8.00	-	-
Ravensworth	-	10.94	16.00	16.00	16.00
Rix's Creek	Approved to 2019. It has been assumed that the Rix's Creek Continuation Project (Todoroski 2015) will be approved for the purposes of this assessment	2.76	4.50	4.50	4.50
Rix's Creek North	Approved - recommenced operations in 2016 (C&M in 2014)	-	6.00	6.00	6.00

* Assumed that Project will be in operation.

¹ The component of HVO which is in the model domain.

² Calendar years are indicative only and are to provide guidance for the duration of other mining operations relative to the Proposed Modification.

Table 13, Table 14 and Table 15 show the estimated annual TSP, PM₁₀ and PM_{2.5} emissions, respectively, due to the Proposed Modification as well as all other operating, or assumed to be operating, mines in the model domain. Estimates for 2014 were based on production and material handling quantities contained in the respective AEMR while estimates for future years, that is, Year 2 onwards, were based on maximum approved production rates. As noted above, the assessment has also been carried out on the assumption that the Ashton South East Open Cut (SEOC) operation will be operating in the future. The operational status of SEOC is currently not known. In addition, all the neighbouring mines have been assumed to be operating at maximum approved production rates. These assumptions mean that the model predictions will likely over-state impacts.

It should be noted that the main intent of the inventories is 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. **Appendix B** provides details of the dust emission calculations, including assumptions, emission controls and allocation of emissions to modelled locations.

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

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

The approach of recalculating emissions from other mines in the model domain has been chosen for this assessment. 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 later, in **Section 8**, that the emission estimation approach (combined with model setup assumptions etc.) has produced results which do not underestimate average concentrations at the key sensitive receptor locations.

Table 13 Estimated TSP emissions due to the Proposed Modification and other operations

Operation	Notes	Annual TSP emissions (kg/y)			
		2014	Year 2 (2020) ²	Year 8 (2026) ²	Year 15 (2033) ²
Mount Owen	-	3,405,017	5,639,370	4,323,209	2,586,753
Ravensworth East	2014-West Pit. 2020-BNP	1,249,533	1,219,623	41,610	-
Glendell	Approved to 2021	2,339,356	2,156,320	-	-
Ashton and SEOC*	Approved – not currently operating	99,652	1,315,174	1,315,174	1,315,174
HVO ¹	Approved until 2030	9,497,030	12,984,612	12,984,612	-
Integra Underground	C&M from Apr 2014 to Feb 2017	99,516	99,774	99,774	99,774
Liddell	2023 is the last planned mining year	3,592,011	3,993,209	-	-
Ravensworth	-	5,756,323	7,233,968	7,233,968	7,233,968
Rix's Creek	It has been assumed that the Rix's Creek Continuation Project (Todoroski 2015) will be approved.	2,101,898	2,537,935	2,537,935	2,537,935
Rix's Creek North	Approved - recommenced operations in 2016 (C&M in 2014)	-	2,088,994	2,088,994	2,088,994

* Assumed that Project will be in operation.

¹ The component of HVO which is in the model domain.

² Calendar years are indicative only and are to provide guidance for the duration of other mining operations relative to the Proposed Modification.

Table 14 Estimated PM₁₀ emissions due to the Proposed Modification and other operations

Operation	Notes	Annual PM ₁₀ emissions (kg/y)			
		2014	Year 2 (2020) ²	Year 8 (2026) ²	Year 15 (2033) ²
Mount Owen	-	1,068,242	1,777,359	1,376,239	855,442
Ravensworth East	2014-West Pit. 2020-BNP	392,210	385,405	20,805	-
Glendell	Approved to 2021	715,243	658,139	-	-
Ashton and SEOC*	Approved – not currently operating	37,909	413,682	413,682	413,682
HVO ¹	Approved until 2030	2,784,357	3,708,651	3,708,651	-
Integra Underground	C&M from Apr 2014 to Feb 2017	37,844	37,966	37,966	37,966
Liddell	2023 is the last planned mining year	1,148,709	1,269,735	-	-
Ravensworth	-	1,932,183	2,393,948	2,393,948	2,393,948
Rix's Creek	It has been assumed that the Rix's Creek Continuation Project (Todoroski 2015) will be approved	683,880	812,733	812,733	812,733
Rix's Creek North	Approved - recommenced operations in 2016 (C&M in 2014)	-	692,468	692,468	692,468

* Assumed that Project will be in operation.

¹ The component of HVO which is in the model domain.

² Calendar years are indicative only and are to provide guidance for the duration of other mining operations relative to the Proposed Modification.

Table 15 Estimated PM_{2.5} emissions due to the Proposed Modification and other operations

Operation	Notes	Annual PM _{2.5} emissions (kg/y)			
		2014	Year 2 (2020) ²	Year 8 (2026) ²	Year 15 (2033) ²
Mount Owen	-	151,162	220,514	177,615	113,953
Ravensworth East	2014-West Pit. 2020-BNP	68,048	68,712	3,121	-
Glendell	Approved to 2021	128,748	123,510	-	-
Ashton and SEOC*	Approved – not currently operating	3,201	70,387	70,387	70,387
HVO ¹	Approved until 2030	510,574	697,800	697,800	-
Integra Underground	C&M from Apr 2014 to Feb 2017	3,191	3,210	3,210	3,210
Liddell	2023 is the last planned mining year	178,850	192,796	-	-
Ravensworth	-	285,530	340,666	340,666	340,666
Rix's Creek	It has been assumed that the Rix's Creek Continuation Project (Todoroski 2015) will be approved	116,588	131,396	131,396	131,396
Rix's Creek North	Approved - recommenced operations in 2016 (C&M in 2014)	-	109,901	109,901	109,901

* Assumed that Project will be in operation.

¹ The component of HVO which is in the model domain.

² Calendar years are indicative only and are to provide guidance for the duration of other mining operations relative to the Proposed Modification.

The estimated emissions for the Proposed Modification will differ to the estimated emissions for the Approved Operations as reported in the assessment of the Continued Operations Project (Umwelt 2015). The differences can be largely explained by a revised approach to the assessment in order to improve the correlation between measured air quality levels and model predictions. An updated approach to the emission inventory development has also been adopted for the Proposed Modification and this approach influences the estimated emissions for the Approved Operations. The inventory development approach was updated in an effort to improve the simulation of existing (i.e. 2014) conditions. Once the existing conditions were simulated as accurately as possible, this same approach was carried through to the predictions for future operations.

Key differences between the inventories for the Continued Operations Project and the Proposed Modification are as follows:

- All Mount Owen Mine and other mining operations use similar activity lists, emission factors and techniques for producing the emission files.
- The dust generating activities for each operation have been consolidated into more conventional, consistent lists. For example, the inventories for Mount Owen Mine operations include fewer defined activities than were used in the assessment for the Continued Operations Project, while the inventories for other mines include more defined activities. Thus, the modelling for other mines was consistent with that used for Mount Owen.
- A default factor approach was used for estimating emissions from wheel generated dust. This approach means that emissions from this activity will not be as dependent on road-silt and moisture content data as previously. There is only a limited dataset of silt and moisture (that is, around two samples of each per year) and these samples are unlikely to be representative of long term conditions.

As can be seen from the items above, the inventories for the Proposed Modification now incorporate adjustments to the activity lists, for consistency with other operations, and adjustments to emission factors based on more default type approaches. It will be seen later (**Section 8**) that this approach has led to reasonable agreement between the measured and modelled average results and has avoided the use of model correction factors.

Additionally, Mount Owen is committed to the continued implementation of operational noise controls during adverse weather conditions in order to meet the existing noise criteria. The operational controls will result in reduced levels of activity at the North Pit relative to the capacity considered as part of the current air quality modelling. In the case of the Proposed Modification, there will be periods when equipment may need to be shut-down or operated at reduced levels in order to meet relevant noise criteria at nearby sensitive receptors. A hierarchy of operational controls will be implemented which could include:

- Relocating or shutting down ancillary equipment in exposed locations (e.g. rehabilitation and pre-strip dozers).
- Employing first-gear reverse for dozers in exposed locations.
- Strategically relocating or shutting down ancillary equipment (such as road construction maintenance, extra water cart(s), and drill(s)).
- Moving activities to lower dumps, or night dumps.
- Shutting down exposed dozers and/or replacing with rubber tyred dozers, and reducing speed of all other dozers.
- Reducing speed of trucks.
- Implementing shutdown options based on waste/coal priority.

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 13**, **Table 14** and **Table 15** should represent conservative estimates, as these further detailed operational controls are not included, and it follows that the predicted impacts of the Proposed Modification will also be conservative. That is, the predicted impacts are likely to over-state actual impacts to some extent.

7. Approach to Assessment

7.1 Overview

This assessment has followed the EPA's "Approved Methods of the Modelling and Assessment of Air Pollutants in New South Wales" (EPA, 2016), which specifies how assessments based on the use of air dispersion models should be undertaken. The "Approved Methods" include guidelines for the preparation of meteorological data, reporting requirements and air quality assessment criteria to assess the significance of dispersion model predictions.

The CALPUFF computer-based air dispersion model has been used to predict ground-level concentrations and deposition levels due to the identified emission sources, and the model predictions have been compared with relevant air quality criteria. 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, through the CALMET meteorological pre-processor, simulates complex meteorological patterns that exist in a particular region. The effects of local topography and changes in land surface characteristics are accounted for by this model. The model comprises meteorological modelling as well as dispersion modelling, both of which are described below. It should also be noted that the methodology has been subject to independent peer review, by NH2 Dispersion Sciences, in order to test all assumptions and the outcomes are provided in **Appendix C**. Review comments have been addressed in this assessment.

7.2 Meteorological Modelling

The air dispersion model used for this assessment, CALPUFF, requires information on the meteorological conditions in the modelled region. This information is typically generated by the meteorological pre-processor, CALMET, using surface observation data from local weather stations and upper air data from radio-sondes or numerical models, such as the CSIRO's prognostic model known as TAPM (The Air Pollution Model). CALMET also requires information on the local land-use and terrain. The result of a CALMET simulation is a year-long, three-dimensional output of meteorological conditions that can be used as input to the CALPUFF air dispersion model.

There are no known meteorological stations in the Upper Hunter region that collect suitable upper air data for CALMET. The closest station with suitable data is operated by the Bureau of Meteorology at Williamtown, approximately 80 km to the east-southeast of Mount Owen. The necessary upper air data were therefore generated by TAPM, using influence from the surface observations at the Glendell meteorological station. CALMET was then set up with three surface observations stations (Glendell, Mt Owen and Camberwell) and one upper air station (based on TAPM output for the Glendell meteorological station). The meteorological modelling followed the guidance of TRC (2011) and adopted the "observations" mode. A "hybrid" mode was also tested but found to produce unrealistic wind-fields because of too much weighting towards the prognostic data.

Key model settings for TAPM are shown below in **Table 16**.

Table 16 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, with one "spin-up" day.
Centre of analysis	Mount Owen Mine (32°24.5' S, 151°5.5' E)
Terrain data source	Shuttle Research Topography Mission (SRTM)
Land use data source	Default
Meteorological data assimilation	Glendell mine meteorological station. Radius of influence = 15 km. Number of vertical levels for assimilation = 4

Table 17 lists the model settings and input data for CALMET. This information has been provided so that the user can reproduce the results if required.

Table 17 Model settings and inputs for CALMET

Parameter	Value(s)
Model version	6.334
Terrain data source(s)	SRTM and Project Digital Elevation Model (DEM)
Land-use data source(s)	Digitized from aerial imagery
Meteorological grid domain	20 km x 20 km
Meteorological grid resolution	0.2 km
Meteorological grid dimensions	100 x 100 x 9
Meteorological grid origin	310000 mE, 6400000 mN. MGA Zone 56
Surface meteorological stations	Glendell (Observations of wind speed and wind direction. TAPM for ceiling height, cloud cover and air pressure) Mount Owen (Observations of wind speed and wind direction) Camberwell (Observations of wind speed, wind direction, temperature and humidity)
Upper air meteorological stations	Upper air data file for the location of Glendell met 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

Terrain information was extracted from the NASA Shuttle Research Topography Mission database which has global coverage at approximately 30 metre resolution (in addition to the Proposed Modification Digital Elevation Model). Land use data were extracted from aerial imagery. **Figure 13** 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.

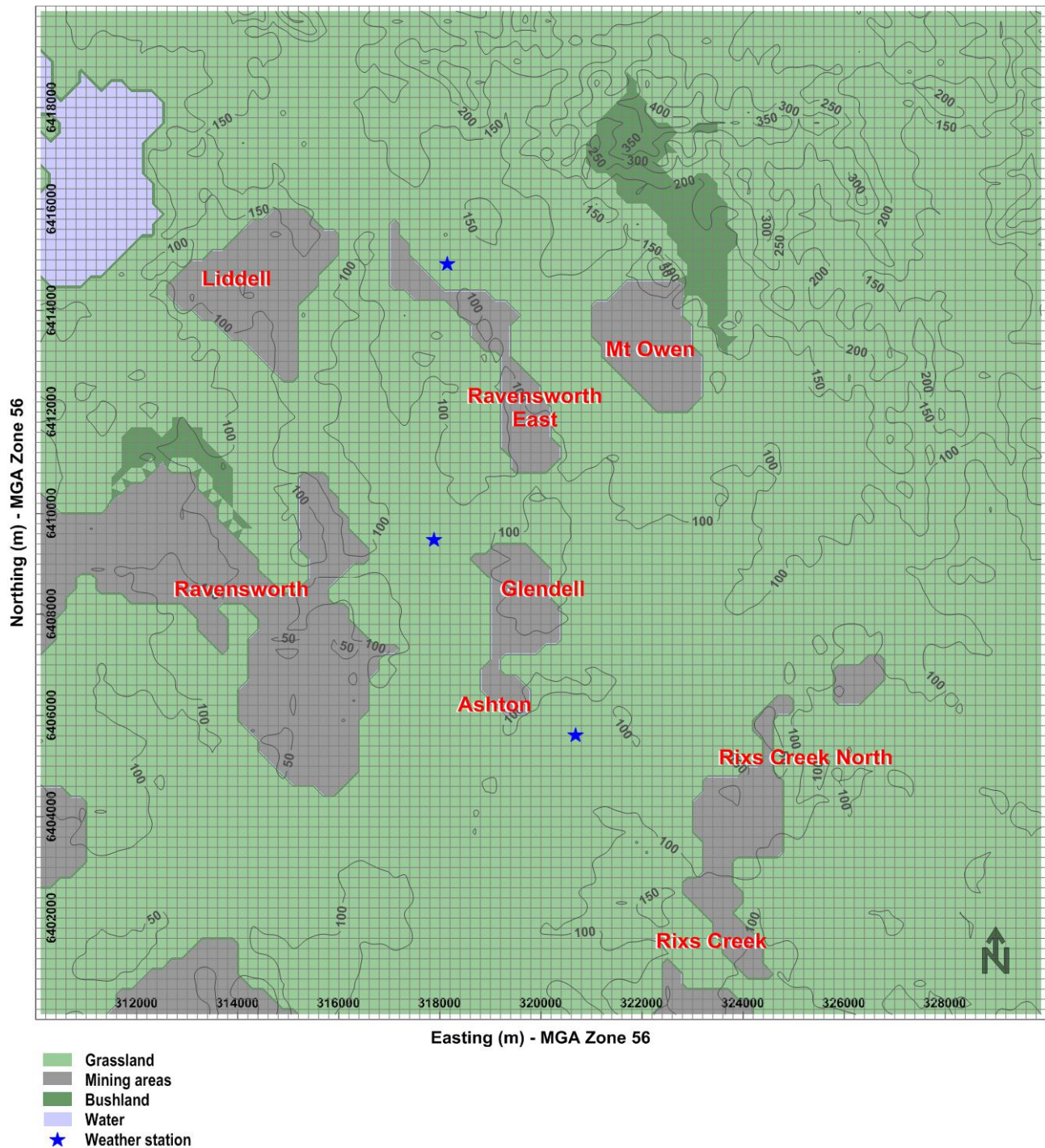


Figure 13 Model grid, land-use and terrain information

Figure 14 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, which further supports the use of a non-steady-state model such as CALPUFF.

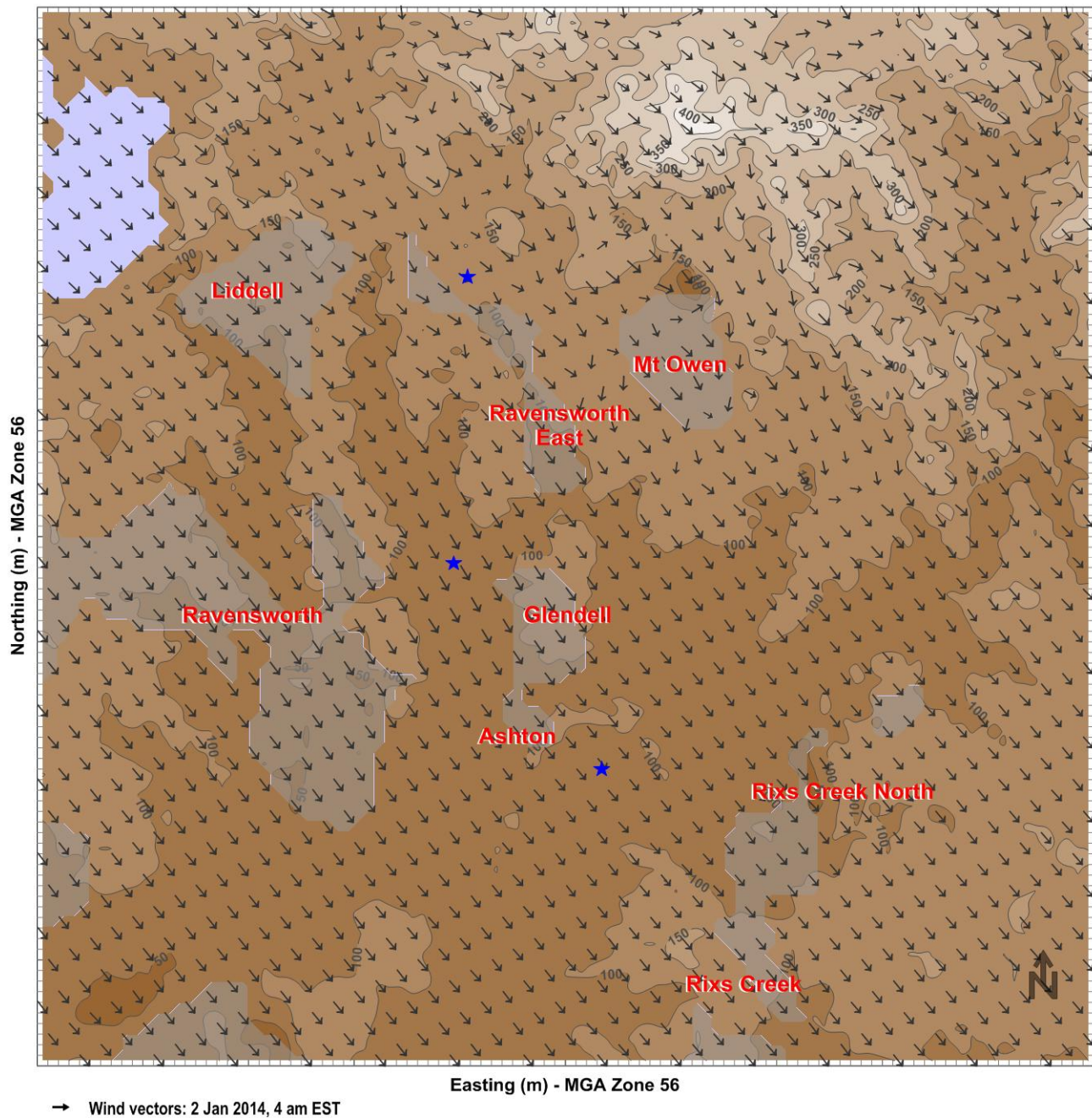


Figure 14 Example of CALMET simulated ground-level wind flows

7.3 Dispersion Modelling

Ground-level concentration and deposition levels due to the emission sources have been predicted using the air dispersion model known as CALPUFF (Version 6.42). CALPUFF is a Lagrangian dispersion model that simulates the dispersion of pollutants within a turbulent atmosphere by representing emissions as a series of puffs emitted sequentially. Provided the rate at which the puffs are emitted is sufficiently rapid, the puffs overlap and the serial release is representative of a continuous release.

The CALPUFF model differs from traditional Gaussian plume models (such as AUSPLUME and ISCST3) in that it can model spatially varying wind and turbulence fields that are important in complex terrain, long-range transport and near calm conditions. It is the preferred model of the United States Environmental Protection Agency for the long-range transport of pollutants and for complex terrain (TRC 2007). CALPUFF has the ability to model the effect of emissions entrained into the thermal internal boundary layer that forms over land, both through fumigation and plume trapping. CALPUFF is an air dispersion model which has been approved by the EPA for these types of assessments (EPA 2016).

The modelling was performed using the emission estimates from **Section 6** and using the meteorological information provided by the CALMET model, described in **Section 7.2**. Predictions were made at 986 discrete receptors (including sensitive receptors and monitoring locations) to allow for contouring of results. The locations of the model receptors are shown in **Appendix D**.

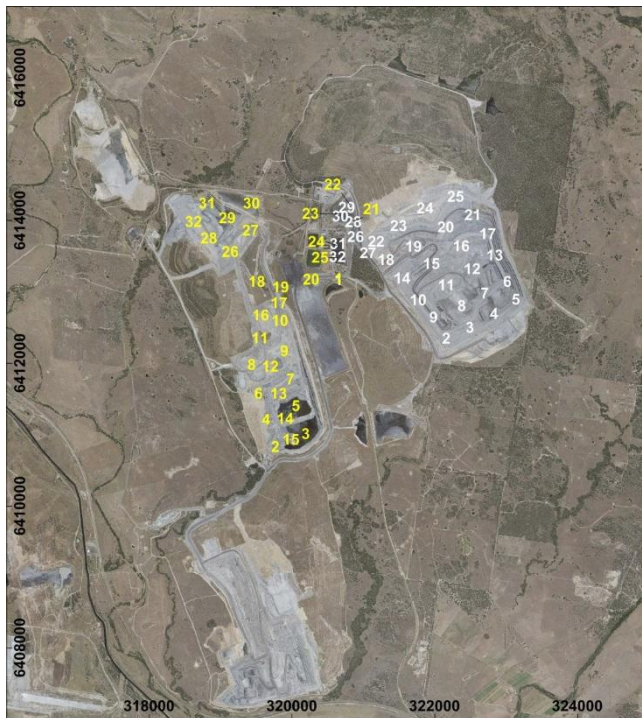
Mining operations were represented by a series of volume sources located according to the location of activities for each modelled scenario. **Figure 15** and **Figure 16** show the location of the modelled sources for Mount Owen Mine and other mining operations respectively, where the emissions from the dust generating activities summarised in **Table 13** to **Table 15** were assigned to one or more of these source locations (refer to **Appendix B** for details of the allocations).

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

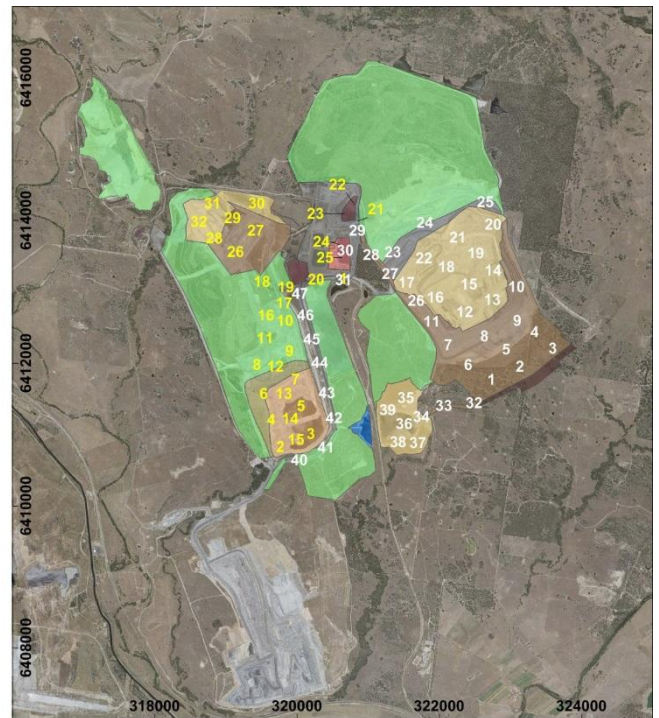
- Wind insensitive sources, where emissions are relatively insensitive to wind speed (for example, dozers).
- Wind sensitive sources, where emissions vary with the hourly wind speed, raised to the power of 1.3, a generic relationship published by the US EPA (1987). This relationship has been applied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

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

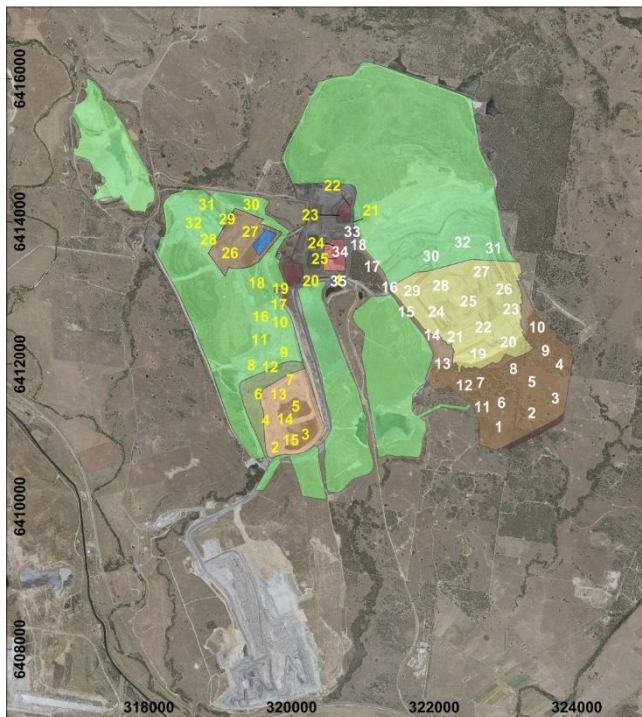
Blasting activities and associated emissions were assumed to take place only during daylight hours (9 am to 5 pm for the purposes of the modelling) while all other activities have been modelled for 24 hours per day.



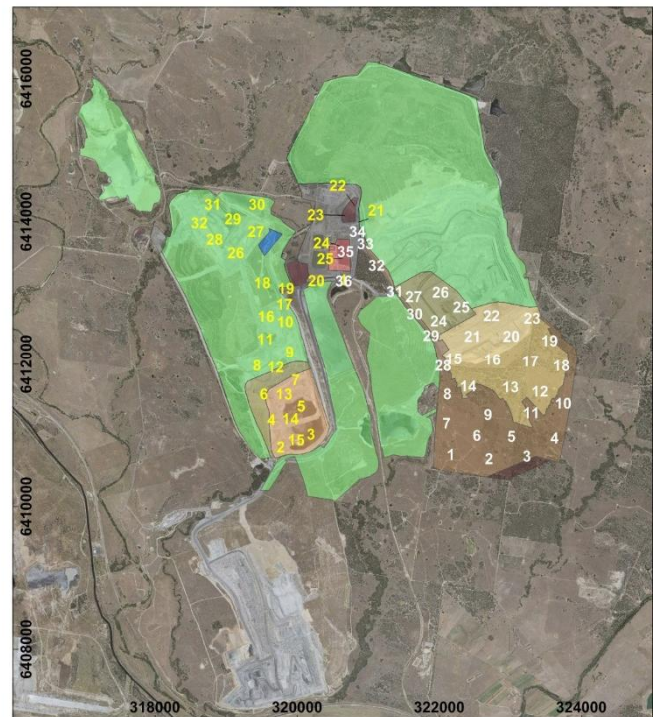
2014



Year 2



Year 8



Year 15



Figure 15 Location of modelled sources for Mount Owen Mine Proposed Modification operations

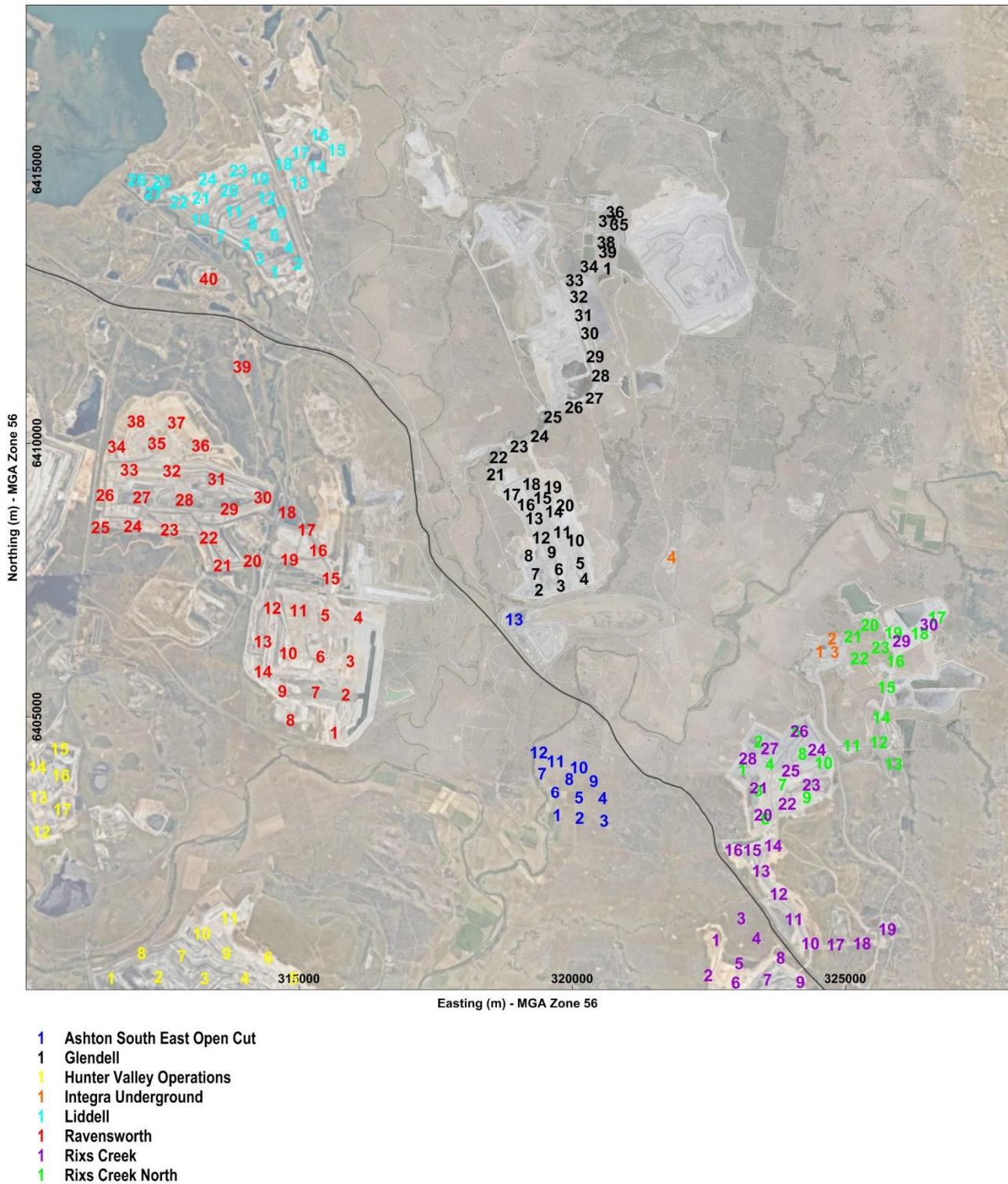


Figure 16 Location of modelled sources for other mining operations

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:

$$e = \frac{1}{\frac{a}{e} + \frac{v_g}{(aU_r)^{\frac{1}{2}}}}$$

where:

e = escaped fraction for the particle size category

v_g = gravitational settling velocity (m/s)

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

a = 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 PM₁₀ emissions are trapped in the pit using this calculation.

The effect of rainfall for suppressing dust from exposed areas has also been simulated. For each hour of rainfall above 0.254 mm (i.e. 0.1 inch) a 50% control on emissions has been applied to wind erosion from active pits and active dumps.

Key model settings and inputs for CALPUFF are provided in **Table 18**.

Table 18 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
Puff element	Puff
Dispersion option	Turbulence from micrometeorology
Time step	3600 seconds (1 hour)
Terrain adjustment	Partial plume path
Number of volume sources	See Appendix B. Height = 5m, SY = 20 m, SZ = 10 m
Number of discrete receptors	986. See Appendix D.

Finally, the model predictions at identified sensitive receptors were then compared with the EPA air quality criteria, previously discussed in **Section 4**. Contour plots have also been created to show the spatial distribution of model predictions. Where possible, the results for each substance and averaging time were presented as a series of figures showing:

- Model performance, based on measurements and predictions for a recent year (2014).
- Model predictions for future operational scenarios, as Proposed Modification contributions.
- Model predictions for future operational scenarios, due to all sources.

8. Assessment of Impacts

This section provides an assessment of the key air quality issues associated with the Proposed Modification, primarily based on model predictions and comparisons to air quality criteria. One objective of this study was to predict the extent of air quality impacts due to the Proposed Modification, and to identify potential changes in air quality over existing levels, recognising that the Mount Owen Mine currently exists and the Proposed Modification represents the continuation of mining. For this objective, comparisons with predictions for 2014 are useful. In this assessment the term “due to the Proposed Modification” represents the predicted contribution from the proposed activities at both Mount Owen Mine and Ravensworth East.

The complete list of tabulated results is provided in **Appendix E**. Contour plots have also been prepared and are discussed below. Additional information on the model performance is provided in **Appendix F**.

8.1 Particulate Matter (as PM₁₀)

Figure 17 shows the maximum 24-hour average PM₁₀ concentrations for existing conditions (that is, 2014). These results have been compared to the measurement data to highlight the model performance. This comparison is useful for determining the confidence in the model predictions for future operations. It should be noted that only one data point is shown for each location and more detailed comparisons between measured and predicted results for all percentiles is provided in **Appendix F**.

Figure 17 shows that the model predictions are in the order of 20 per cent of the measured result in the Middle Falbrook area. There is a tendency for under-prediction of the maximum 24-hour average in Camberwell. For example, the maximum measured concentration was 80 µg/m³ and the maximum predicted concentration was 53 µg/m³ (that is, under-prediction by about 34 per cent). On further analysis, the maximum predicted results in Camberwell are more closely aligned to the 9th highest measured concentration. In Camberwell, the 9th highest 24-hour average PM₁₀ concentration was 54 µg/m³. This comparison highlights the difficulty in predicting short-term (24-hour average) concentrations and also reflects the highly variable nature of daily PM₁₀ concentrations.

Figure 18 and **Figure 19** show the predicted maximum 24-hour average PM₁₀ concentrations due to the Proposed Modification and cumulative scenarios respectively. **Figure 18** shows that the contribution of the Proposed Modification will not exceed 50 µg/m³ at any private properties. This assessment of impact is consistent with the application of the current 24-hour average PM₁₀ criteria in SSD-5850. **Figure 19** suggests that maximum 24-hour average PM₁₀ concentrations will continue to exceed 50 µg/m³ on at least one occasion each year for many locations in the model domain. This outcome is consistent with results of air quality monitoring in the area (refer to **Section 5.2**) and consistent with the outcomes of 24-hour average PM₁₀ concentration predictions for the Approved Operations (PEL 2014 and 2016).

Figure 20, **Figure 21** and **Figure 22** provide additional information on the 24-hour average PM₁₀ concentrations by showing the number of days above 50 µg/m³. From **Figure 20** the model predictions for 2014 are close to the actual measurement results in the Middle Falbrook area (within 2 to 3 days) but lower than the measurements in the Camberwell area (about 10 days lower than measured). With the Proposed Modification, the number of days above 50 µg/m³ may potentially increase in the Middle Falbrook and Camberwell areas. This outcome is based on the assumption that the Ashton South East Open Cut operation will be operating. The future status of this operation is currently not known. In addition, all the neighbouring mines have been assumed to be operating at maximum approved production rates which will result in over stating potential impacts.

Figure 23 shows the measured and predicted annual average PM₁₀ concentrations for 2014. These results show that the model predictions in the Middle Falbrook and Camberwell areas are within 1 to 2 µg/m³ of the measurements. Similar performance may therefore be expected for the predictions of future conditions.

Figure 24 shows the predicted annual average PM₁₀ concentrations due to the Proposed Modification and **Figure 25** shows the predicted cumulative concentrations. As noted in **Section 7** the computer-based dispersion model known as CALPUFF has been used to make predictions of potential air quality impacts. This model takes account of three-dimensional variations in meteorological conditions as well as the variations in topography, land-use and location of emission sources. The contours reflect all these factors. In some cases the

effects are clear. For example, in **Figure 25**, the contours are centred around the emission sources and there are lower concentrations predicted further from the active mining operations and in the Middle Falbrook area. The lower concentrations in the Middle Falbrook area will reflect the distance from modelled sources as well as the lower topography along Glennies Creek.

The EPA air quality assessment criterion for annual average PM₁₀ is 25 µg/m³, now applicable to the assessment of the Proposed Modification. From **Figure 25** it can be seen that annual average PM₁₀ concentrations are predicted to exceed the 25 µg/m³ criterion in Camberwell in most years. Again, this outcome is based on inclusion of mines which may not be operating as well as assumed maximum production rates for all operations. The predictions at key sensitive receptors for future operational scenarios have therefore been inferred to be conservative estimates of impacts. **Section 5.2.1** also highlighted that annual average PM₁₀ concentrations in the Camberwell area have exceeded the current 25 µg/m³ assessment criterion in some recent years, but not the (then applicable) 30 µg/m³ criterion.

Several properties in Camberwell with acquisition rights have been identified as potentially experiencing PM₁₀ concentrations above 25 µg/m³ in the future, where currently levels may be below 25 µg/m³. These properties include 150, 143 and 127a. At all of these locations the contribution from the Proposed Modification is predicted to be very low at less than 2 µg/m³. This is also indicated on **Figure 24**, which shows that predicted concentrations above 25 µg/m³ due to the Proposed Modification alone are located in close proximity to Mount Owen Mine and on land owned by Mount Owen.

As noted previously many locations in the model domain are expected to experience cumulative maximum 24-hour average PM₁₀ concentrations above 50 µg/m³ on at least one occasion each year, similar to the status of existing conditions (2014) and consistent with the outcomes of predicted impacts for the Approved Operations. This includes the background contributions. Therefore, the trigger for whether a receptor is predicted to be impacted by the Proposed Modification was defined as the Proposed Modification contribution greater than 50 µg/m³. This is consistent with the application of the impact assessment criteria in the current development consent; SSD-5850. Excluding community or private infrastructure, or properties subject to existing acquisition rights, there are no private sensitive locations which are predicted to experience a Proposed Modification contribution of greater than 50 µg/m³ for maximum 24-hour average PM₁₀ concentrations.

Excluding community or private infrastructure, or properties subject to existing acquisition rights, there are no private sensitive locations which are predicted to experience exceedances of the annual average PM₁₀ criterion (25 µg/m³) at any stage of the Proposed Modification.

On the basis of this modelling there are no additional private properties or private sensitive receivers (without existing acquisition rights) predicted to experience impacts over the relevant criteria for the Proposed Modification relative to the Approved Operations.

Finally, a comparison has been made between the Approved Operation and the Proposed Modification, in terms of the maximum predicted extent of annual average PM₁₀ concentrations. This comparison is provided in **Appendix G** and shows that the predicted contribution of the Proposed Modification to off-site air quality on private properties (without existing acquisition rights) would be similar to the predicted contribution of the Approved Operation, with some potential increases in contributions to the southeast of Mount Owen Mine.

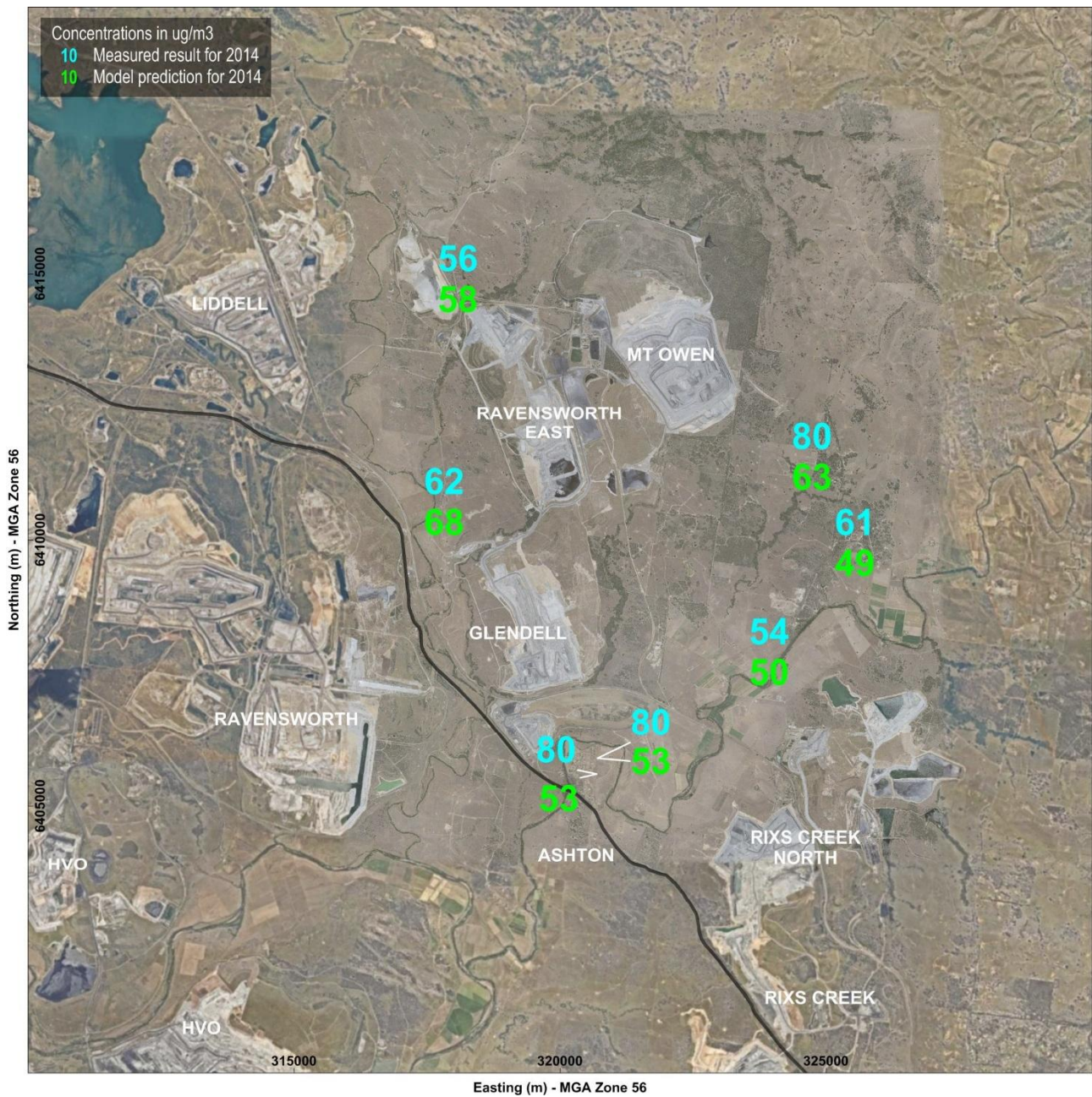
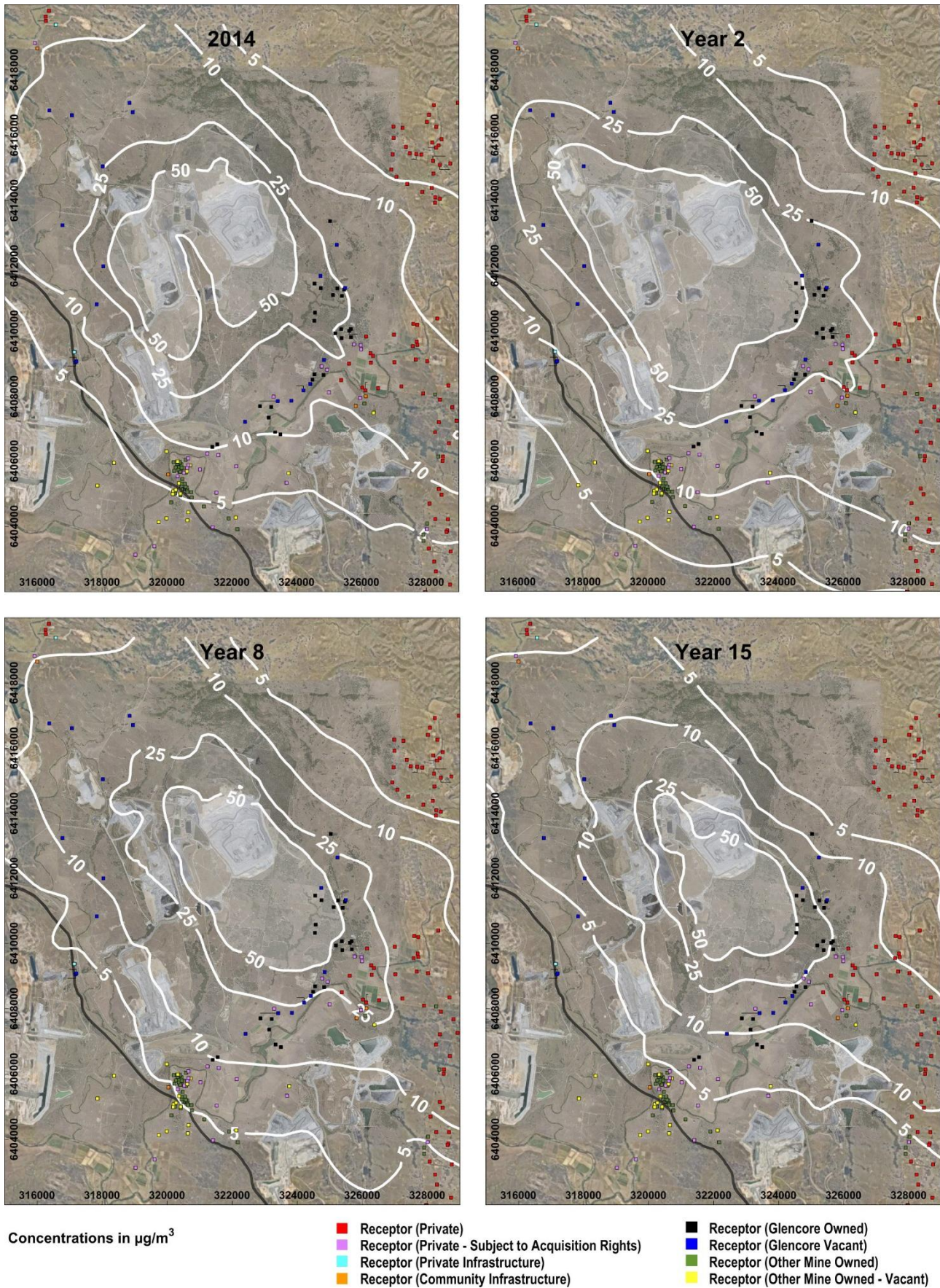
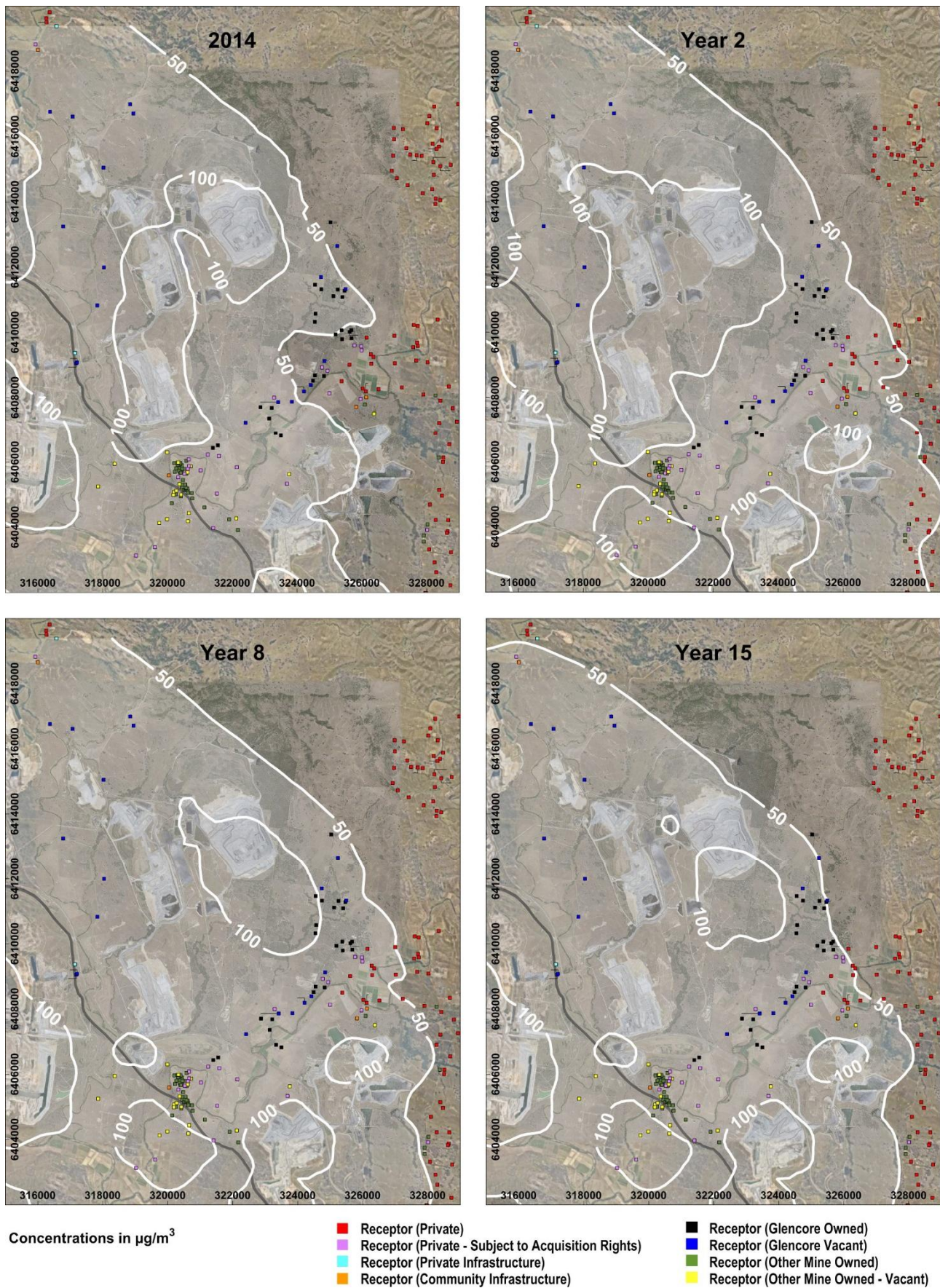


Figure 17 Predicted maximum 24-hour average PM₁₀ concentrations due to all sources in 2014

Figure 18 Predicted maximum 24-hour average PM_{10} concentrations due to the Proposed Modification

Figure 19 Predicted maximum 24-hour average PM_{10} concentrations due all sources (cumulative)

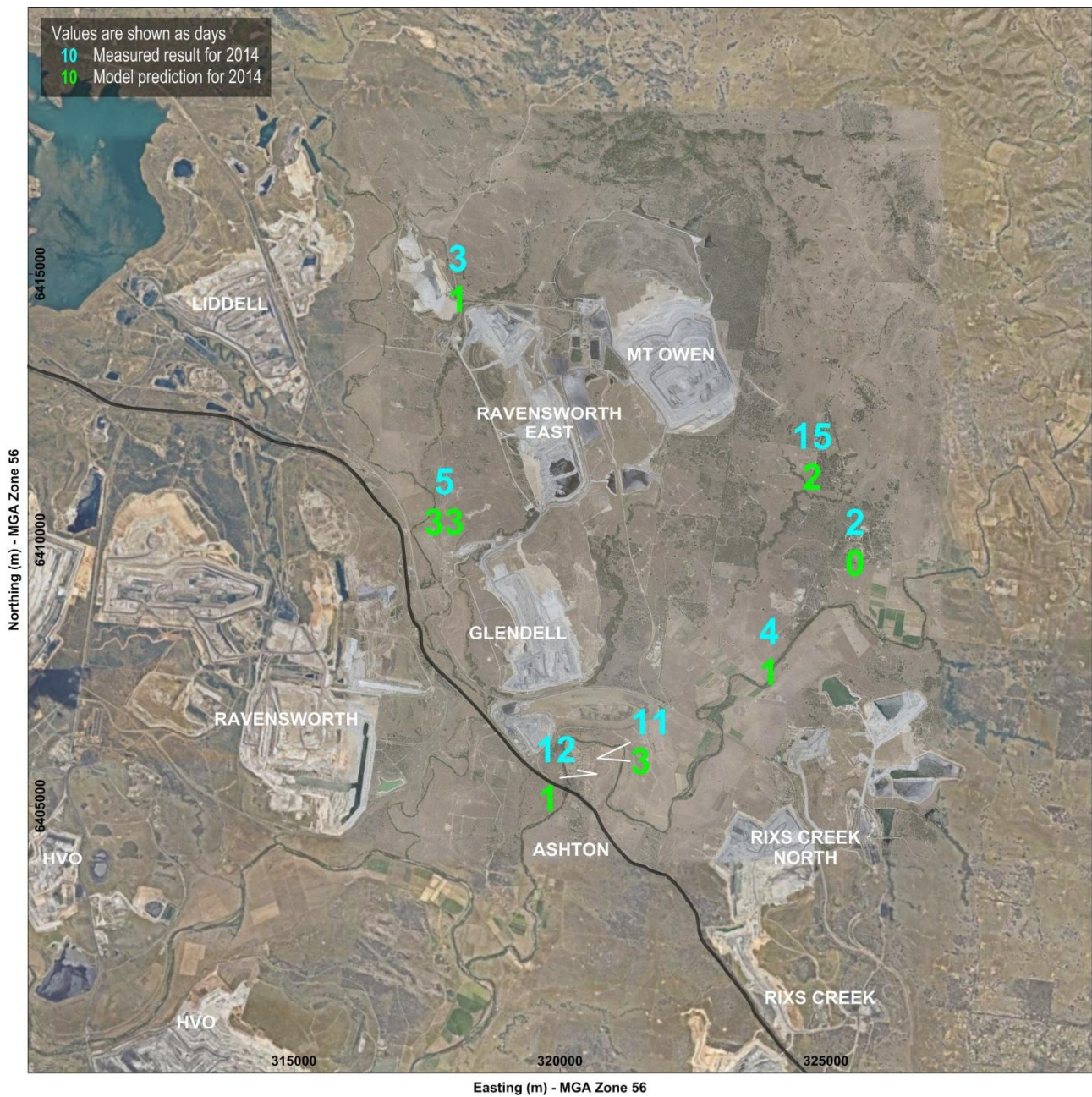
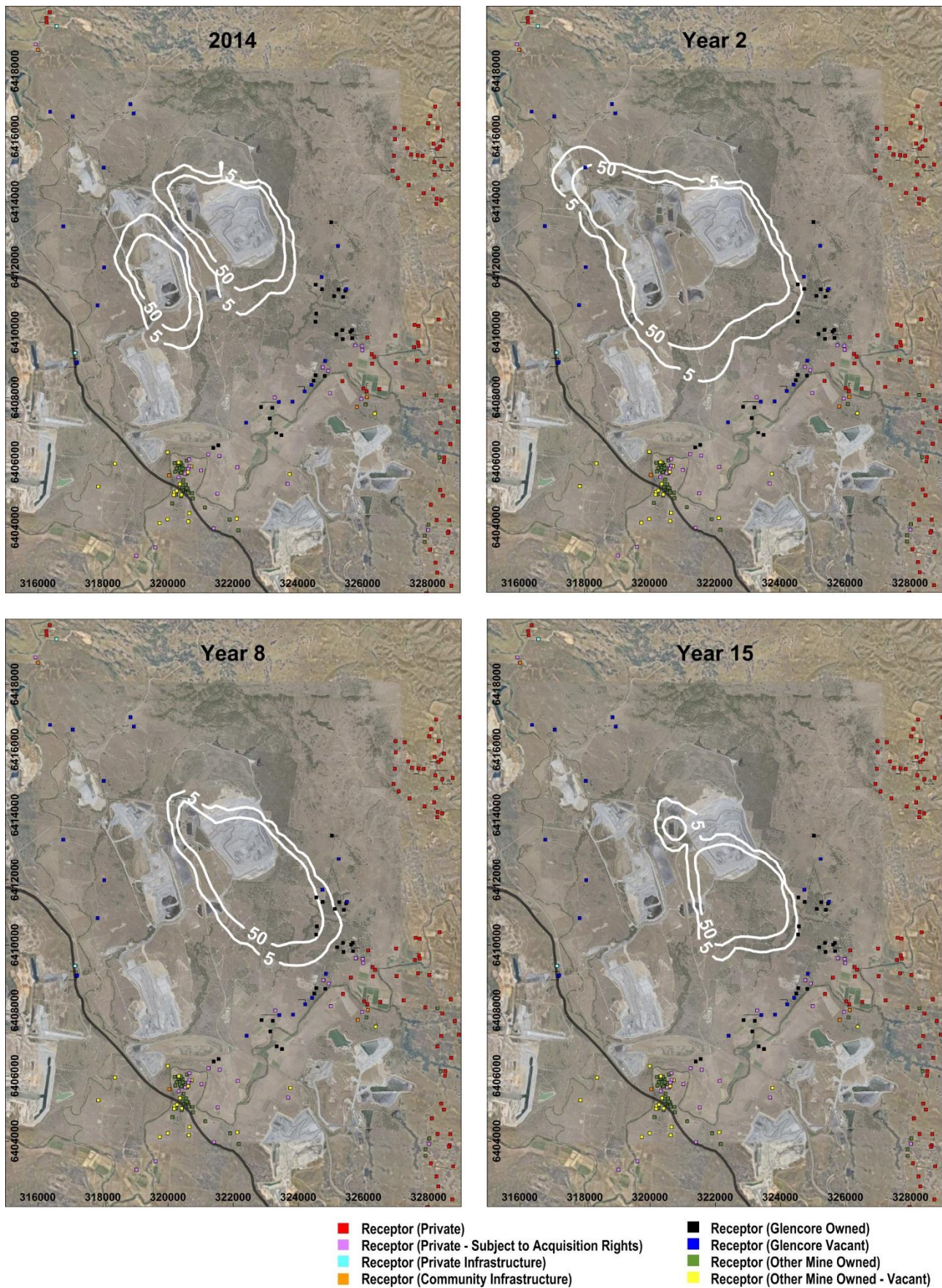
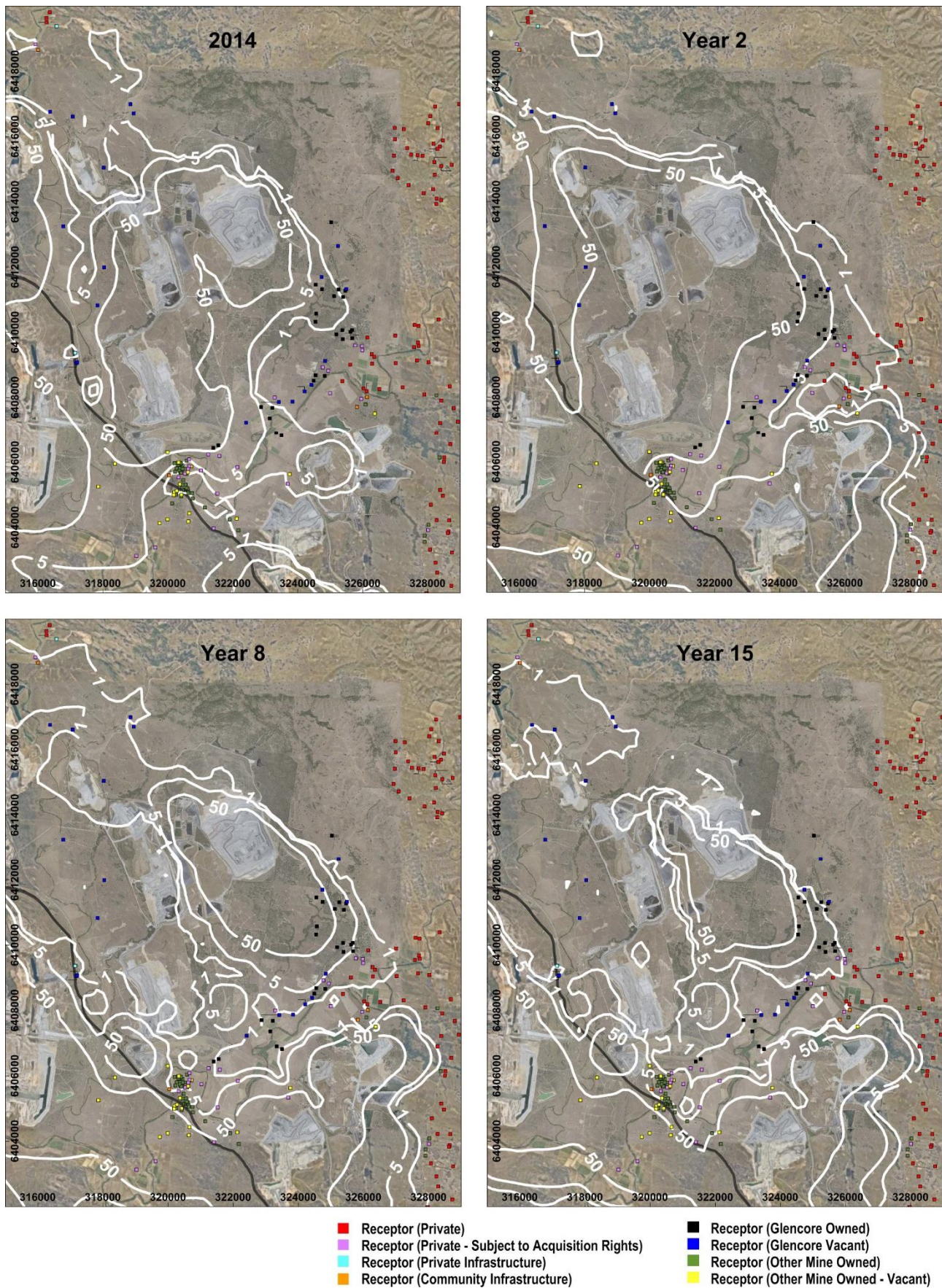


Figure 20 Predicted number of days above $50 \mu\text{g}/\text{m}^3$ PM_{10} due to all sources (cumulative) in 2014

Figure 21 Predicted number of days above $50 \mu\text{g}/\text{m}^3$ PM_{10} due to the Proposed Modification

Figure 22 Predicted number of days above 50 µg/m³ PM₁₀ due all sources (cumulative)

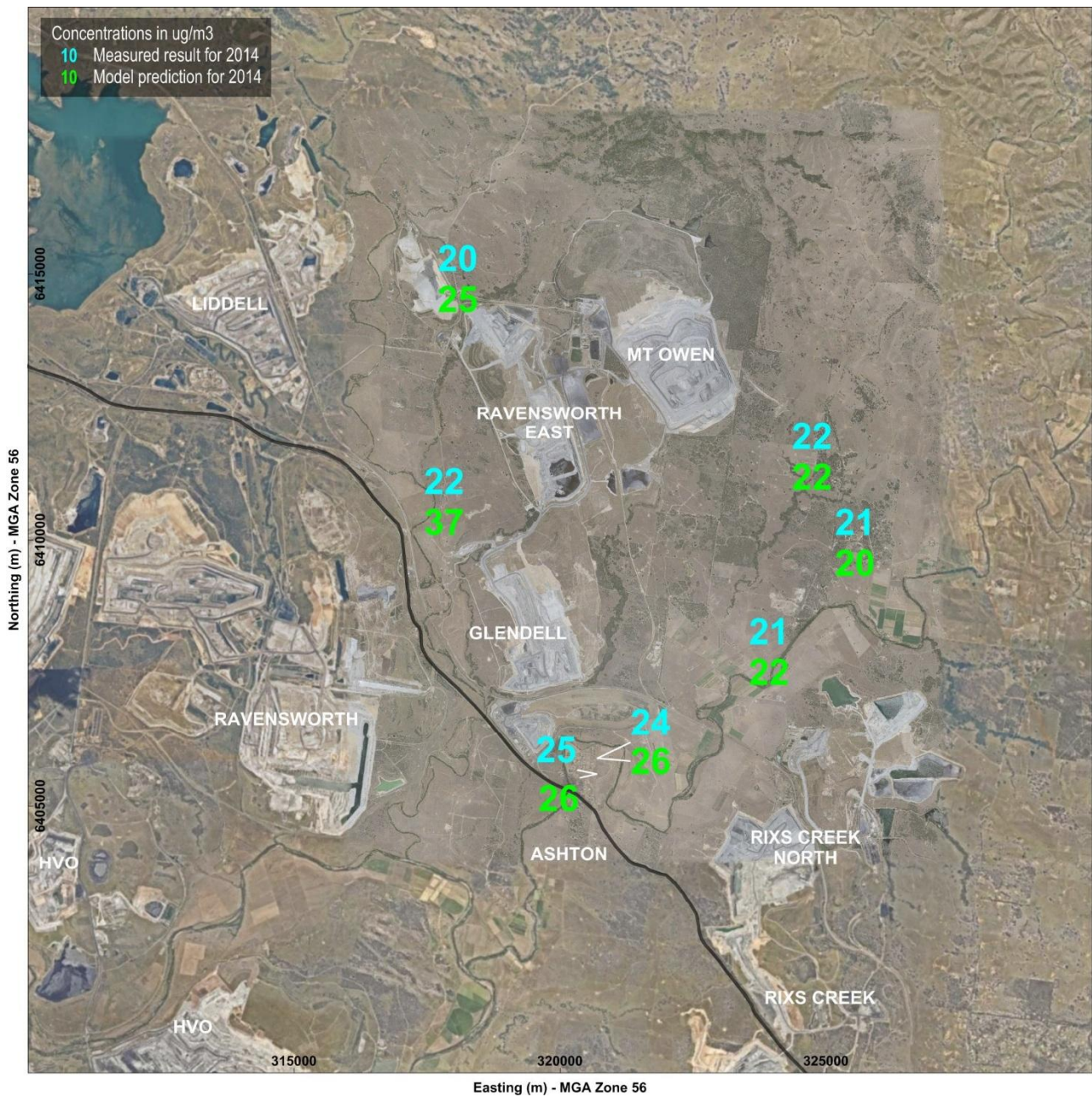
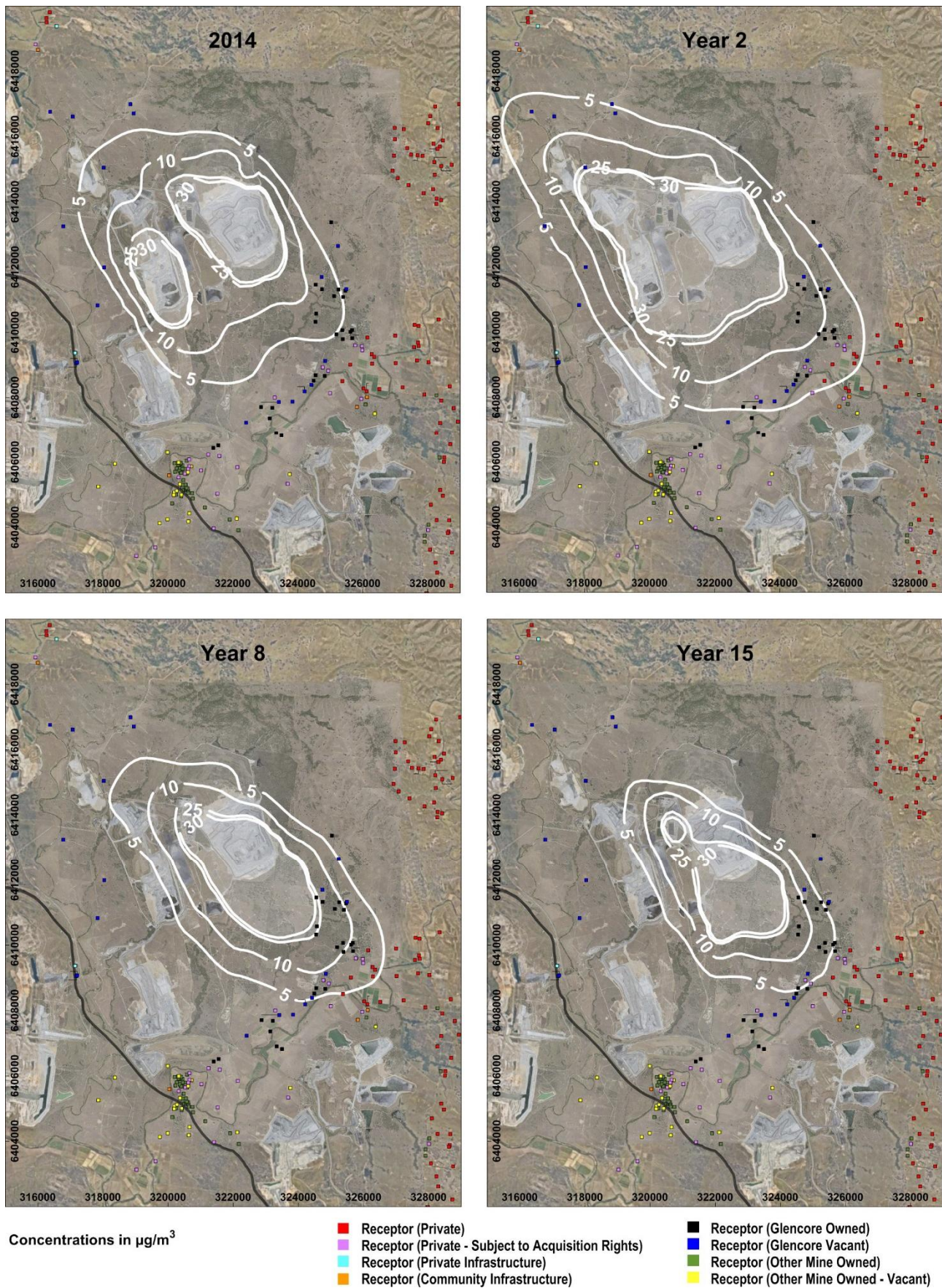
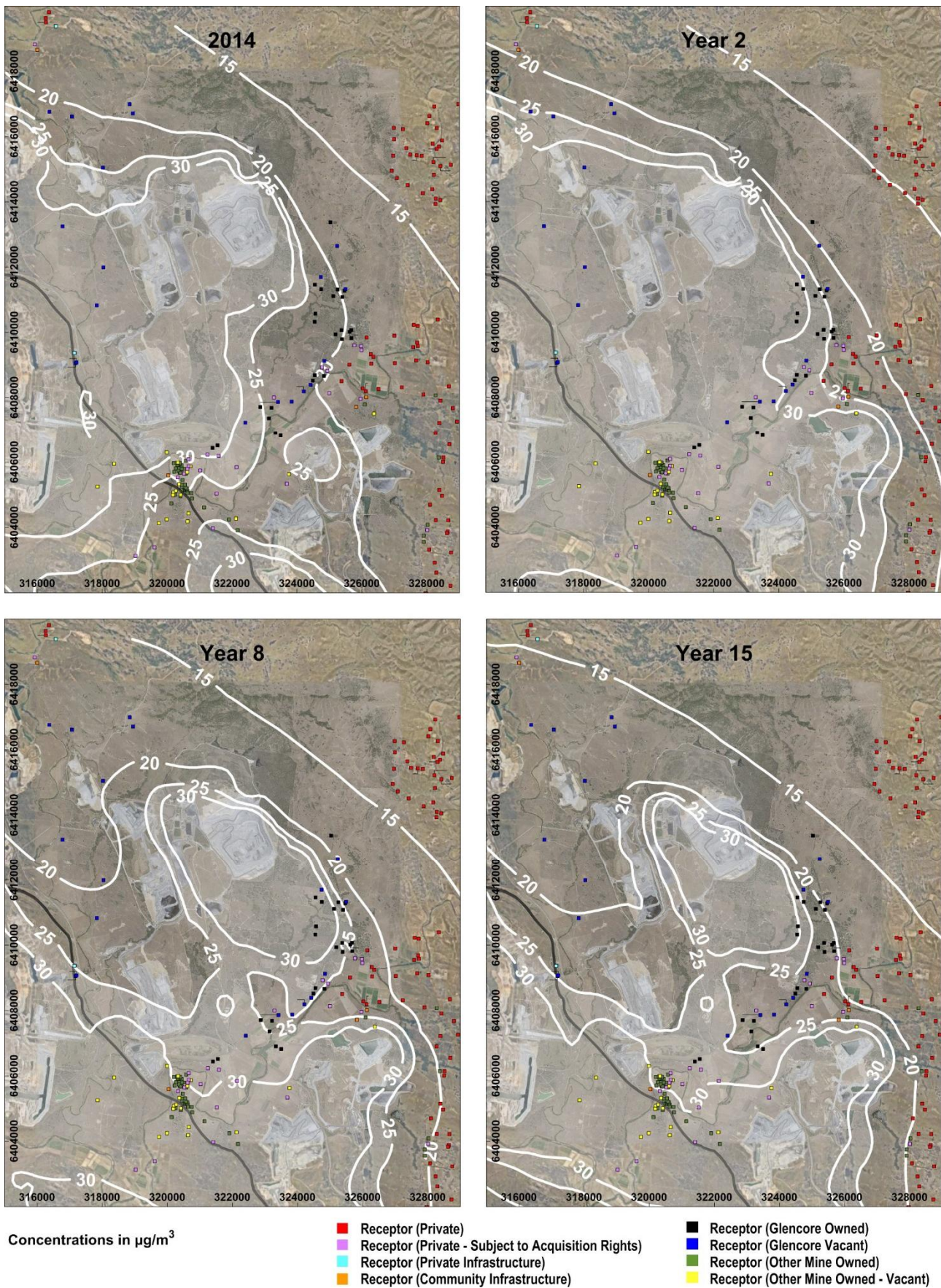


Figure 23 Predicted annual average PM₁₀ concentrations due to all sources (cumulative) in 2014

Figure 24 Predicted annual average PM_{10} concentrations due to the Proposed Modification

Figure 25 Predicted annual average PM₁₀ concentrations due to all sources (cumulative)

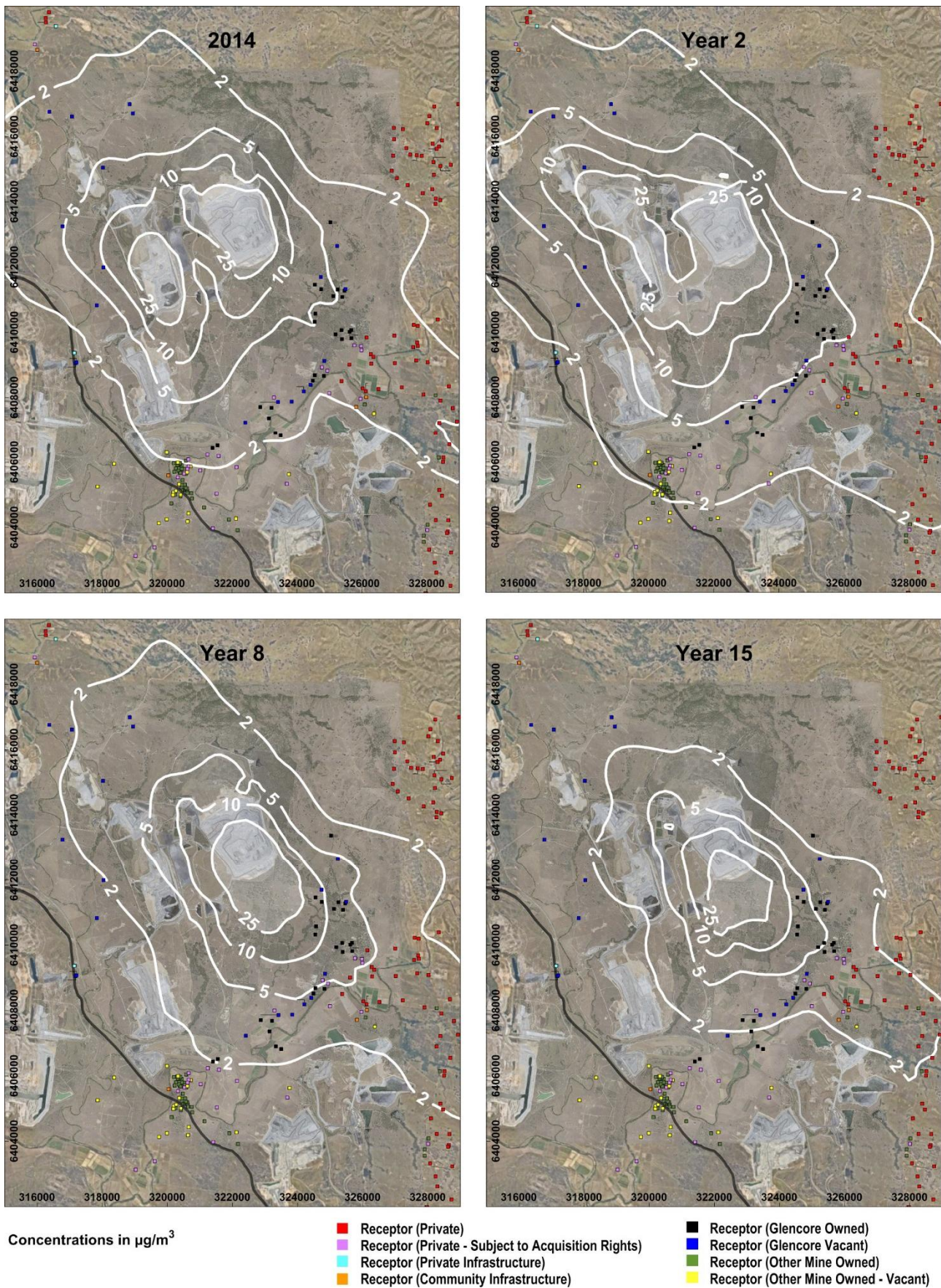
8.2 Particulate Matter (as PM_{2.5})

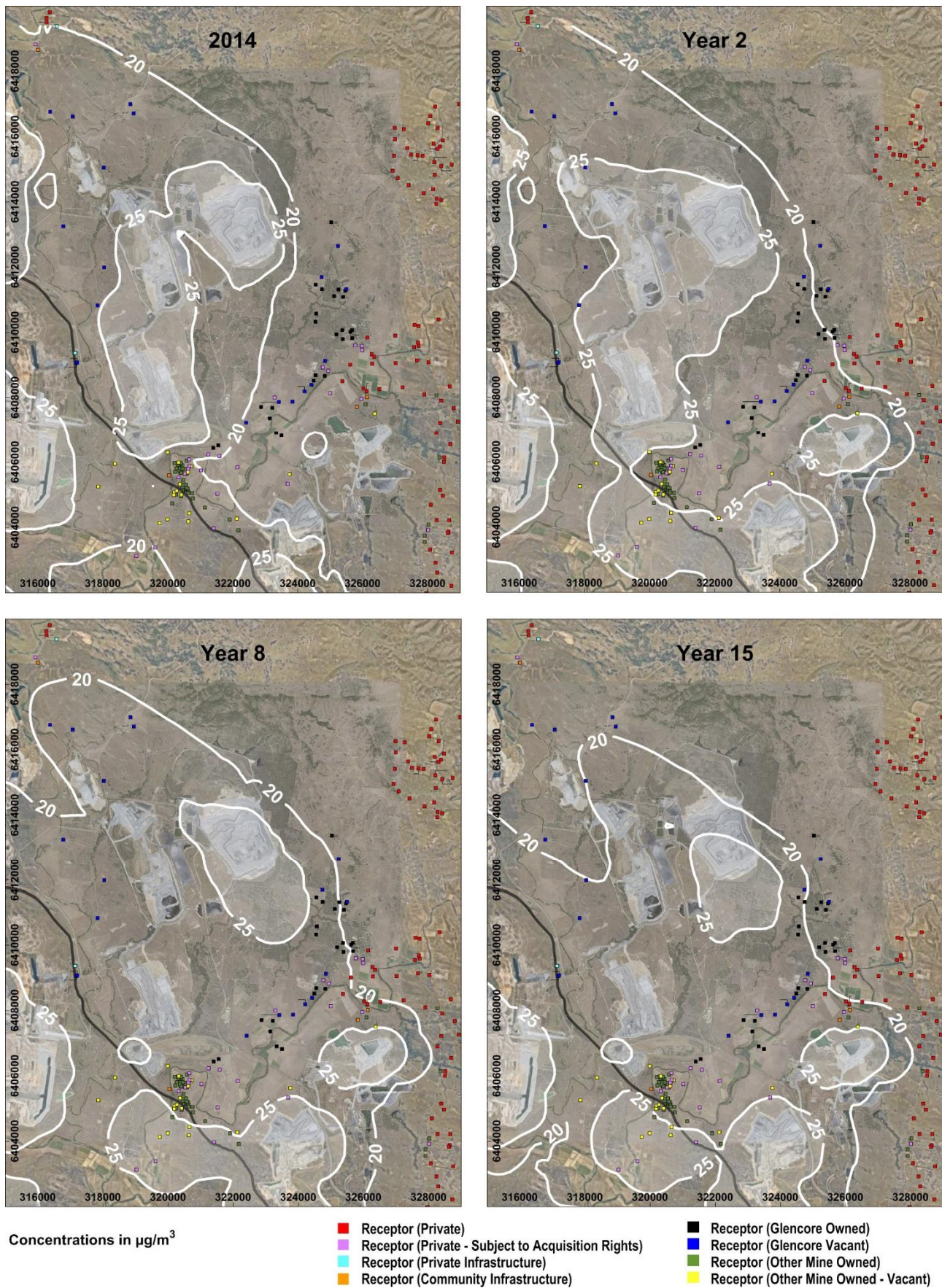
The results for PM_{2.5} are shown in **Figure 26** to **Figure 29**, including the Proposed Modification and cumulative scenarios, for maximum 24-hour and annual averages. **Appendix E** provides all PM_{2.5} model results for each receptor in tabular form.

Excluding community or private infrastructure, or properties subject to existing acquisition rights, there are no private sensitive locations which are predicted to experience exceedances of the maximum 24-hour average PM_{2.5} criterion (25 µg/m³) at any stage of the Proposed Modification.

Excluding community or private infrastructure, or properties subject to acquisition rights, there are no private sensitive locations which are predicted to experience exceedances of the annual average PM_{2.5} criterion (8 µg/m³) at any stage of the Proposed Modification.

On the basis of this modelling there are no additional impacts to private land and sensitive receivers (without existing acquisition rights) associated with the Proposed Modification relative to the Approved Operations.

Figure 26 Predicted maximum 24-hour average $\text{PM}_{2.5}$ concentrations due to the Proposed Modification

Figure 27 Predicted maximum 24-hour average $\text{PM}_{2.5}$ concentrations due to all sources (cumulative)

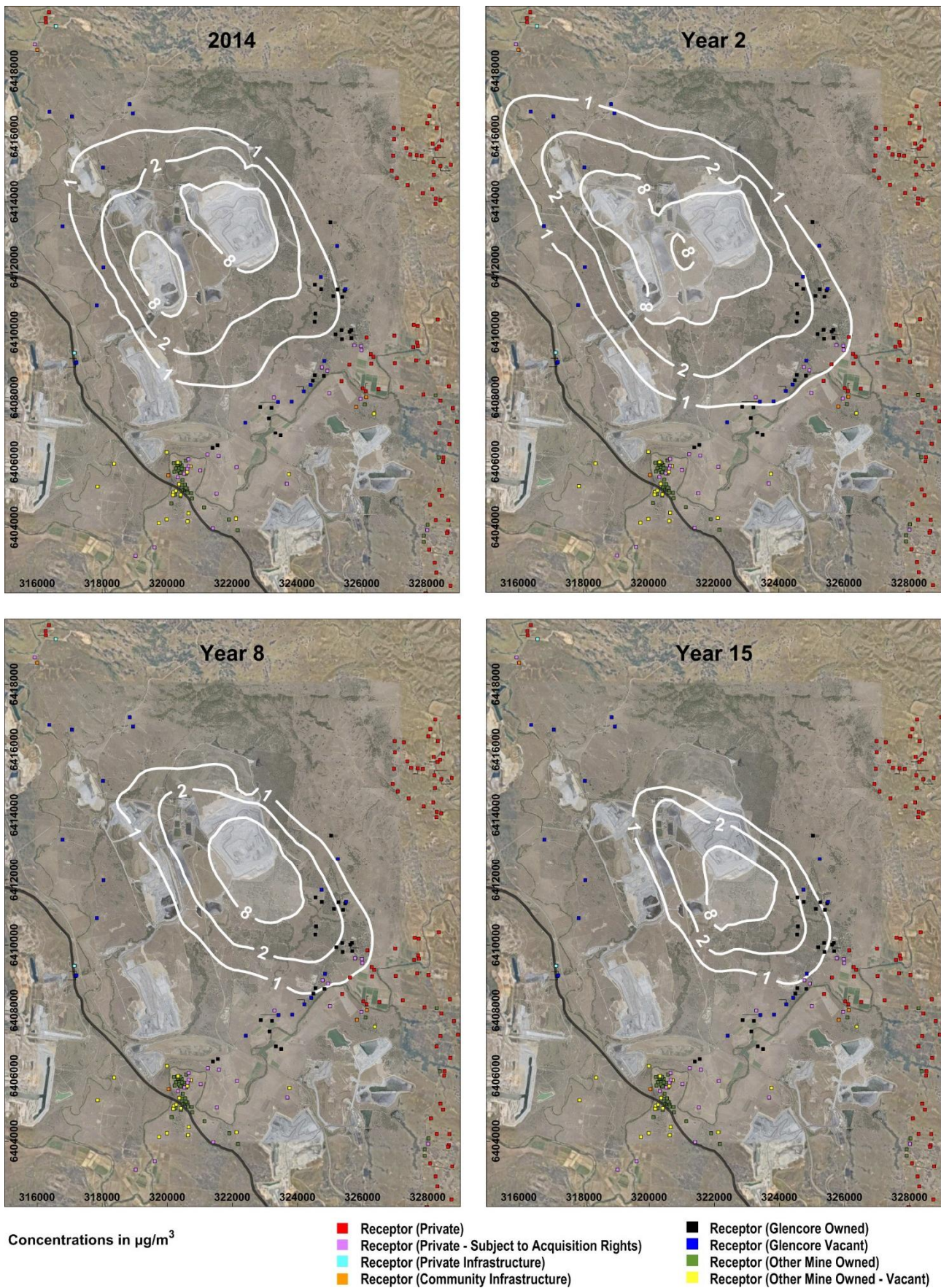
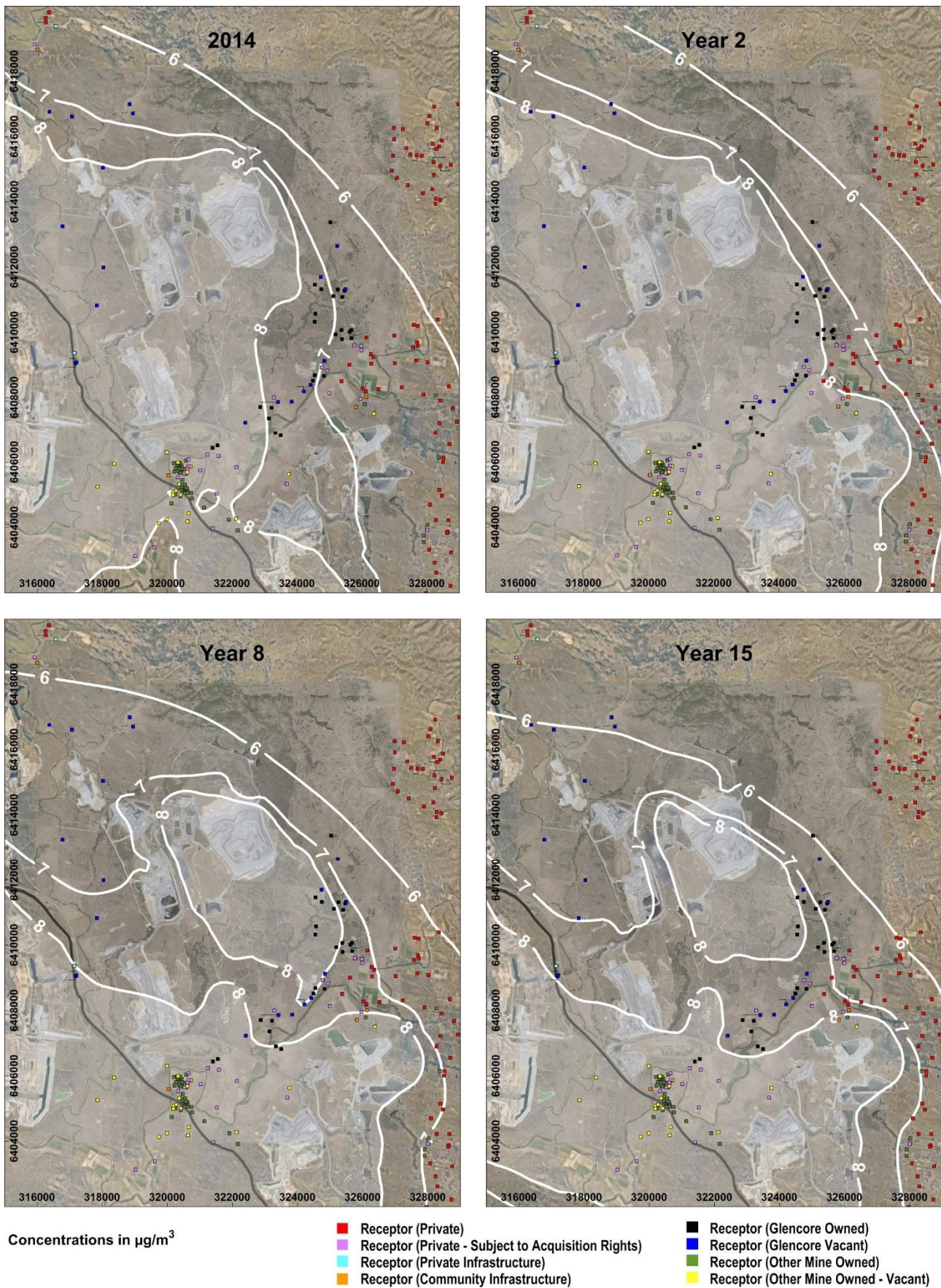


Figure 28 Predicted annual average PM_{2.5} concentrations due to the Proposed Modification

Figure 29 Predicted annual average $\text{PM}_{2.5}$ concentrations due to all sources (cumulative)

8.3 Particulate Matter (as TSP)

Figure 30 shows the annual average TSP concentrations for existing conditions (2014). This figure shows that the model predictions for this statistic are within five per cent of the measured result in the Camberwell and Middle Falbrook areas. There is a tendency for over-prediction to the northwest of Mount Owen Mine, however it is noted that the closest sensitive receivers are located to the south and south east of the Proposed Modification. Accordingly, it is considered that the over prediction to the north west is acceptable.

Figure 31 and **Figure 32** show the predicted annual average TSP concentrations in future years for the Proposed Modification and cumulative scenarios respectively.

Excluding community or private infrastructure, or properties subject to existing acquisition rights, there are no private sensitive locations which are predicted to experience exceedances of the annual average TSP criterion ($90 \mu\text{g}/\text{m}^3$) at any stage of the Proposed Modification.

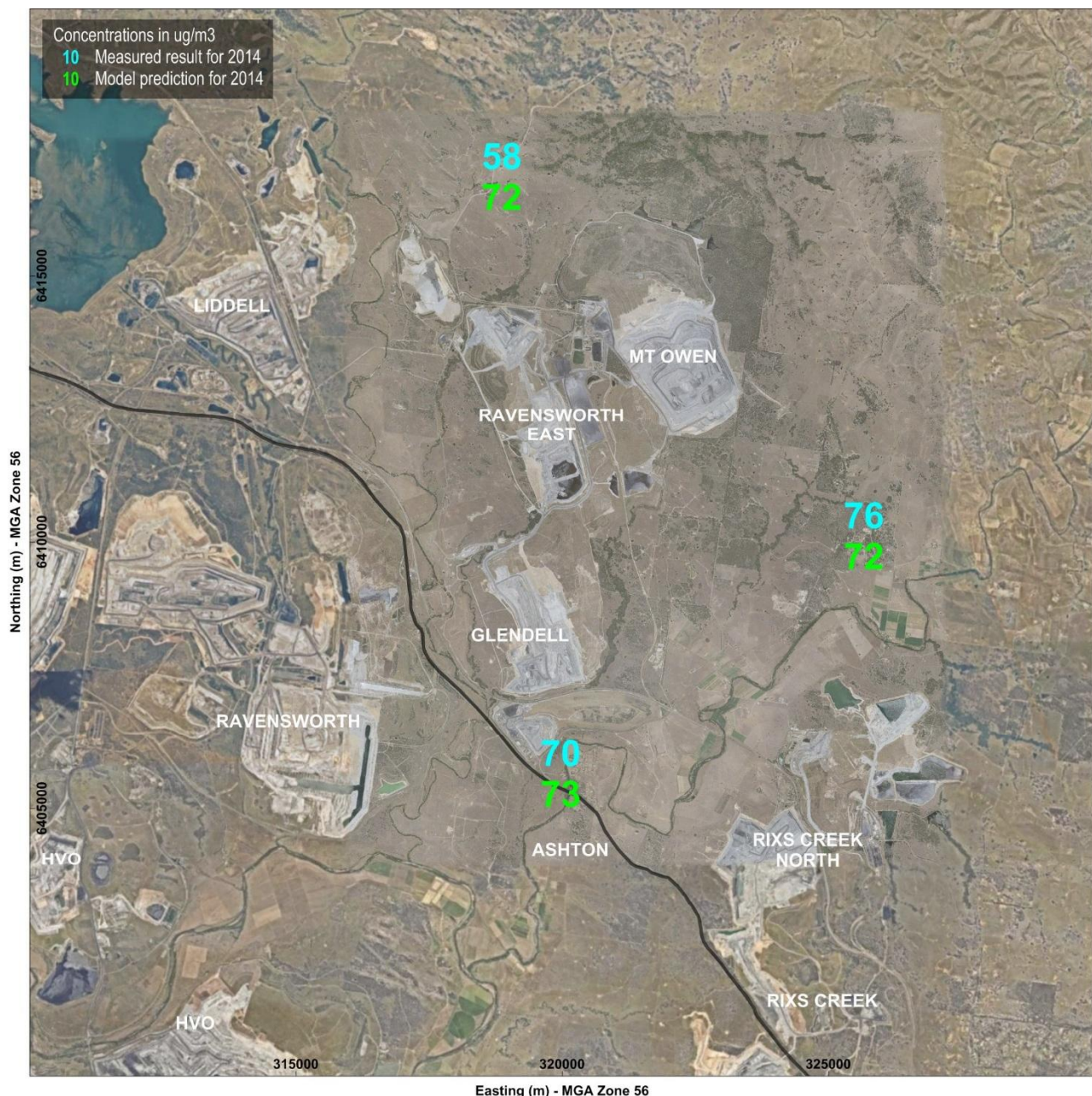


Figure 30 Predicted annual average TSP concentrations due to all sources (cumulative) in 2014

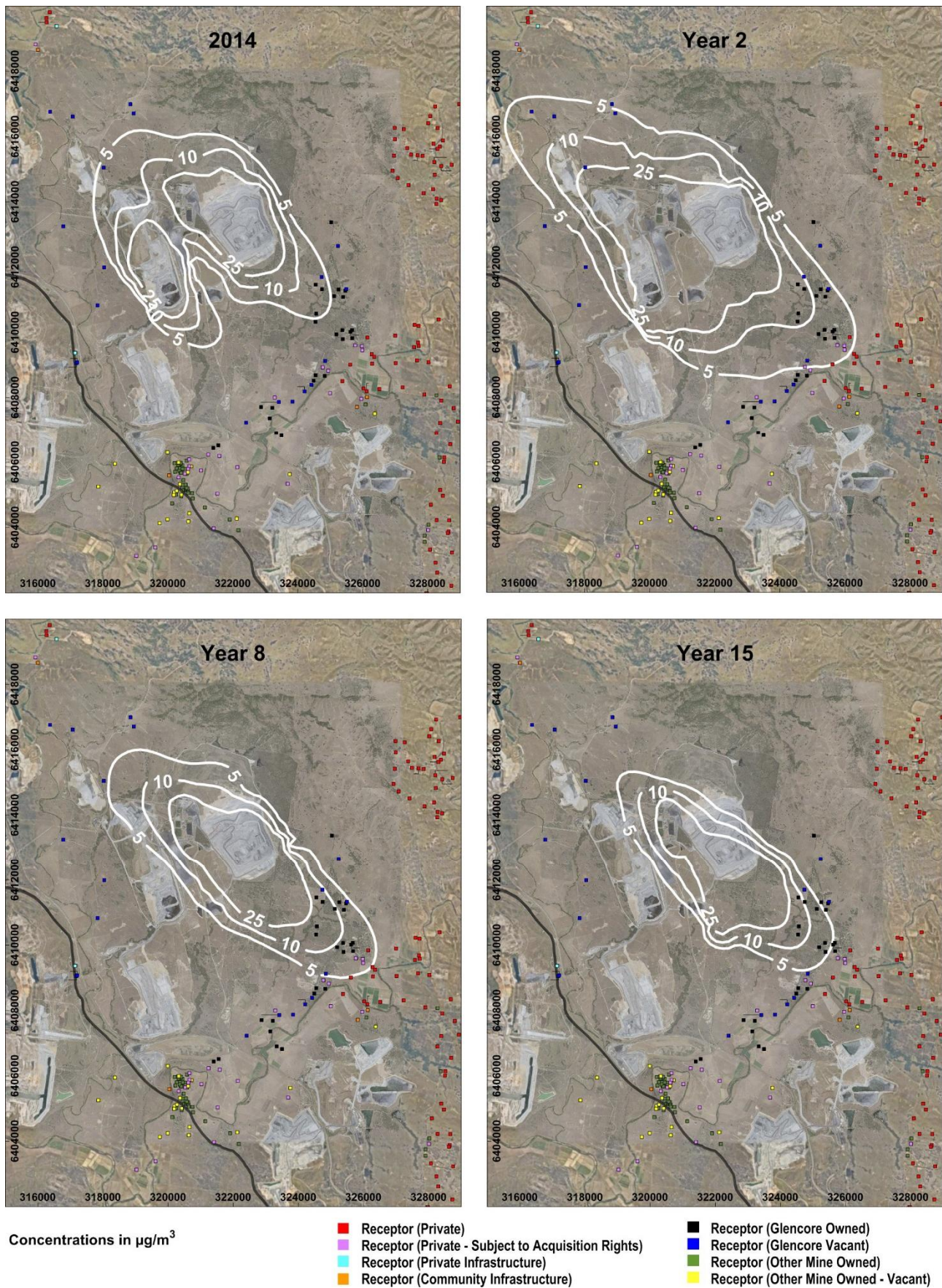


Figure 31 Predicted annual average TSP concentrations due to the Proposed Modification

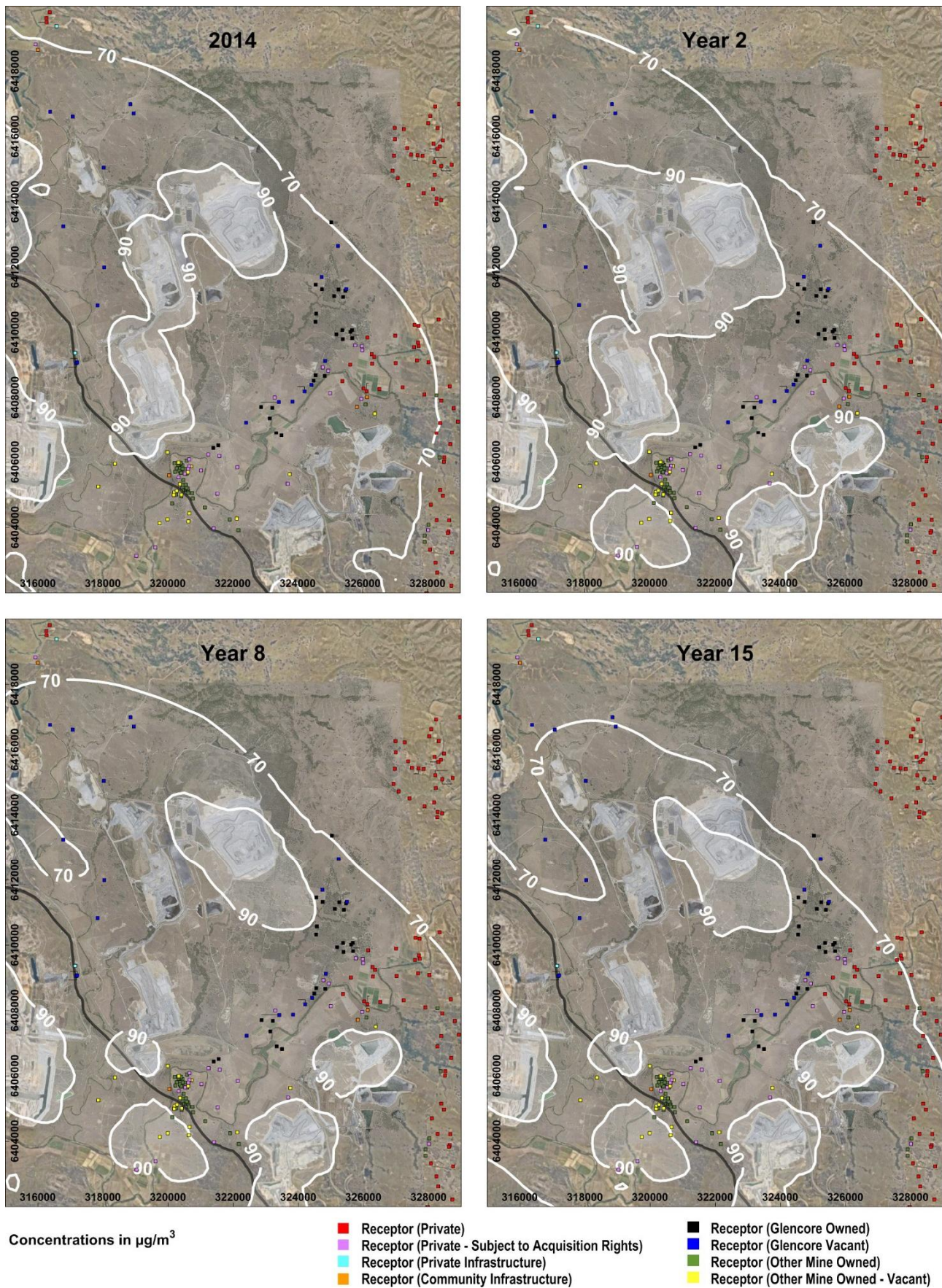


Figure 32 Predicted annual average TSP concentrations due to all sources (cumulative)

8.4 Deposited Dust

Figure 33 shows the annual average dust deposition levels for existing conditions (2014). Given the variability in deposited levels from one location to another, an average model performance approach was adopted and **Figure 33** indicates that the model predictions were, on average, ten per cent higher than the measured results.

Figure 34 and **Figure 35** show the predicted annual average dust deposition levels in future years for the Proposed Modification and cumulative scenarios respectively.

Excluding community or private infrastructure, or properties subject to existing acquisition rights, there are no private sensitive locations which are predicted to experience exceedances of the annual average dust deposition criteria at any stage of the Proposed Modification.

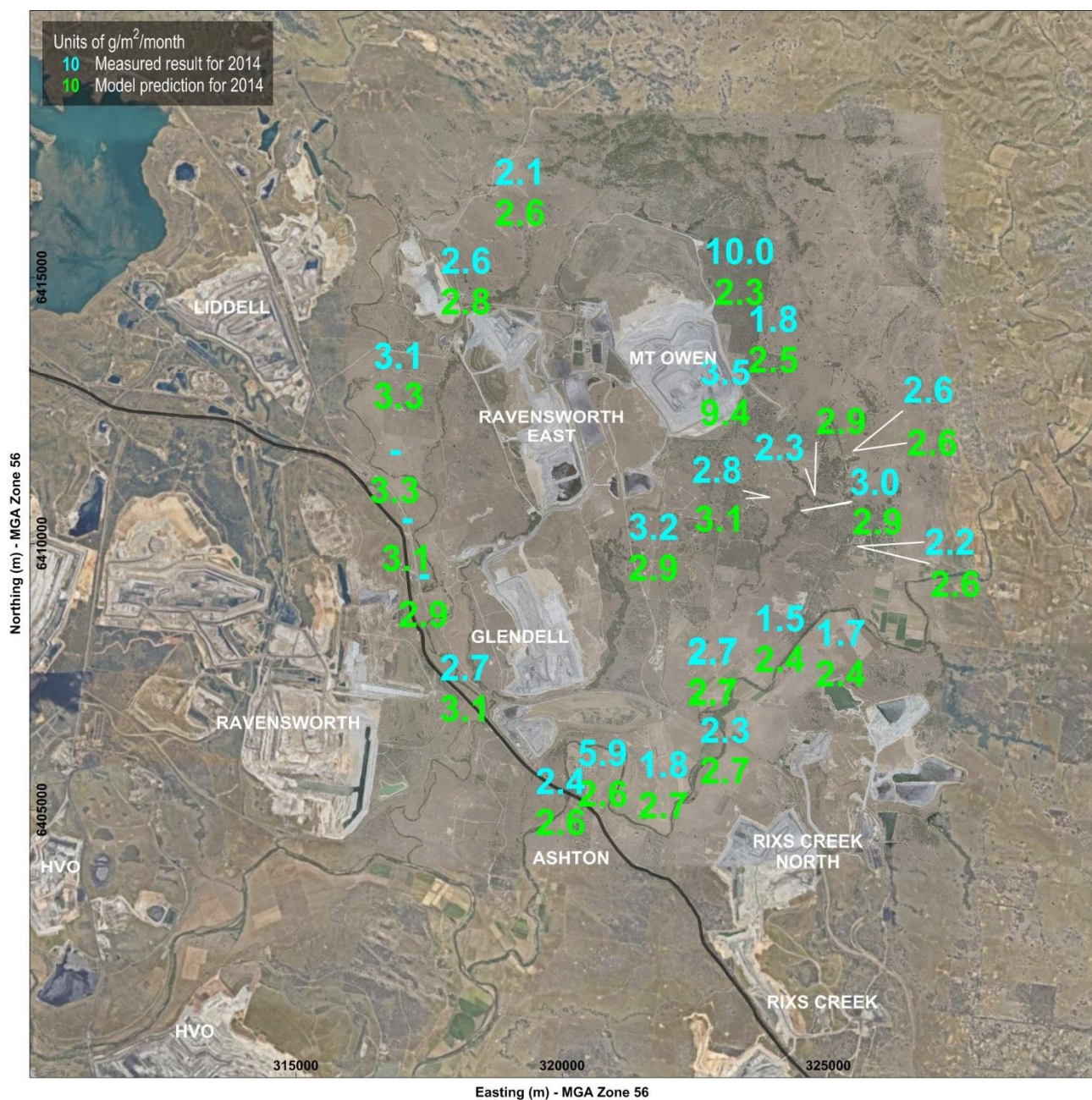


Figure 33 Predicted annual average deposited dust levels due to all sources (cumulative) in 2014

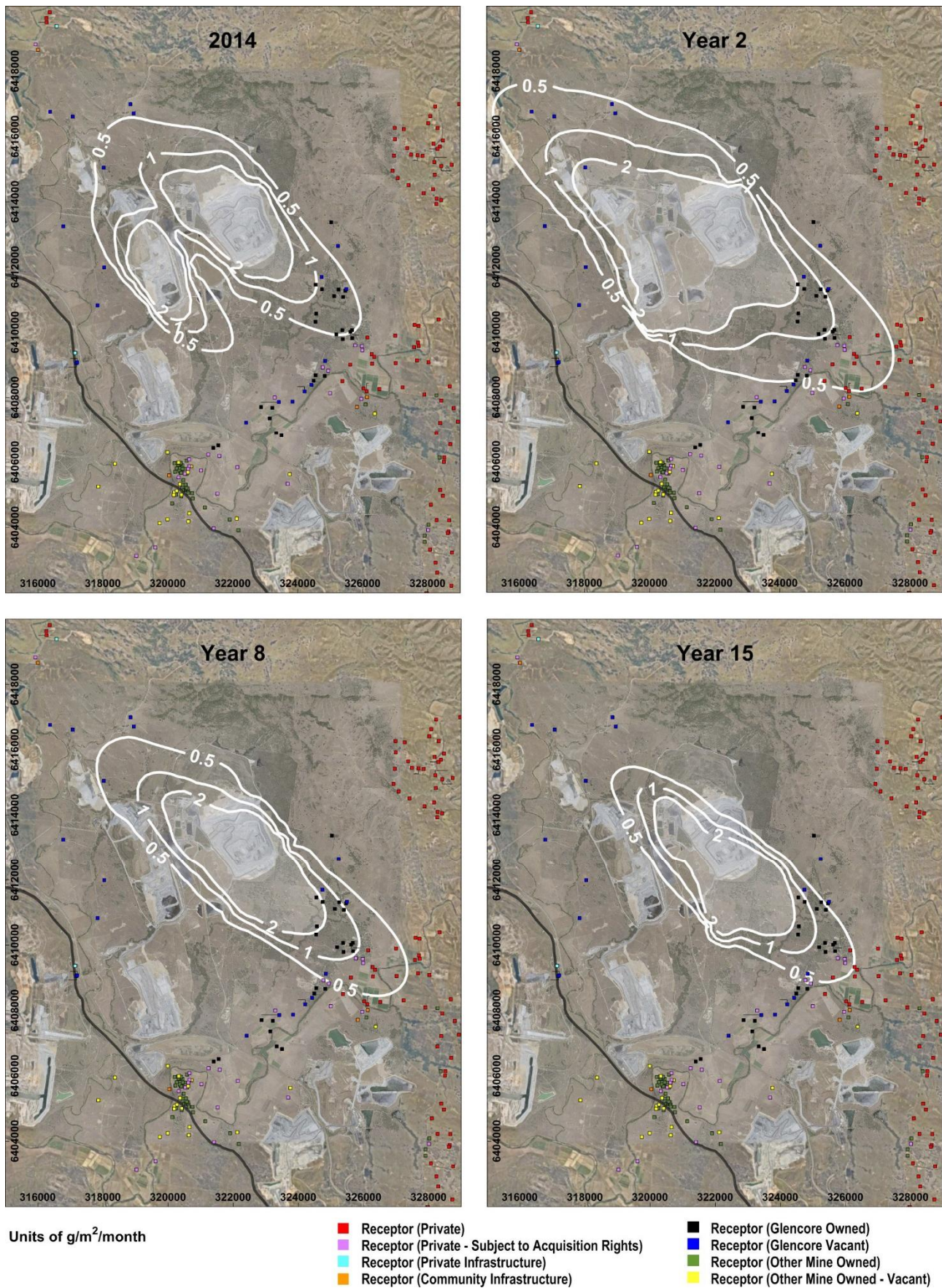


Figure 34 Predicted annual average deposited dust levels due to the Proposed Modification

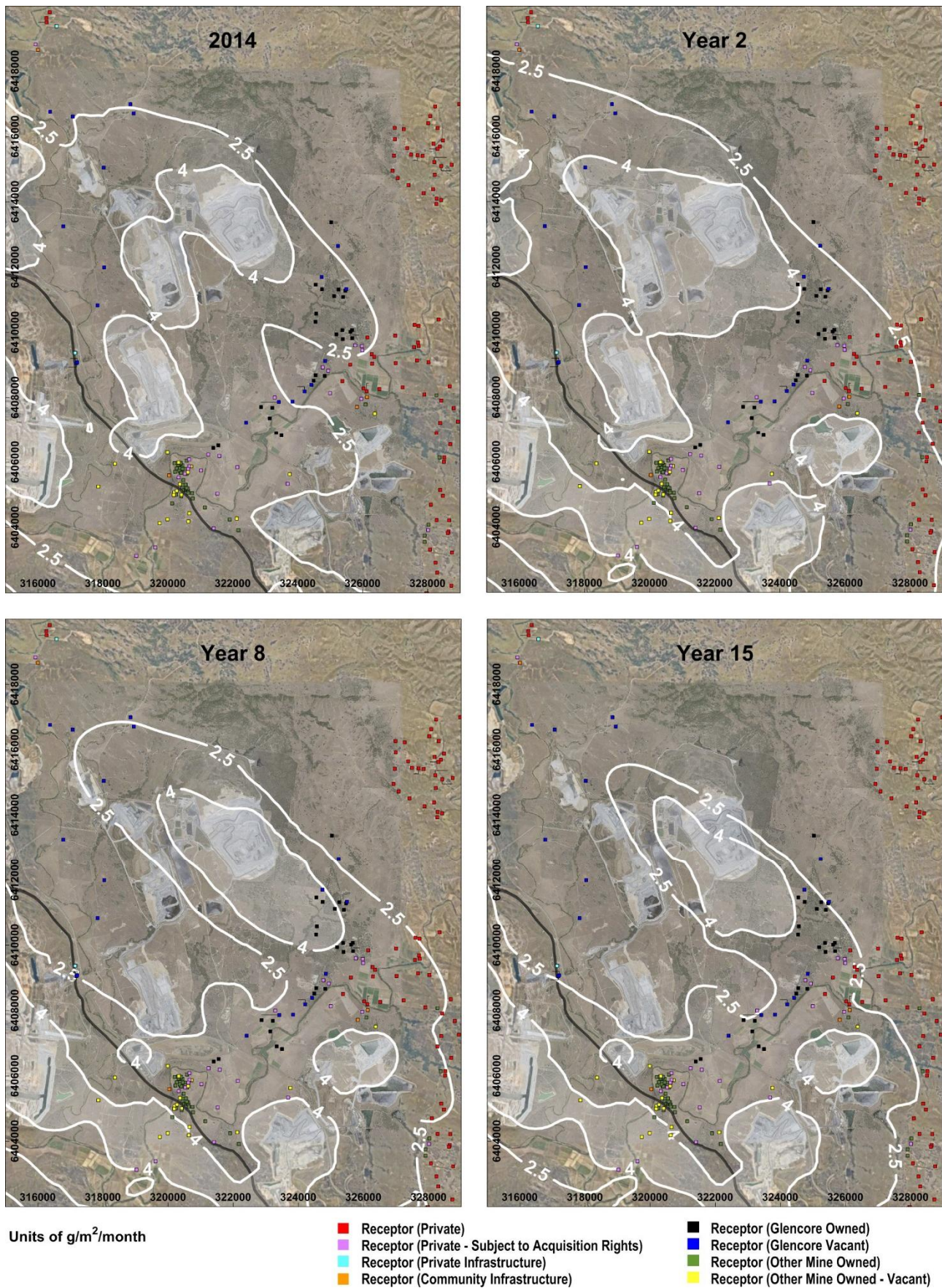


Figure 35 Predicted annual average deposited dust levels due to all sources (cumulative)

8.5 Post-Blast Fume (NO₂)

Blasting activities have the potential to result in fume and particulate matter emissions. Particulate matter emissions from blasting are included in the dispersion modelling results presented in **Sections 8.1 to 8.4**. 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.

Post-blast fumes comprise of oxides of nitrogen (NO_x) including nitric oxide (NO) and nitrogen dioxide (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. It is the NO₂ which has been linked to adverse health effects.

Glencore has developed blasting procedures to provide for effective fume management. A site-specific blast management plan is implemented during operations, including key fume management actions, such as defining the potential risk zone based upon weather patterns and obtaining permission to fire, based on an assessment of current weather conditions. In addition to general fume management practices, the mining contractor, Thiess, continues to work closely with its explosive suppliers to minimise the potential for post-blast fume.

No changes are proposed to the number of blasts per day, permissible blasting hours, blasting practices or blast management procedures as part of the Proposed Modification. Therefore, the extent of potential blast fume impact will be within the extent of potential blast fume impact under the Approved Operations and will continue to be managed in accordance with existing approved management plans and processes.

8.6 Diesel Exhaust Emissions

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.

The most significant emissions from diesel exhausts are products of combustion including carbon monoxide (CO), oxides of nitrogen (NO_x) and particulate matter (PM₁₀ and including PM_{2.5}). It is the NO_x, or more specifically NO₂, and PM₁₀ (including PM_{2.5}) which have been reviewed in this section.

8.6.1 Particulate Matter (as PM₁₀ and PM_{2.5})

The emission factors, presented in **Section 6** and **Appendix B**, 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 include 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 1980's (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.

Based on the information collated above, the potential impacts of diesel exhaust emissions (as PM₁₀ and PM_{2.5}) are represented in the preceding results, in **Sections 8.1 to 8.4**.

8.6.2 Nitrogen Dioxide (NO₂)

Emissions of NO_x from diesel exhausts have been estimated using fuel consumption data, provided by Mount Owen, and an emission factor from the EPA's Air Emissions Inventory for 2008 (EPA 2012). **Table 19** shows the calculations.

Table 19 Estimated NO_x emissions from diesel exhausts

Item	Value by year		
	Year 2	Year 8	Year 15
Total fuel used (litres)	50,999,945	46,767,575	21,512,920
Diesel exhaust emission factor (kg/kL)	40.77	40.77	40.77
Diesel exhaust emissions – all equipment (kg/y)	2,079,268	1,906,714	877,082

The Year 2 NO_x emission estimates from **Table 19** have been modelled, using the same source locations as in **Figure 15**, to provide an indication of the off-site NO₂ concentrations due to diesel exhaust emissions. The predicted maximum 1-hour average NO₂ concentrations are shown in **Figure 36**, which assumes that 20% of the NO_x is NO₂ at the locations of maximum ground-level concentrations. At the nearest sensitive receptors, the predicted maximum 1-hour average NO₂ concentrations are in the order of 50 µg/m³. With the addition of maximum background levels (74 µg/m³ from **Table 10**) the results demonstrate compliance with the EPA's 246 µg/m³ criterion. The 172 µg/m³ contour represents the EPA criterion assuming a background level of 74 µg/m³. These results are for Year 2 which is anticipated to have the highest emissions of the three assessment years.

Figure 37 shows the predicted annual average NO₂ concentrations, which assumes that 50% of the NO_x is NO₂. At nearest sensitive receptors the predicted average NO₂ concentrations are in the order of 10 µg/m³ or less. With the addition of conservative background levels (16 µg/m³ from **Table 10**) the results show compliance with the EPA's 62 µg/m³ criterion.

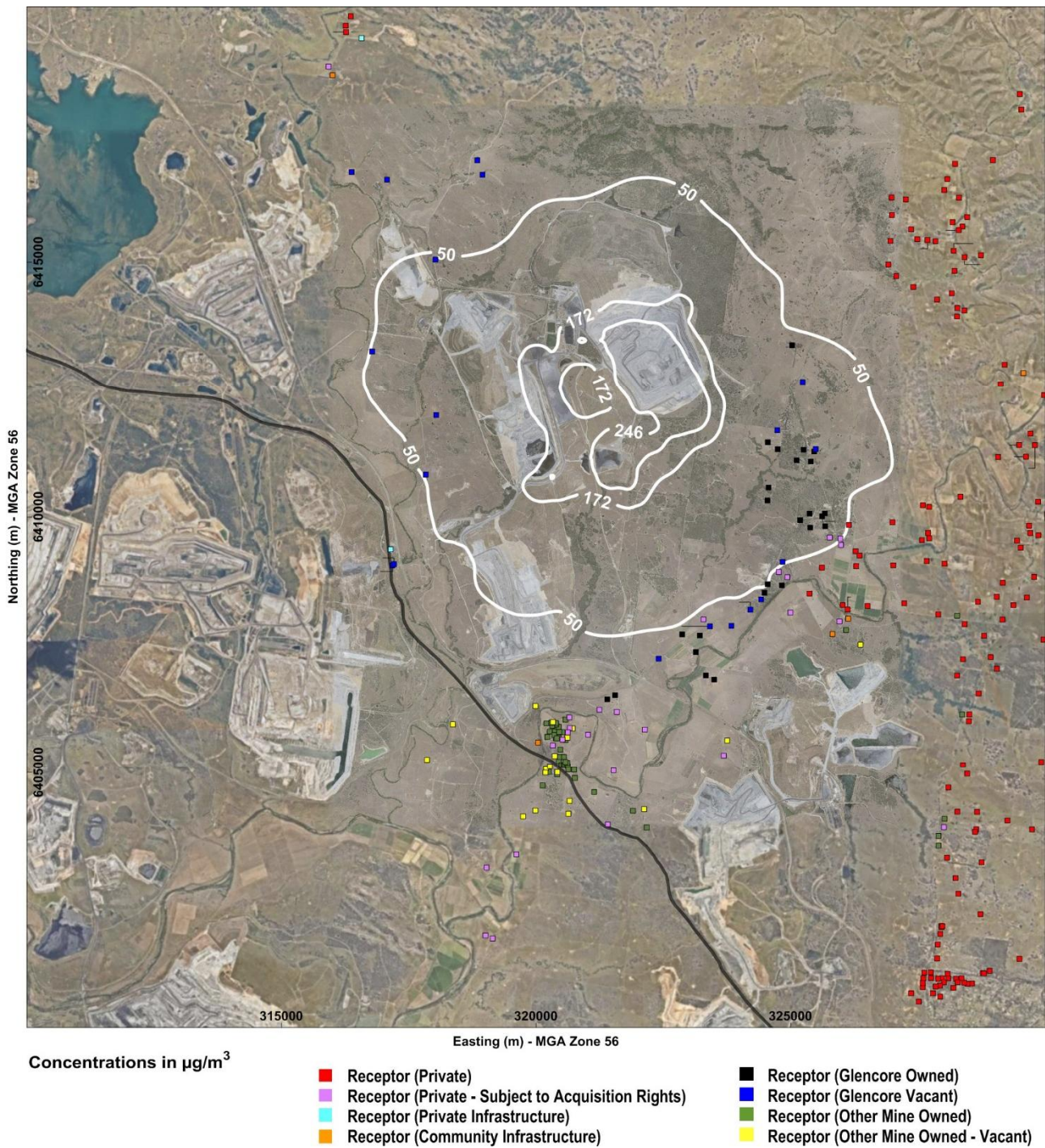


Figure 36 Predicted maximum 1-hour average NO_2 concentrations due to the Proposed Modification diesel exhausts in Year 2

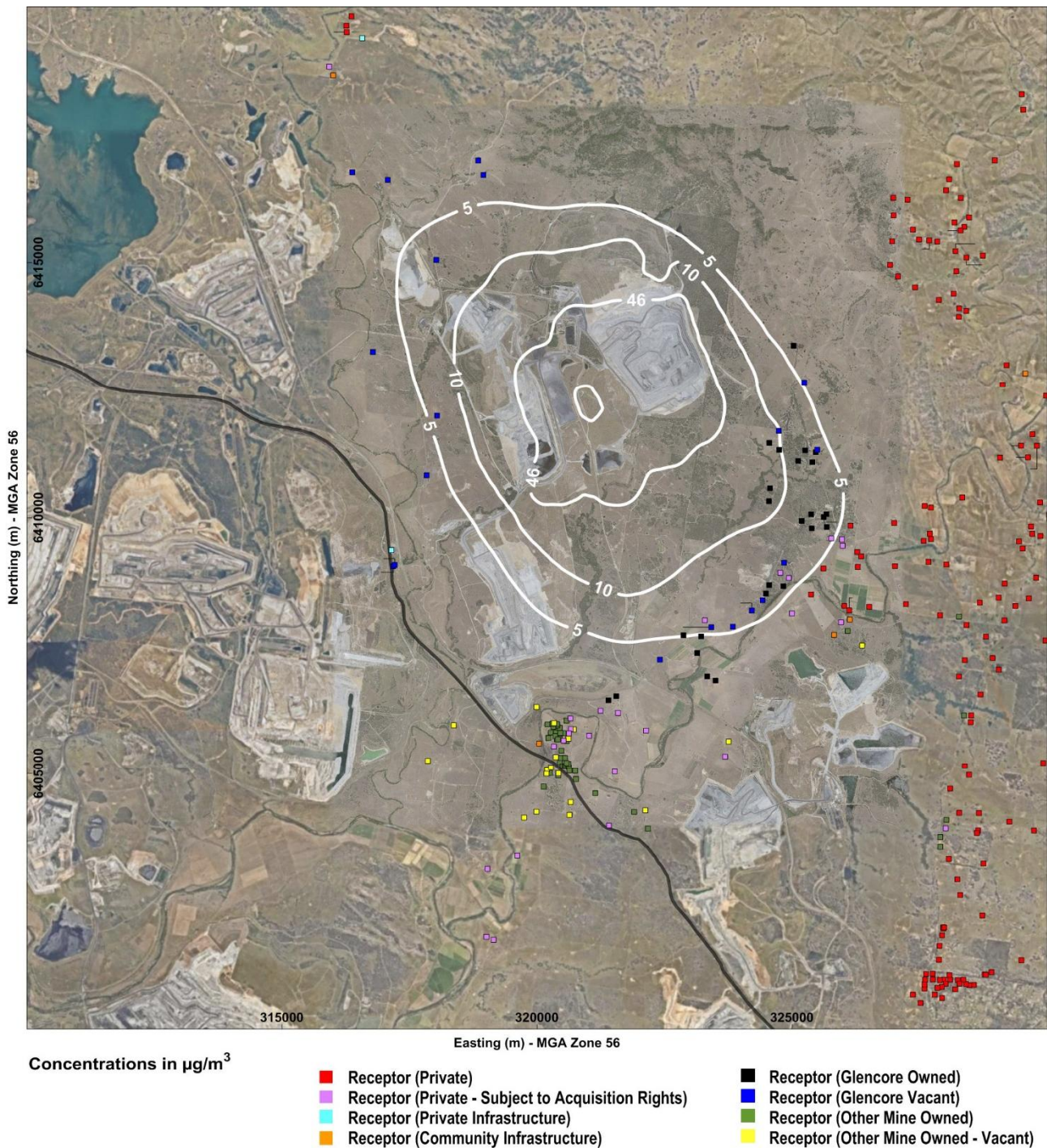


Figure 37 Predicted annual average NO_2 concentrations due to the Proposed Modification diesel exhausts in Year 2

8.7 Construction

Dust emissions from construction works have the potential to cause nuisance impacts if not properly managed. Air quality impacts during construction would largely result from dust generated during earthworks and other engineering activities associated with the site construction works. The Proposed Modification represents a continuation of mining and there will be no additional construction activities relative to the Approved Operations.

9. Management and Monitoring

Table 20 summarises the standard emission management measures, currently implemented as part of the existing Air Quality Management Plan, that will continue to be adopted as part of the Proposed Modification.

Table 20 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
Stripping topsoil by scraper	Watering of haul routes Restricting vehicle speeds	50	Control measures for this activity are not specifically identified but can be inferred from the bulldozers information below.	Y
Drilling overburden	Water injection and application of water to drill cuttings upon removal Dust curtains Ceasing operations when visible dust is generated	70	<i>"Best practice control measures include air extraction to a bag filter. No mines were found to use this practice."</i>	N (bag filters are not best practice in NSW)
Blasting overburden	Pre-blast checks including review of meteorological conditions	0	<i>"Best practice control measures include delaying shot to avoid unfavourable weather conditions and minimising the area blasted"</i>	Y
Hauling overburden and coal on unsealed roads	Watering of haul routes Gravel compaction and maintenance of haul routes Restricting vehicle speeds Clearly marked haul routes Fleet optimisation to reduce vehicle kilometres travelled Prompt clean-up of any material spillage	85	<i>"Control measures include watering, grading, well-defined haul routes, speed limits to 40 km/h and/or the use of suppressants."</i>	Y
Loading and unloading of overburden	Minimisation of fall distances during unloading and loading Planning of dump locations based on weather conditions Ceasing operations during adverse dust conditions	0	<i>"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".</i>	Y
Unloading coal to ROM hopper	Water sprays and partial enclosure	70	<i>"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."</i>	N (additional control devices are not best practice in NSW)
Coal processing	Enclosure	70	Control measures for this process are not specifically identified.	-

Activity	Emission management measures	Assumed emission control (%) (NPI 2012, Donnelly et al 2011)	Measures identified from Donnelly et al (2011)	Consistent with best practice
Dozers or loaders on ROM and product coal stockpiles	Watering of travel routes Minimisation during dusty conditions Reduced travel speed during dusty conditions	50	<i>"Best practice control measures include minimising the travel speed and distance travelled by bulldozers and the application of water to keep travel routes moist"</i>	Y
Conveyors to stockpiles	Covered / enclosure Belt cleaning	70	<i>"The use of wind shielding on conveyor sides, water sprays at conveyor transfers, enclosure of transfer points, and, soft-loading chutes."</i>	Y (except for water sprays and soft-loading chutes)
Wind erosion from partially rehabilitated dumps	Partial rehabilitation / stabilisation	30	<i>"Control measures include watering exposed areas, minimising areas of disturbance, progressive rehabilitation and use of suppressants"</i>	Y
Wind erosion from ROM and product coal stockpiles	Water sprays, triggered by wind conditions Minimisation of FEL drop heights when loading	50	<i>"Control measures include watering exposed areas, minimising areas of disturbance, progressive rehabilitation and use of suppressants"</i>	Y
Grading roads	Watering of haul routes Restricting vehicle speeds Clearly marked routes	50	Control measures for this activity are not specifically identified. This activity forms part of the control measures for haul roads.	-
Machinery exhausts and plant and equipment	Servicing all machinery in accordance with maintenance contracts and adopting original equipment manufacturer recommendations for maintenance. Targeting the maintenance to ensure equipment remains fit for purpose over its whole life cycle. Defining failure modes, effects and criticality. Constructing timelines for downtimes.	0	Control measures for this activity are not specifically identified.	-

In addition to the measures listed above Mount Owen implements both proactive and reactive dust control strategies. Reactive air quality management include the modification or suspension of activities in response to the following triggers:

- Visual conditions, such as visible dust from trucks above wheel height;
- Meteorological conditions, such as dry, windy conditions, with winds blowing towards sensitive receptors; or
- Ambient air quality conditions (that is, elevated short-term PM₁₀ concentrations).

Specific "triggers" are defined in the Mount Owen Complex Air Quality Management Plan. These triggers are linked to specific actions for managing dust at both private and mine owned residences.

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

- Implementation of a system to provide environmental personnel with a daily forecast of expected dust conditions in the vicinity of the operation.
- Discussion of the dust forecast at daily pre-shift meetings.
- Modifying the planned mining activities, as appropriate, to minimise or avoid the potential dust impacts.

The dust management measures as outlined 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 identified that the majority of proposed measures are consistent with best practice dust mitigation measures.

The meteorological and air quality monitoring network currently operated by Mount Owen (refer to **Section 5**) is suitably setup to measure the key air quality parameters, compliance with air quality criteria, and to allow for the contribution of mining activities to be determined. This monitoring network will continue to be operated as part of the Proposed Modification.

10. Conclusions

This report has assessed the potential air quality impacts of the Proposed Modification at Mount Owen Mine, including discussion of impacts relative to the Approved Operations.

The potential air quality issues were identified as:

- Dust (that is, particulate matter in the form of TSP, PM₁₀ or PM_{2.5}) from the general mining activities;
- Fume (that is, NO_x emissions) from blasting; and
- Emissions of substances from machinery exhausts, that is, diesel emissions.

A detailed review of the existing environment was carried out. The following conclusions were made in relation to the existing air quality conditions:

- There are seasonal variations in particulate matter concentrations, with PM₁₀ levels typically higher in spring and PM_{2.5} levels higher in winter.
- There are daily variations in particulate matter concentrations, with levels typically highest in the morning and evening.
- In terms of PM₁₀ concentrations, most monitoring sites in the vicinity of Mount Owen Mine have experienced at least one day above the EPA's 24-hour average criterion (50 µg/m³) in the past five years, but annual averages have complied with EPA criteria for all sensitive locations.
- TSP and NO₂ concentrations are below the relevant EPA criteria.
- Deposited dust levels have exceeded EPA criteria at some monitoring sites.
- The two closest PM_{2.5} monitoring stations, Camberwell and Singleton, have measured PM_{2.5} concentrations which are close to or have exceeded the EPA criteria. Wood smoke was identified as one of the main factors influencing PM_{2.5} concentrations, especially in winter.

The computer-based dispersion model known as CALPUFF was used to predict the potential air quality impacts of the Proposed Modification, including cumulative impacts with neighbouring mining operations. The dispersion modelling accounted for meteorological conditions, land use and terrain information and used dust emission estimates to predict the off-site air quality impacts. The performance of the model was reviewed by comparing predictions to measured results for a representative year. It was found that, with the adopted approach for modelling and assessment, the model predictions for average concentrations were typically within 10 per cent of measured results. This result is well within the factor-of-two accuracy that has been recognised for these types of models (US EPA, 2005).

The predicted area of impact in relation to private residences (not currently subject to acquisition) for the Proposed Modification was found to be consistent with that predicted for the Approved Operations. The main conclusions of the assessment were as follows:

- Excluding community or private infrastructure, or properties subject to existing acquisition rights, there are no private sensitive locations which are predicted to experience a Proposed Modification contribution of greater than 50 µg/m³ for maximum 24-hour average PM₁₀ concentrations.
- Excluding community or private infrastructure, or properties subject to existing acquisition rights, there are no private sensitive locations which are predicted to experience exceedances of the annual average PM₁₀ criterion at any stage of the Proposed Modification.
- Excluding community or private infrastructure, or properties subject to existing acquisition rights, there are no private sensitive locations which are predicted to experience exceedances of the maximum 24-hour or annual average PM_{2.5} criterion at any stage of the Proposed Modification.
- Excluding community or private infrastructure, or properties subject to existing acquisition rights, there are no private sensitive locations which are predicted to experience exceedances of the annual average TSP or dust deposition criteria at any stage of the Proposed Modification.

- There would be no change to the extent of potential impact of post-blast fume due to the Proposed Modification.
- Emissions from diesel exhausts associated with off-road vehicles and equipment are not expected to result in any adverse air quality impacts, based on model predictions which show compliance with air quality criteria.

The modelling indicated that the Proposed Modification has the potential to cause adverse air quality impacts at some mine owned properties, consistent with the outcomes of the Continued Operations Project (now the Approved Operations). These impacts will need to be managed in accordance with approval conditions.

11. References

- ACARP (2015) "Development of Australia-specific PM₁₀ emission factors for coal mines". Published by the Australian Coal Association Research Program (ACARP), 21/9/2015.
- ANSTO (2008) Fine particle aerosol sampling newsletter. Number 38, July 2008.
- Ashton Coal (2015) "Annual Environmental Management Report 2014". 24/3/2015.
- Attalla M I, Day S J, Lange T, Lilley W and Morgan S (2008) "NO_x emissions from blasting operations in open-cut coal mining" published in Atmospheric Environment, 42, (2008), 7874-7883. CSIRO Energy Technology, PO Box 330, Newcastle, NSW 2300.
- Betts A, Dutt U, Jiang N, Warren L and Watt S (2014) "Observations of particulate matter concentrations from the Upper Hunter Air Quality Monitoring Network, NSW". Published in "Air Quality and Climate Change" journal from the Clean Air Society of Australia and New Zealand, Volume 48, No. 4, November 2014.
- BoM (2017) Climatic Averages Australia, Bureau of Meteorology website, accessed November 2017.
<http://www.bom.gov.au/climate/averages/>
- DEC (2005) "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW". Published by the Department of Environment and Conservation, now EPA. August 2005.
- DEEDI (2011) "Management of oxides of nitrogen in open cut blasting". Queensland Guidance Note QGN 20 v3. Department of Employment, Economic Development and Innovation.
- DoE (2016) *National Environment Protection (Ambient Air Quality) Measure – as amended*, Federal Register of Legislative Instruments F2016C00215, Department of the Environment, Canberra.
- Donnelly S-J, Balch A, Wiebe A, Shaw N, Welchman S, Schloss A, Castillo E, Henville K, Vernon A and Planner J (2011) "NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and / or Minimise Emissions of Particulate Matter from Coal Mining". Prepared by Katestone Environmental Pty Ltd for NSW Office of Environment and Heritage, December 2010.
- EPA (2012) "Air Emissions Inventory for the Greater Metropolitan Region in New South Wales, 2008 Calendar Year, Off-Road Mobile Emissions". Technical Report No. 6. Prepared by the Environment Protection Authority. EPA 2012/0050. August 2012.
- EPA (2016) "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW".
- Holmes Air Sciences (2007) "Glennies Creek Open Cut Coal Mine Air Quality Assessment". Prepared by Holmes Air Sciences for Integra Coal Operations Pty Ltd, October 2007.
- Liddell Coal Operations (2015) "2014 Annual Environmental Management Report", dated 30/03/2015.
- Mt Owen Pty Ltd (2014) "Mt Owen Complex Annual Review 2014".
- National Pollutant Inventory (2012) "Emission Estimation Technique Manual for Mining". Version 3.1, January 2012.
- NEPC (1998) "Ambient Air – National Environment Protection Measure for Ambient Air Quality", National Environment Protection Council, Canberra.
- NERDDC (1988) "Air Pollution from Surface Coal Mining: Measurement, Modelling and Community Perception", Project No. 921, National Energy Research Development and Demonstration Council, Canberra.

NHMRC (1996) "Ambient Air Quality Goals Recommended by the National Health and Medical Research Council, National Health and Medical Research Council", Canberra.

NSW Government (2014) "Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments". November 2014.

NSW Government (2017) "Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments - DRAFT". November 2017

OEH (2013a) New South Wales Air Quality Statement 2013.

<http://www.environment.nsw.gov.au/aqms/140057nswairqual13.htm>

OEH (2013b) "Upper Hunter Fine Particle Characterisation Study". Final report, dated 17 September 2013. CSIRO.

OEH (2017) Air quality monitoring data from the Office of Environment and Heritage website

<http://www.environment.nsw.gov.au/AQMS/search.htm>. Accessed September 2015.

Pacific Environment Limited (2013) "Air Quality and Greenhouse Gas Assessment – Liddell Coal Operations Modification 5". Job no. 5347. Report dated 20 February 2013.

Pacific Environment Limited (2014) "Air Quality Impact Assessment - Mount Owen Continued Operations". Dated 29 October 2014.

Pacific Environment Limited (2016) "Mount Owen Continued Operations – Refined Project". Dated 26 May 2016.

PAEHolmes (2009) "Air Quality Impact Assessment – Ashton South East Open Cut Mine". Job no. 2886, 23 October 2009.

Ravensworth Operations Pty Ltd (2015) "The Ravensworth Complex Annual Review for the period of 1 January 2014 to 31 December 2014". Dated March 2015.

Rio Tinto (2015) "2014 Hunter Valley Operations Annual Environmental Review". March 2015.

Rix's Creek Ltd (2015) "Annual Review 2015". Rix's Creek Mine. Dated 19/4/2016.

Skidmore, E.L. (1998) "Wind Erosion Processes". USDA-ARS Wind Erosion Research Unit, Kansas State University. Wind Erosion in Africa and West Asia: Problems and Control Strategies. Proceedings of the expert group meeting 22-25 April 1997, Cairo, Egypt.

SPCC (1986) "Particle size distributions in dust from open cut coal mines in the Hunter Valley". Report number 10636-002-71. Prepared for the State Pollution Control Commission of NSW (now EPA) by Dames and Moore.

Todoroski (2015) "Air Quality and Greenhouse Gas Assessment – Rix's Creek Continuation of Mining Project". Prepared by Todoroski Air Sciences, job number 13080222, report dated 26 August 2015.

Todoroski (2016) "Review – Air Quality Impact Assessment – Mt Owen Continued Operations Project". Prepared by Todoroski Air Sciences for the NSW Department of Planning and Environment. Job number 15090470, report dated 29 April 2016.

Todoroski (2017) "Air Quality and Greenhouse Gas Assessment – HVO South Modification 5". Prepared by Todoroski Air Sciences, job number 15010400, report dated 25 January 2017.

TRC (2007) CALPUFF model web-site (<http://www.src.com/calpuff/regstat.htm>).

TRC (2011) "Generic Guidance and Optimum Model Settings for the CALPUFF Modelling System for Inclusion into the 'Approved Methods for the Modelling and Assessments of Air Pollutants in NSW'". Prepared for the Office of Environment and Heritage by TRC, March 2011.

URS (2000) "Mount Arthur North Coal Project". EIS produced for Coal Australia Pty Ltd by URS Australia Pty Ltd.

US EPA (1985 and updates) "Compilation of Air Pollutant Emission Factors", AP-42, Fourth Edition United States Environmental Protection Agency, Office of Air and Radiation Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina 27711. Now a web-based document.

US EPA (1987) Update of fugitive dust emission factors in AP-42 Section 11.2, EPA Contract No. 68-02-3891, Midwest Research Institute, Kansas City, MO, July 1987.

US EPA (1995) "User's Guide for the Industrial Source Complex (ISC3) Dispersion Models - Volume 1 User's Instructions" and "Volume 2 Description of Model Algorithms" US Environmental Protection Agency, Office of Air Quality Planning and Standards Emissions, Monitoring and Analysis Division, Research Triangle Park, North Carolina 27711.

US EPA (2005) "Revision to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and Other Revisions; Final Rule". Environmental Protection Agency.

Vale (2015) "Annual Review – Integra Coal Operations". March 2015.

Appendix A. Wind-roses for all meteorological stations

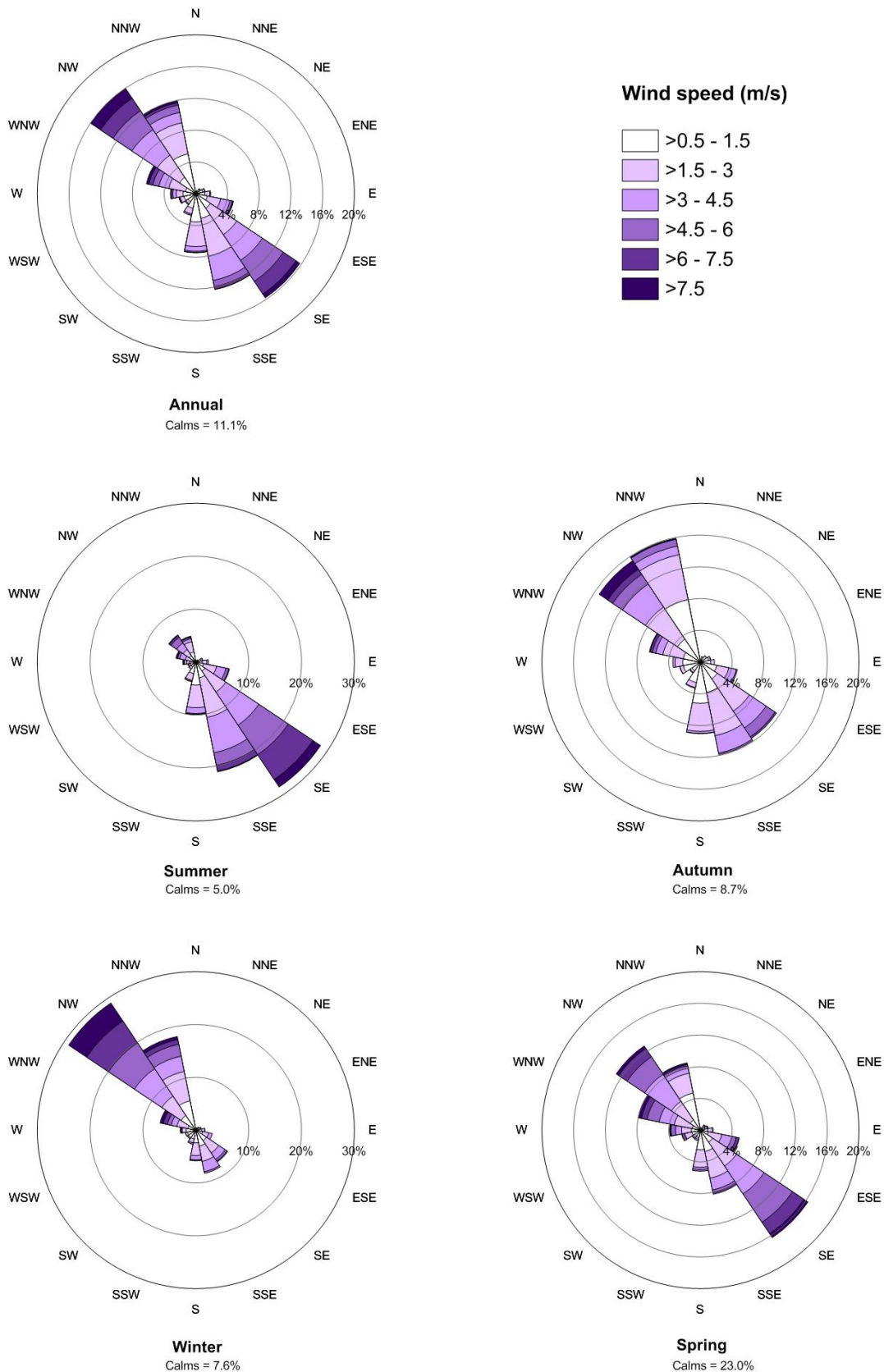


Figure A1 Annual and seasonal wind-roses for Glendell (SX13) 2014

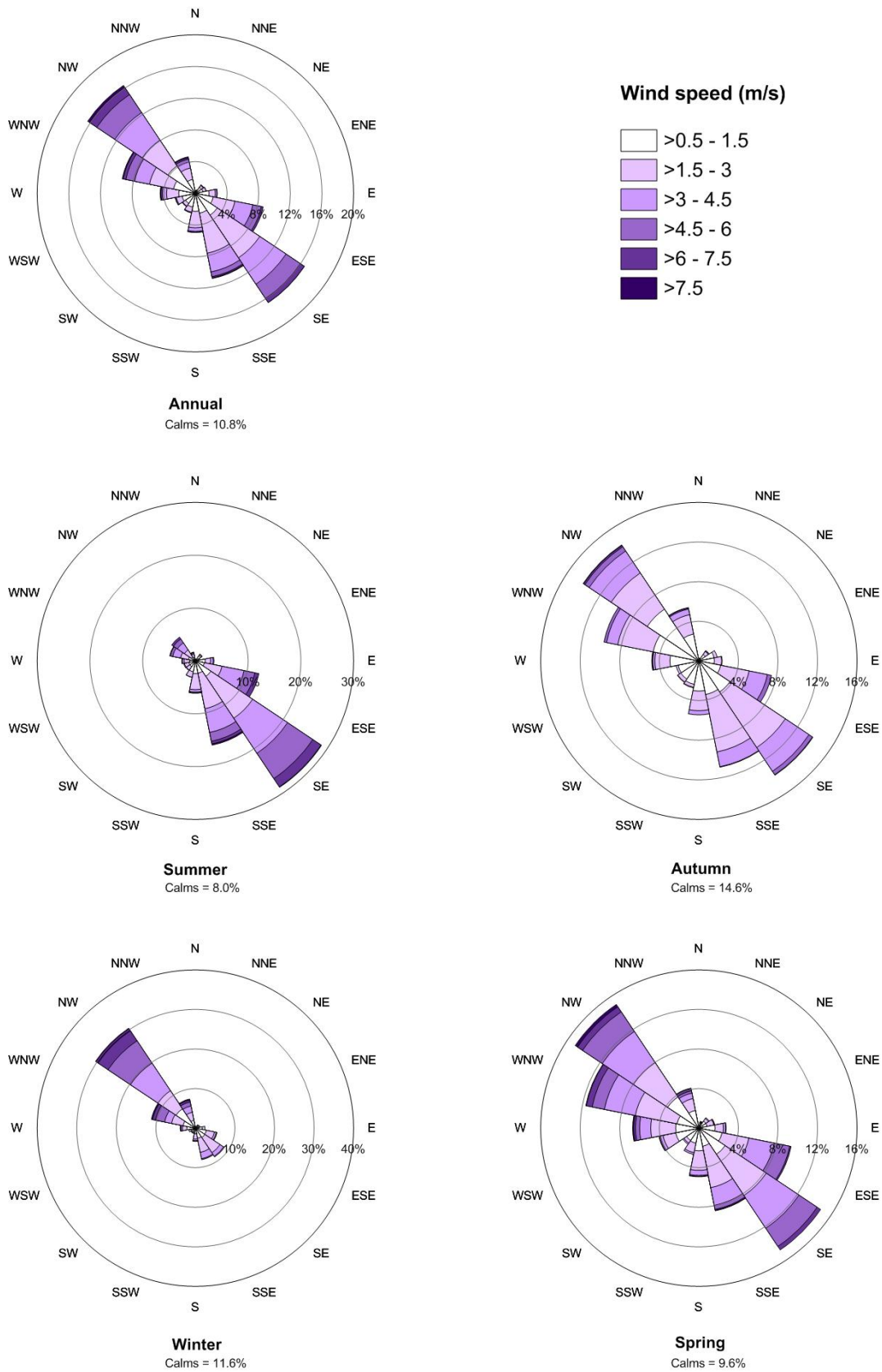


Figure A2 Annual and seasonal wind-roses for Mt Owen (SX8) 2014

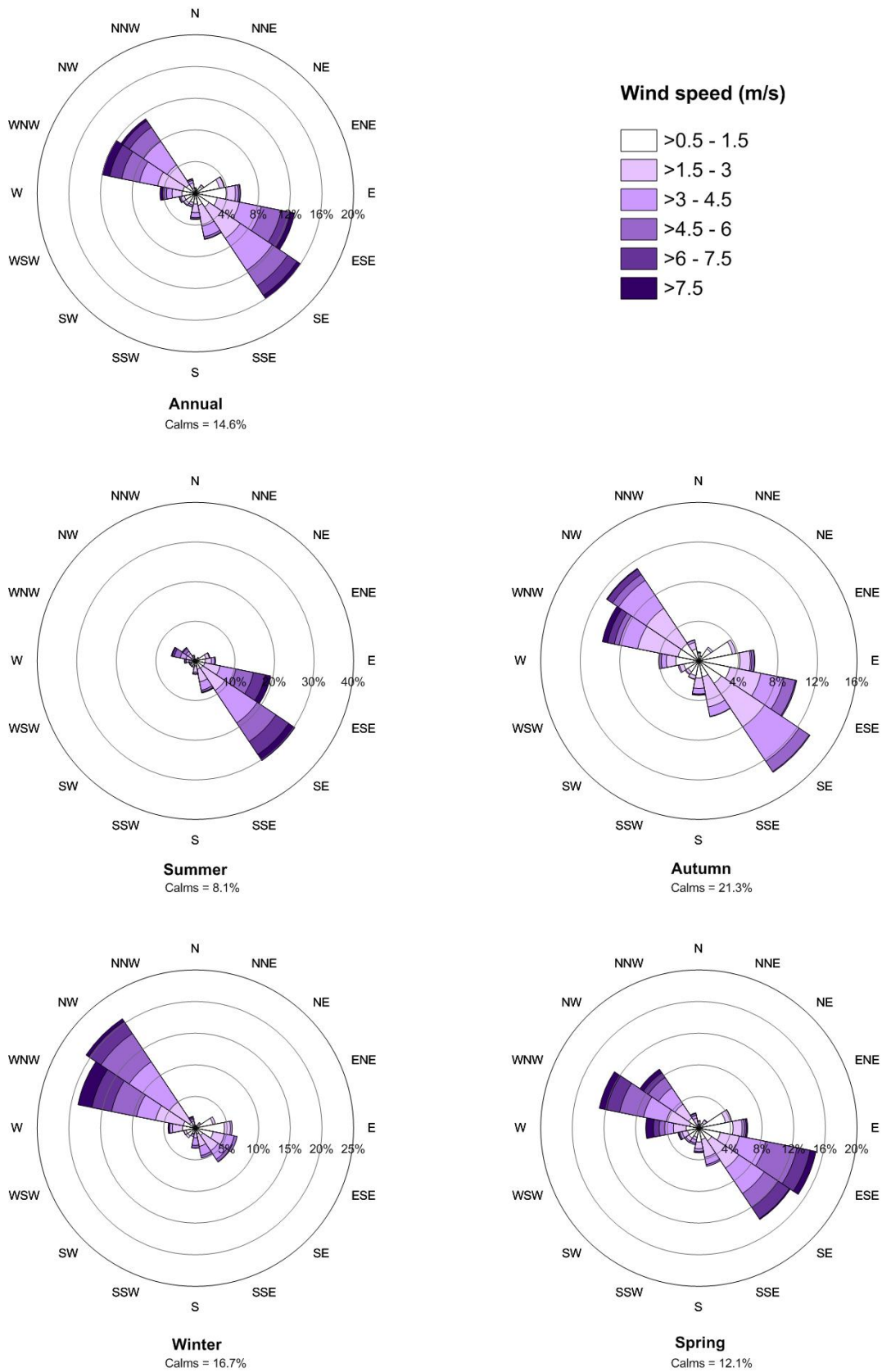


Figure A3 Annual and seasonal wind-roses for Camberwell 2014

Appendix B. Emissions Calculations

Emission calculations Mt Owen 2014																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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Notes: based on data from Mt Owen (2014)

Emission calculations
Glendell 2014

	Annual emissions (kg/y)						TSP		PM10		PM2.5						Variables					
Activity	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)*1.3	Moisture (%)	Drop distance (m)	kg/VKT	t/truck	km/rip	Silt (%)	Speed (km/h)	
Stripping topsoil by scraper	783	197	39	50	54000	t/y	0.029	kg/t	0.0073	kg/t	0.001	kg/t	-	-	-	-	-	-	-	-	-	
Drilling overburden	16001	8320	480	70	90400	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-	-	
Blasting overburden	70315	36564	2109	0	113	blasts/y	622.3	kg/blast	323.6	kg/blast	18.7	kg/blast	20000	-	-	-	-	-	-	-	-	
Excavators loading overburden to trucks	65412	30938	4685	0	40161366	t/y	0.00163	kg/t	0.00077	kg/t	0.0001	kg/t	-	1.38	2	-	-	-	-	-	-	
Hauling overburden from pit to dump	442143	130657	13264	85	40161366	t/y	0.07339	kg/t	0.02169	kg/t	0.002	kg/t	-	-	-	-	4	218	4	-	-	
Unloading overburden to dump	65412	30938	4685	0	40161366	t/y	0.00163	kg/t	0.00077	kg/t	0.0001	kg/t	-	1.38	2	-	-	-	-	-	-	
Dozers shaping overburden	439805	107069	46179	0	26280	h/y	16.7	kg/h	4.07415	kg/h	1.757	kg/h	-	-	2	-	-	-	-	10	-	
Dozers working on overburden for rehabilitation	219902	53534	23090	0	13140	h/y	16.7	kg/h	4.07415	kg/h	1.757	kg/h	-	-	2	-	-	-	-	10	-	
Drilling coal	0	0	0	70	0	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-	-	
Blasting coal	0	0	0	0	0	blasts/y	220.0	kg/blast	114.4	kg/blast	6.6	kg/blast	10000	-	-	-	-	-	-	-	-	
Dozers working on coal	262928	83815	5784	0	13140	h/y	20.0	kg/h	6.4	kg/h	0.440	kg/h	-	-	8	-	-	-	-	7	-	
Loading ROM coal to trucks	209027	30061	3972	0	4370000	t/y	0.04783	kg/t	0.00688	kg/t	0.001	kg/t	-	-	8	-	-	-	-	-	-	
Hauling ROM coal from pit to hopper / ROM pad	331200	97872	9936	85	4370000	t/y	0.50526	kg/t	0.14931	kg/t	0.015	kg/t	-	-	-	-	4	133	16.8	-	-	
Unloading ROM coal to ROM pad	13110	5506	249	70	4370000	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-	
ROM coal rehandle to hopper	4370	1835	83	0	437000	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-	
Transferring ROM coal by conveyor to CHPP	307	145	22	70	4370000	t/y	0.00023	kg/t	0.00011	kg/t	0.0000	kg/t	-	1.38	8	-	-	-	-	-	-	
Handling coal at CHPP	1533	725	22	70	4370000	t/y	0.00117	kg/t	0.00055	kg/t	0.0000	kg/t	-	1.38	8	-	-	-	-	-	-	
Dozers on ROM coal stockpiles	0	0	0	50	0	h/y	20.0	kg/h	6.4	kg/h	0.440	kg/h	-	-	8	-	-	-	-	7	-	
Dozers on product coal stockpiles	0	0	0	50	0	h/y	8.6	kg/h	2.5	kg/h	0.188	kg/h	-	-	11	-	-	-	-	5	-	
Conveyer to product stockpiles	196	93	14	70	4370000	t/y	0.00015	kg/t	0.00007	kg/t	0.0000	kg/t	-	1.38	11	-	-	-	-	-	-	
Loading product coal to trains	1748	743	87	0	4370000	t/y	0.00040	kg/t	0.00017	kg/t	0.0000	kg/t	-	-	-	-	-	-	-	-	-	
Wind erosion from active pits	78686	39343	5901	0	90	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-	
Wind erosion from active dumps	107246	53623	8043	0	122	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-	
Wind erosion from partially rehabilitated dumps	0	0	0	30	0	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	9232	3264	101	50	30000	km	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	-	-	8	
Dragline working on overburden	0	0	0	0	0	t/bcm	0.03	kg/bcm	0.01	kg/bcm	0.002	kg/bcm	-	-	2	7	-	-	-	-	-	
	2339356	715243	128748																			

Notes: based on data from Mt Owen (2014)

Emission calculations

HVO (South of River and Carrington) 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)*1.3	Moisture (%)	Drop distance (m)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)
Stripping topsoil by scraper	1450	365	73	50	100000 t/y		0.029 kg/t	0.0073 kg/t	0.001 kg/t	-	-	-	-	-	-	-	-	-	-	-	
Drilling overburden	14921	7759	448	70	84300 holes/y		0.59 kg/hole	0.31 kg/hole	0.018 kg/hole	-	-	-	-	-	-	-	-	-	-	-	
Blasting overburden	65570	34096	1967	0	105 blasts/y		622.3 kg/blast	323.6 kg/blast	18.7 kg/blast	20000	-	-	-	-	-	-	-	-	-	-	
Excavators loading overburden to trucks	136912	64756	9806	0	84060000 t/y		0.00163 kg/t	0.00077 kg/t	0.0001 kg/t	-	1.38	2	-	-	-	-	-	-	-	-	
Hauling overburden from pit to dump	611537	180714	18346	85	84060000 t/y		0.04850 kg/t	0.01433 kg/t	0.001 kg/t	-	-	-	-	4	240	3	-	-	-	-	
Unloading overburden to dump	136912	64756	9806	0	84060000 t/y		0.00163 kg/t	0.00077 kg/t	0.0001 kg/t	-	1.38	2	-	-	-	-	-	-	-	-	
Dozers shaping overburden	1649267	401507	173173	0	98550 h/y		16.7 kg/h	4.07415 kg/h	1.757 kg/h	-	-	2	-	-	-	-	-	10	-	-	
Dozers working on overburden for rehabilitation	549756	133836	57724	0	32850 h/y		16.7 kg/h	4.07415 kg/h	1.757 kg/h	-	-	2	-	-	-	-	-	10	-	-	
Drilling coal	7461	3879	224	70	42150 holes/y		0.59 kg/hole	0.31 kg/hole	0.018 kg/hole	-	-	-	-	-	-	-	-	-	-	-	
Blasting coal	23183	12055	695	0	105 blasts/y		220.0 kg/blast	114.4 kg/blast	6.6 kg/blast	10000	-	-	-	-	-	-	-	-	-	-	
Dozers working on coal	1314641	419073	28922	0	65700 h/y		20.0 kg/h	6.4 kg/h	0.440 kg/h	-	-	8	-	-	-	-	-	7	-	-	
Loading ROM coal to trucks	860979	123822	16359	0	18000000 t/y		0.04783 kg/t	0.00688 kg/t	0.001 kg/t	-	-	8	-	-	-	-	-	-	-	-	
Hauling ROM coal from pit to hopper / ROM pad	882189	260694	26466	85	18000000 t/y		0.32674 kg/t	0.09655 kg/t	0.010 kg/t	-	-	-	-	4	190	16	-	-	-	-	
Unloading ROM coal to ROM pad	54000	22680	1026	70	18000000 t/y		0.01 kg/t	0.0042 kg/t	0.000 kg/t	-	-	-	-	-	-	-	-	-	-	-	
ROM coal rehandle to hopper	18000	7560	342	0	1800000 t/y		0.01 kg/t	0.0042 kg/t	0.000 kg/t	-	-	-	-	-	-	-	-	-	-	-	
Transferring ROM coal by conveyor to CHPP	1263	597	90	70	18000000 t/y		0.00023 kg/t	0.00011 kg/t	0.0000 kg/t	-	1.38	8	-	-	-	-	-	-	-	-	
Handling coal at CHPP	6314	2987	90	70	18000000 t/y		0.00117 kg/t	0.00055 kg/t	0.0000 kg/t	-	1.38	8	-	-	-	-	-	-	-	-	
Dozers on ROM coal stockpiles	525856	167629	11569	50	52560 h/y		20.0 kg/h	6.4 kg/h	0.440 kg/h	-	-	8	-	-	-	-	-	7	-	-	
Dozers on product coal stockpiles	112424	32397	2473	50	26280 h/y		8.6 kg/h	2.5 kg/h	0.188 kg/h	-	-	11	-	-	-	-	-	5	-	-	
Conveyor to product stockpiles	345	163	25	70	7669286 t/y		0.00015 kg/t	0.00007 kg/t	0.0000 kg/t	-	1.38	11	-	-	-	-	-	-	-	-	
Loading product coal to trains	3068	1304	153	0	7669286 t/y		0.00040 kg/t	0.00017 kg/t	0.0000 kg/t	-	-	-	-	-	-	-	-	-	-	-	
Wind erosion from active pits	507173	253587	38038	0	579 ha		876.0 kg/ha/y	438.0 kg/ha/y	65.7 kg/ha/y	-	-	-	-	-	-	-	-	-	-	-	
Wind erosion from active dumps	507173	253587	38038	0	579 ha		876.0 kg/ha/y	438.0 kg/ha/y	65.7 kg/ha/y	-	-	-	-	-	-	-	-	-	-	-	
Wind erosion from partially rehabilitated dumps	0	0	0	30	0 ha		876.0 kg/ha/y	438.0 kg/ha/y	65.7 kg/ha/y	-	-	-	-	-	-	-	-	-	-	-	
Wind erosion from ROM coal stockpiles	2190	1095	164	50	5 ha		876.0 kg/ha/y	438.0 kg/ha/y	65.7 kg/ha/y	-	-	-	-	-	-	-	-	-	-	-	
Wind erosion from product coal stockpile	2190	1095	164	50	5 ha		876.0 kg/ha/y	438.0 kg/ha/y	65.7 kg/ha/y	-	-	-	-	-	-	-	-	-	-	-	
Grading roads	18464	6528	202	50	60000 km		0.61547 kg/VKT	0.2176 kg/VKT	0.007 kg/VKT	-	-	-	-	-	-	-	-	-	8	-	
Dragline working on overburden	1483794	325836	74190	0	46700000 t/bcm		0.03 kg/bcm	0.01 kg/bcm	0.002 kg/bcm	-	-	2	7	-	-	-	-	-	-	-	
	9497030	2784357	510574																		

Notes: based on data from Rio Tinto (2014)

Emission calculations

Integra Underground 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)
ROM coal by conveyor to ROM stockpile	58	28	4	70	828813 t/y		0.00023 kg/t		0.00011 kg/t		0.0000 kg/t		-	1.38	8	-	-	-	-	-	-
Dozers on ROM coal stockpiles	65732	20954	1446	50	6570 h/y		20.0 kg/h		6.4 kg/h		0.440 kg/h		-	-	8	-	-	-	7	-	-
Wind erosion from ROM coal stockpiles	2190	1095	164	50	5 ha		876.0 kg/ha/y		438.0 kg/ha/y		65.7 kg/ha/y		-	-	-	-	-	-	-	-	-
Ventilation outlet(s)	31536	15768	1577	0	1.577E+10 m3/y		2E-06 kg/m3		1E-06 kg/m3		0.0000 kg/m3										
	99516	37844	3191																		

Notes: based on data from Vale (2015)

Emission calculations																							
Liddell 2014																							
Annual emissions (kg/y)																Variables							

Emission calculations

Ravensworth 2014

Activity	Annual emissions (kg/y)			Control (%)	Intensity	Units	TSP		PM10		PM2.5		Area (m2)	(ws2.2)^1.3	Moisture (%)	Drop distance (m)	Variables				
	TSP	PM10	PM2.5				Factor	Units	Factor	Units	Factor	Units					kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)
Stripping topsoil by scraper	783	197	39	50	54000	t/y	0.029	kg/t	0.0073	kg/t	0.001	kg/t	-	-	-	-	-	-	-	-	
Drilling overburden	58198	30263	1746	70	328800	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-	
Blasting overburden	255746	132988	7672	0	411	blasts/y	622.3	kg/blast	323.6	kg/blast	18.7	kg/blast	20000	-	-	-	-	-	-	-	
Excavators loading overburden to trucks	237493	112328	17010	0	168528000	t/y	0.00141	kg/t	0.00067	kg/t	0.0001	kg/t	-	1.19	2	-	-	-	-	-	
Hauling overburden from pit to dump	1685280	498014	50558	85	168528000	t/y	0.06667	kg/t	0.0197	kg/t	0.002	kg/t	-	-	-	-	4	300	5	-	
Unloading overburden to dump	237493	112328	17010	0	168528000	t/y	0.00141	kg/t	0.00067	kg/t	0.0001	kg/t	-	1.19	2	-	-	-	-	-	
Dozers shaping overburden	439805	107069	46179	0	26280	h/y	16.7	kg/h	4.07415	kg/h	1.757	kg/h	-	-	2	-	-	-	-	10	
Dozers working on overburden for rehabilitation	439805	107069	46179	0	26280	h/y	16.7	kg/h	4.07415	kg/h	1.757	kg/h	-	-	2	-	-	-	-	10	
Drilling coal	0	0	0	70	0	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-	
Blasting coal	0	0	0	0	0	blasts/y	220.0	kg/blast	114.4	kg/blast	6.6	kg/blast	10000	-	-	-	-	-	-	-	
Dozers working on coal	525856	167629	11569	0	26280	h/y	20.0	kg/h	6.4	kg/h	0.440	kg/h	-	-	8	-	-	-	-	7	
Loading ROM coal to trucks	523323	75262	9943	0	10940825	t/y	0.04783	kg/t	0.00688	kg/t	0.001	kg/t	-	-	8	-	-	-	-	-	
Hauling ROM coal from pit to hopper / ROM pad	218817	64662	6564	85	10940825	t/y	0.13333	kg/t	0.0394	kg/t	0.004	kg/t	-	-	-	-	4	180	6	-	
Unloading ROM coal to ROM pad	32822	13785	624	70	10940825	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	
ROM coal rehandle to hopper	10941	4595	208	0	1094083	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	
Transferring ROM coal by conveyor to CHPP	664	314	48	70	10940825	t/y	0.00020	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.19	8	-	-	-	-	-	
Handling coal at CHPP	4118	1948	59	70	13566539	t/y	0.00101	kg/t	0.00048	kg/t	0.0000	kg/t	-	1.19	8	-	-	-	-	-	
Dozers on ROM coal stockpiles	131464	41907	2892	50	13140	h/y	20.0	kg/h	6.4	kg/h	0.440	kg/h	-	-	8	-	-	-	-	7	
Dozers on product coal stockpiles	56212	16198	1237	50	13140	h/y	8.6	kg/h	2.5	kg/h	0.188	kg/h	-	-	11	-	-	-	-	5	
Conveyer to product stockpiles	527	249	38	70	13566539	t/y	0.00013	kg/t	0.00006	kg/t	0.0000	kg/t	-	1.19	11	-	-	-	-	-	
Loading product coal to trains	5427	2306	271	0	13566539	t/y	0.00040	kg/t	0.00017	kg/t	0.0000	kg/t	-	-	-	-	-	-	-	-	
Wind erosion from active pits	368730	184365	27655	0	421	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	
Wind erosion from active dumps	368730	184365	27655	0	421	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	
Wind erosion from partially rehabilitated dumps	129056	64528	9679	30	210	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	
Wind erosion from ROM coal stockpiles	4380	2190	329	50	10	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	
Wind erosion from product coal stockpile	2190	1095	164	50	5	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	
Grading roads	18464	6528	202	50	60000	km	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	-	8	
Dragline working on overburden	43529	9559	2176	0	1370000	bcm/y	0.03	kg/bcm	0.01	kg/bcm	0.002	kg/bcm	-	-	2	7	-	-	-	-	
	5756323	1932183	285530																		

Notes: based on data from Ravensworth Operations (2015)

Mt Owen 2020

	Annual emissions (kg/y)						TSP		PM10		PM2.5					Variables						
Activity	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	Area (m2)	(we2.2)/m.3	Moisture (%)	Drop distance (m)	kg/VKT	t/truck	km/hrp	Silt (%)	Speed (km/h)	
Stripping topsoil by scraper	2610	657	131	50	180000	t/y	0.029	kg/t	0.0073	kg/t	0.001	kg/t	-	-	-	-	-	-	-	-	-	
Drilling overburden	13576	7059	407	70	76700	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-	-	
Blasting overburden	148610	77277	4458	0	130	blasts/y	1143.2	kg/blast	594.4	kg/blast	34.3	kg/blast	30000	-	-	-	-	-	-	-	-	
Excavators loading overburden to trucks	159823	75592	11447	0	98126702	t/y	0.00163	kg/t	0.00077	kg/t	0.0001	kg/t	-	1.38	2	-	-	-	-	-	-	
Hauling overburden from pit to dump	1782485	526739	53475	85	98126702	t/y	0.12110	kg/t	0.03579	kg/t	0.004	kg/t	-	-	-	-	4	218	6.6	-	-	
Unloading overburden to dump	159823	75592	11447	0	98126702	t/y	0.00163	kg/t	0.00077	kg/t	0.0001	kg/t	-	1.38	2	-	-	-	-	-	-	
Dozers shaping overburden	313562	76335	32924	0	18737	h/y	16.7	kg/h	4.07415	kg/h	1.757	kg/h	-	-	2	-	-	-	-	-	10	
Dozers working on overburden for rehabilitation	78388	19083	8231	0	4684	h/y	16.7	kg/h	4.07415	kg/h	1.757	kg/h	-	-	2	-	-	-	-	-	10	
Drilling coal	0	0	0	70	0	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-	-	
Blasting coal	0	0	0	0	0	blasts/y	220.0	kg/blast	114.4	kg/blast	6.6	kg/blast	10000	-	-	-	-	-	-	-	-	
Dozers working on coal	374913	119512	8248	0	18737	h/y	20.0	kg/h	6.4	kg/h	0.440	kg/h	-	-	8	-	-	-	-	-	7	
Loading ROM coal to trucks	392998	56519	7467	0	8216191	t/y	0.04783	kg/t	0.00688	kg/t	0.001	kg/t	-	-	8	-	-	-	-	-	-	
Hauling ROM coal from pit to hopper / ROM pad	429960	127057	12899	85	8216191	t/y	0.34887	kg/t	0.10309	kg/t	0.010	kg/t	-	-	-	-	4	133	11.6	-	-	
Unloading ROM coal to ROM pad, inc Glendell	34475	14480	655	70	11491794	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-	
ROM coal rehandle to hopper	57459	24133	1092	0	5745897	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-	
Transferring ROM coal to CHPP, less Rav East conveyor	666	315	48	70	9491794	t/y	0.00023	kg/t	0.00011	kg/t	0.0000	kg/t	-	1.38	8	-	-	-	-	-	-	
Handling coal at CHPP	3330	1575	48	70	9491794	t/y	0.00117	kg/t	0.00055	kg/t	0.0000	kg/t	-	1.38	8	-	-	-	-	-	-	
Dozers on ROM coal stockpiles	48213	15369	1061	50	4819	h/y	20.0	kg/h	6.4	kg/h	0.440	kg/h	-	-	8	-	-	-	-	-	7	
Dozers on product coal stockpiles	20615	5941	454	50	4819	h/y	8.6	kg/h	2.5	kg/h	0.188	kg/h	-	-	11	-	-	-	-	-	5	
Conveyer to product stockpiles	247	117	18	70	5505240	t/y	0.00015	kg/t	0.00007	kg/t	0.0000	kg/t	-	1.38	11	-	-	-	-	-	-	
Loading product coal to trains	2202	936	110	0	5505240	t/y	0.00040	kg/t	0.00017	kg/t	0.0000	kg/t	-	-	-	-	-	-	-	-	-	
Wind erosion from active pits, inc topsoil stockpiles	170820	85410	12812	0	195	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-	
Wind erosion from active dumps	214620	107310	16097	0	245	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-	
Wind erosion from shaped or partially rehabilitated dumps	26280	13140	1971	0	30	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-	
Wind erosion from ROM coal stockpiles	6001	3000	450	50	14	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-	
Wind erosion from product coal stockpile	5431	2716	407	50	12	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-	
Grading roads	18464	6528	202	50	60000	km	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	6	-	-	-	-	-	8	
Dragline working on overburden	0	0	0	0	0	t/bcm	0.03	kg/bcm	0.01	kg/bcm	0.002	kg/bcm	-	-	2	7	-	-	-	-	-	
Machinery exhausts	0	0	0	100	53402	kL/y	2.84	kg/kL	2.84	kg/kL	2.75	kg/kL	-	-	-	-	-	-	-	-	-	
Gravel crushing in-pit	810	360	41	85	2000000	t/y	0.00270	kg/t	0.0012	kg/t	0.0001	kg/t	-	-	-	-	-	-	-	-	-	
Loading ROM coal for transfer to Rav East conveyor	95664	13758	1818	0	2000000	t/y	0.04783	kg/t	0.00688	kg/t	0.001	kg/t	-	-	8	-	-	-	-	-	-	
Hauling ROM coal to Rav East Conveyor	72180	21330	2165	85	2000000	t/y	0.24060	kg/t	0.0711	kg/t	0.007	kg/t	-	-	-	-	4	133	8	-	-	
Transfer of ROM coal to Rav East Conveyor	20000	8400	380	0	2000000	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-	
Haulage of Glendell ROM to ROM pad	985144	291118	29554	0	3275603	t/y	0.30075	kg/t	0.08887	kg/t	0.009	kg/t	-	-	-	-	4	133	10	-	-	
	5639370	1777359	220514																			

Ashton 2020

Notes: based on data from PAEHolmes (2009). Includes Ashton and SEOC.

Emission calculations																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				</
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Notes: based on data from Pacific Environment Limited (2014)

Emission calculations																					
HVO (South of River and Carrington) 2020 onwards																					
	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)
Activity																					
Stripping topsoil by scraper	1450	365	73	50	100000	t/y	0.029	kg/t	0.0073	kg/t	0.001	kg/t	-	-	-	-	-	-	-	-	-
Drilling overburden	21553	11207	647	70	12176	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-	-
Blasting overburden	94712	49250	2841	0	152	blasts/y	622.3	kg/blast	323.6	kg/blast	18.7	kg/blast	20000	-	-	-	-	-	-	-	-
Excavators loading overburden to trucks	197761	93536	14164	0	121420000	t/y	0.00163	kg/t	0.00077	kg/t	0.0001	kg/t	-	1.38	2	-	-	-	-	-	-
Hauling overburden from pit to dump	883331	261031	26500	85	121420000	t/y	0.04850	kg/t	0.01433	kg/t	0.001	kg/t	-	-	-	-	4	240	3	-	-
Unloading overburden to dump	197761	93536	14164	0	121420000	t/y	0.00163	kg/t	0.00077	kg/t	0.0001	kg/t	-	1.38	2	-	-	-	-	-	-
Dozers shaping overburden	2382275	579955	250139	0	142350	h/y	16.7	kg/h	4.07415	kg/h	1.757	kg/h	-	-	2	-	-	-	-	10	-
Dozers working on overburden for rehabilitation	794092	193318	83380	0	47450	h/y	16.7	kg/h	4.07415	kg/h	1.757	kg/h	-	-	2	-	-	-	-	10	-
Drilling coal	10776	5604	323	70	60883	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-	-
Blasting coal	33486	17413	1005	0	152	blasts/y	220.0	kg/blast	114.4	kg/blast	6.6	kg/blast	10000	-	-	-	-	-	-	-	-
Dozers working on coal	1898925	605328	41776	0	94900	h/y	20.0	kg/h	6.4	kg/h	0.440	kg/h	-	-	8	-	-	-	-	7	-
Loading ROM coal to trucks	1243636	178855	23629	0	260000000	t/y	0.04783	kg/t	0.00688	kg/t	0.001	kg/t	-	-	8	-	-	-	-	-	-
Hauling ROM coal from pit to hopper / ROM pad	1274274	376558	38228	85	260000000	t/y	0.32674	kg/t	0.09655	kg/t	0.010	kg/t	-	-	-	-	4	190	16	-	-
Unloading ROM coal to ROM pad	78000	32760	1482	70	260000000	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-
ROM coal rehandle to hopper	26000	10920	494	0	260000000	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-
Transferring ROM coal by conveyor to CHPP	1824	863	131	70	260000000	t/y	0.00023	kg/t	0.00011	kg/t	0.0000	kg/t	-	1.38	8	-	-	-	-	-	-
Handling coal at CHPP	9121	4314	131	70	260000000	t/y	0.00117	kg/t	0.00055	kg/t	0.0000	kg/t	-	1.38	8	-	-	-	-	-	-
Dozers on ROM coal stockpiles	525856	167629	11569	50	52560	h/y	20.0	kg/h	6.4	kg/h	0.440	kg/h	-	-	8	-	-	-	-	7	-
Dozers on product coal stockpiles	112424	32397	2473	50	26280	h/y	8.6	kg/h	2.5	kg/h	0.188	kg/h	-	-	11	-	-	-	-	5	-
Conveyer to product stockpiles	1707	807	122	70	380000000	t/y	0.00015	kg/t	0.00007	kg/t	0.0000	kg/t	-	1.38	11	-	-	-	-	-	-
Loading product coal to trains	15200	6460	760	0	380000000	t/y	0.00040	kg/t	0.00017	kg/t	0.0000	kg/t	-	-	-	-	-	-	-	-	-
Wind erosion from active pits	507173	253587	38038	0	579	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-
Wind erosion from active dumps	507173	253587	38038	0	579	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-
Wind erosion from partially rehabilitated dumps	0	0	0	30	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-
Wind erosion from ROM coal stockpiles	2190	1095	164	50	5	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-
Wind erosion from product coal stockpile	2190	1095	164	50	5	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-
Grading roads	18464	6528	202	50	60000	km	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	-	-	8
Dragline working on overburden	2143258	470652	107163	0	67455556	t/bcm	0.03	kg/bcm	0.01	kg/bcm	0.002	kg/bcm	-	-	2	7	-	-	-	-	-
	12984612	3708651	697800																		

Notes: based on data from Todoroski (2017)

Emission calculations																					
Integra Underground																					
	Annual emissions (kg/y)						TSP		PM10		PM2.5		Variables								
Activity	Tsp	PM10	PM2.5	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2) ^{1/3}	Moisture (%)	Drop distance (m)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)
ROM coal by conveyor to ROM stockpile	316	149	23	70	4500000	t/y	0.00023	kg/t	0.00011	kg/t	0.0000	kg/t	-	1.38	8	-	-	-	-	-	-
Dozers on ROM coal stockpiles	65732	20954	1446	50	6570	h/y	20.0	kg/h	6.4	kg/h	0.440	kg/h	-	-	8	-	-	-	-	7	-
Wind erosion from ROM coal stockpiles	2190	1095	164	50	5	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-
Ventilation outlet(s)	31536	15768	1577	0	1.577E+10	m3/y	2E-06	kg/m3	1E-06	kg/m3	0.0000	kg/m3									
	99774	37966	3210																		

Notes: based on data from Vale (2015)

Emission calculations
Ravensworth East 2020 (BNP only)

	Annual emissions (kg/y)						TSP		PM10		PM2.5					Variables						
Activity	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2) ^{1.3}	Moisture (%)	Drop distance (m)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)	
Stripping topsoil by scraper	352	89	18	50	24282	t/y	0.029	kg/t	0.0073	kg/t	0.001	kg/t	-	-	-	-	-	-	-	-	-	
Drilling overburden	1971	1025	59	70	11134	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-	-	
Blasting overburden	64714	33651	1941	0	104	blasts/y	622.3	kg/blast	323.6	kg/blast	18.7	kg/blast	20000	-	-	-	-	-	-	-	-	
Excavators loading overburden to trucks	44432	21015	3182	0	27280080	t/y	0.00163	kg/t	0.00077	kg/t	0.0001	kg/t	-	1.38	2	-	-	-	-	-	-	
Hauling overburden from pit to dump	450497	133126	13515	85	27280080	t/y	0.11009	kg/t	0.03253	kg/t	0.003	kg/t	-	-	-	-	4	218	6	-	-	
Unloading overburden to dump	44432	21015	3182	0	27280080	t/y	0.00163	kg/t	0.00077	kg/t	0.0001	kg/t	-	1.38	2	-	-	-	-	-	-	
Dozers shaping overburden	223132	54321	23429	0	13333	h/y	16.7	kg/h	4.07415	kg/h	1.757	kg/h	-	-	2	-	-	-	-	10	-	
Dozers working on overburden for rehabilitation	109951	26767	11545	0	6570	h/y	16.7	kg/h	4.07415	kg/h	1.757	kg/h	-	-	2	-	-	-	-	10	-	
Drilling coal	0	0	0	70	0	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-	-	
Blasting coal	0	0	0	0	0	blasts/y	220.0	kg/blast	114.4	kg/blast	6.6	kg/blast	10000	-	-	-	-	-	-	-	-	
Dozers working on coal	24212	7718	533	0	1210	h/y	20.0	kg/h	6.4	kg/h	0.440	kg/h	-	-	8	-	-	-	-	7	-	
Loading ROM coal to trucks	82218	11824	1562	0	1718882	t/y	0.04783	kg/t	0.00688	kg/t	0.001	kg/t	-	-	8	-	-	-	-	-	-	
Hauling ROM coal from pit to hopper / ROM pad	48077	14207	1442	85	1718882	t/y	0.18647	kg/t	0.0551	kg/t	0.006	kg/t	-	-	-	-	4	133	6.2	-	-	
Unloading ROM coal to ROM pad	5157	2166	98	70	1718882	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-	
ROM coal rehandle to hopper	1719	722	33	0	171888	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-	
Transferring ROM coal by conveyor to CHPP	121	57	9	70	1718882	t/y	0.00023	kg/t	0.00011	kg/t	0.0000	kg/t	-	1.38	8	-	-	-	-	-	-	
Handling coal at CHPP	603	285	9	70	1718882	t/y	0.00117	kg/t	0.00055	kg/t	0.0000	kg/t	-	1.38	8	-	-	-	-	-	-	
Dozers on ROM coal stockpiles	0	0	0	50	0	h/y	20.0	kg/h	6.4	kg/h	0.440	kg/h	-	-	8	-	-	-	-	7	-	
Dozers on product coal stockpiles	0	0	0	50	0	h/y	8.6	kg/h	2.5	kg/h	0.188	kg/h	-	-	11	-	-	-	-	5	-	
Conveyor to product stockpiles	45	21	3	70	996952	t/y	0.00015	kg/t	0.00007	kg/t	0.0000	kg/t	-	1.38	11	-	-	-	-	-	-	
Loading product coal to trains	399	169	20	0	996952	t/y	0.00040	kg/t	0.00017	kg/t	0.0000	kg/t	-	-	-	-	-	-	-	-	-	
Wind erosion from active pits	60444	30222	4533	0	69	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-	
Wind erosion from active dumps	46428	23214	3482	0	53	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-	
Wind erosion from partially rehabilitated dumps	0	0	0	30	0	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	10720	3790	117	50	34837	km	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	-	-	8	
Dragline working on overburden	0	0	0	0	0	t/bcm	0.03	kg/bcm	0.01	kg/bcm	0.002	kg/bcm	-	-	2	7	-	-	-	-	-	
	1219623	385405	68712																			

Notes: BNP = Bayswater North Pit

Emission calculations																					
Ravensworth 2020																					
	Annual emissions (kg/y)						TSP		PM10		PM2.5		Variables								
	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	Area (m2)	(w/2.2)m.3	Moisture (%)	Drop distance (m)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)
Activity																					
Stripping topsoil by scraper	783	197	39	50	54000	t/y	0.029	kg/t	0.0073	kg/t	0.001	kg/t	-	-	-	-	-	-	-	-	-
Drilling overburden	58198	30263	1746	70	328800	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-	-
Blasting overburden	255746	132988	7672	0	411	blasts/y	622.3	kg/blast	323.6	kg/blast	18.7	kg/blast	20000	-	-	-	-	-	-	-	-
Excavators loading overburden to trucks	401414	189858	28750	0	246457353	t/y	0.00163	kg/t	0.00077	kg/t	0.0001	kg/t	-	1.38	2	-	-	-	-	-	-
Hauling overburden from pit to dump	2464574	728302	73937	85	246457353	t/y	0.06667	kg/t	0.0197	kg/t	0.002	kg/t	-	-	-	-	4	300	5	-	-
Unloading overburden to dump	401414	189858	28750	0	246457353	t/y	0.00163	kg/t	0.00077	kg/t	0.0001	kg/t	-	1.38	2	-	-	-	-	-	-
Dozers shaping overburden	439805	107069	46179	0	26280	h/y	16.7	kg/h	4.07415	kg/h	1.757	kg/h	-	-	2	-	-	-	-	10	-
Dozers working on overburden for rehabilitation	439805	107069	46179	0	26280	h/y	16.7	kg/h	4.07415	kg/h	1.757	kg/h	-	-	2	-	-	-	-	10	-
Drilling coal	0	0	0	70	0	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-	-
Blasting coal	0	0	0	0	0	blasts/y	220.0	kg/blast	114.4	kg/blast	6.6	kg/blast	10000	-	-	-	-	-	-	-	-
Dozers working on coal	525856	167629	11569	0	26280	h/y	20.0	kg/h	6.4	kg/h	0.440	kg/h	-	-	8	-	-	-	-	7	-
Loading ROM coal to trucks	765315	110064	14541	0	16000000	t/y	0.04783	kg/t	0.00688	kg/t	0.001	kg/t	-	-	8	-	-	-	-	-	-
Hauling ROM coal from pit to hopper / ROM pad	320000	94563	9600	85	16000000	t/y	0.13333	kg/t	0.0394	kg/t	0.004	kg/t	-	-	-	-	4	180	6	-	-
Unloading ROM coal to ROM pad	48000	20160	912	70	16000000	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-
ROM coal rehandle to hopper	16000	6720	304	0	1600000	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-
Transferring ROM coal by conveyor to CHPP	1123	531	80	70	16000000	t/y	0.00023	kg/t	0.00011	kg/t	0.0000	kg/t	-	1.38	8	-	-	-	-	-	-
Handling coal at CHPP	7367	3484	106	70	21000000	t/y	0.00117	kg/t	0.00055	kg/t	0.0000	kg/t	-	1.38	8	-	-	-	-	-	-
Dozers on ROM coal stockpiles	131464	41907	2892	50	13140	h/y	20.0	kg/h	6.4	kg/h	0.440	kg/h	-	-	8	-	-	-	-	7	-
Dozers on product coal stockpiles	56212	16198	1237	50	13140	h/y	8.6	kg/h	2.5	kg/h	0.188	kg/h	-	-	11	-	-	-	-	5	-
Conveyer to product stockpiles	943	446	68	70	21000000	t/y	0.00015	kg/t	0.00007	kg/t	0.0000	kg/t	-	1.38	11	-	-	-	-	-	-
Loading product coal to trains	8400	3570	420	0	21000000	t/y	0.00040	kg/t	0.00017	kg/t	0.0000	kg/t	-	-	-	-	-	-	-	-	-
Wind erosion from active pits	368730	184365	27655	0	421	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-
Wind erosion from active dumps	368730	184365	27655	0	421	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-
Wind erosion from partially rehabilitated dumps	129056	64528	9679	30	210	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-
Wind erosion from ROM coal stockpiles	4380	2190	329	50	10	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-
Wind erosion from product coal stockpile	2190	1095	164	50	5	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-
Grading roads	18464	6528	202	50	60000	km	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	-	-	8
Dragline working on overburden	63657	13979	3183	0	2003504	bcm/y	0.03	kg/bcm	0.01	kg/bcm	0.002	kg/bcm	-	-	2	7	-	-	-	-	-
	7233968	2393948	340666																		

Notes: based on data from Ravensworth Operations (2015)

Emission calculations

Rixs Ck 2020

Activity	Annual emissions (kg/y)			Control (%)	Intensity	Units	TSP		PM10		PM2.5		Area (m2)	(ws/2.2) ^{1/3}	Moisture (%)	Drop distance (m)	Variables				
	TSP	PM10	PM2.5				Factor	Units	Factor	Units	Factor	Units					kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)
Stripping topsoil by scraper	869	219	43	50	59958	t/y	0.029	kg/t	0.0073	kg/t	0.001	kg/t	-	-	-	-	-	-	-	-	
Drilling overburden	16709	8689	501	70	94400	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-	
Blasting overburden	73426	38182	2203	0	118	blasts/y	622.3	kg/blast	323.6	kg/blast	18.7	kg/blast	20000	-	-	-	-	-	-	-	
Excavators loading overburden to trucks	84324	39883	6039	0	51772551	t/y	0.00163	kg/t	0.00077	kg/t	0.0001	kg/t	-	1.38	2	-	-	-	-	-	
Hauling overburden from pit to dump	621271	183591	18638	85	51772551	t/y	0.08000	kg/t	0.02364	kg/t	0.002	kg/t	-	-	-	-	4	300	6	-	
Unloading overburden to dump	84324	39883	6039	0	51772551	t/y	0.00163	kg/t	0.00077	kg/t	0.0001	kg/t	-	1.38	2	-	-	-	-	-	
Dozers shaping overburden	329853	80301	34635	0	19710	h/y	16.7	kg/h	4.07415	kg/h	1.757	kg/h	-	-	2	-	-	-	-	10	
Dozers working on overburden for rehabilitation	219902	53534	23090	0	13140	h/y	16.7	kg/h	4.07415	kg/h	1.757	kg/h	-	-	2	-	-	-	-	10	
Drilling coal	0	0	0	70	0	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-	
Blasting coal	0	0	0	0	0	blasts/y	220.0	kg/blast	114.4	kg/blast	6.6	kg/blast	10000	-	-	-	-	-	-	-	
Dozers working on coal	262928	83815	5784	0	13140	h/y	20.0	kg/h	6.4	kg/h	0.440	kg/h	-	-	8	-	-	-	-	7	
Loading ROM coal to trucks	215245	30956	4090	0	4500000	t/y	0.04783	kg/t	0.00688	kg/t	0.001	kg/t	-	-	8	-	-	-	-	-	
Hauling ROM coal from pit to hopper / ROM pad	102000	30142	3060	85	4500000	t/y	0.15111	kg/t	0.04465	kg/t	0.005	kg/t	-	-	-	-	4	180	6.8	-	
Unloading ROM coal to ROM pad	13500	5670	257	70	4500000	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	
ROM coal rehandle to hopper	4500	1890	86	0	450000	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	
Transferring ROM coal by conveyor to CHPP	316	149	23	70	4500000	t/y	0.00023	kg/t	0.00011	kg/t	0.0000	kg/t	-	1.38	8	-	-	-	-	-	
Handling coal at CHPP	1579	747	23	70	4500000	t/y	0.00117	kg/t	0.00055	kg/t	0.0000	kg/t	-	1.38	8	-	-	-	-	-	
Dozers on ROM coal stockpiles	131464	41907	2892	50	13140	h/y	20.0	kg/h	6.4	kg/h	0.440	kg/h	-	-	8	-	-	-	-	7	
Dozers on product coal stockpiles	56212	16198	1237	50	13140	h/y	8.6	kg/h	2.5	kg/h	0.188	kg/h	-	-	11	-	-	-	-	5	
Conveyer to product stockpiles	108	51	8	70	2415010	t/y	0.00015	kg/t	0.00007	kg/t	0.0000	kg/t	-	1.38	11	-	-	-	-	-	
Loading product coal to trains	966	411	48	0	2415010	t/y	0.00040	kg/t	0.00017	kg/t	0.0000	kg/t	-	-	-	-	-	-	-	-	
Wind erosion from active pits	146703	73351	11003	0	167	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	
Wind erosion from active dumps	146703	73351	11003	0	167	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	
Wind erosion from partially rehabilitated dumps	0	0	0	30	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	
Wind erosion from ROM coal stockpiles	4380	2190	329	50	10	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	
Wind erosion from product coal stockpile	2190	1095	164	50	5	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	
Grading roads	18464	6528	202	50	60000	km	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	-	8	
Dragline working on overburden	0	0	0	0	0	t/bcm	0.03	kg/bcm	0.01	kg/bcm	0.002	kg/bcm	-	-	2	7	-	-	-	-	
	2537935	812733	131396																		

Notes: based on data from Todoroski (2015)

Emission calculations
Rixs Creek North (Integra) 2020

	Annual emissions (kg/y)						TSP		PM10		PM2.5					Variables										
Activity	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	Area (m2)	(w/2.2) ^{1.3}	Moisture (%)	Drop distance (m)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)					
Stripping topsoil by scraper	783	197	39	50	54000	t/y	0.029	kg/t	0.0073	kg/t	0.001	kg/t	-	-	-	-	-	-	-	-	-	-				
Drilling overburden	30302	15757	909	70	171200	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-	-	-				
Blasting overburden	133162	69244	3995	0	214	blasts/y	622.3	kg/blast	323.6	kg/blast	18.7	kg/blast	20000	-	-	-	-	-	-	-	-	-				
Excavators loading overburden to trucks	84043	39750	6019	0	51600000	t/y	0.00163	kg/t	0.00077	kg/t	0.0001	kg/t	-	1.38	2	-	-	-	-	-	-	-				
Hauling overburden from pit to dump	206400	60993	6192	85	51600000	t/y	0.02667	kg/t	0.00788	kg/t	0.001	kg/t	-	-	-	-	4	300	2	-	-					
Unloading overburden to dump	84043	39750	6019	0	51600000	t/y	0.00163	kg/t	0.00077	kg/t	0.0001	kg/t	-	1.38	2	-	-	-	-	-	-	-				
Dozers shaping overburden	329853	80301	34635	0	19710	h/y	16.7	kg/h	4.07415	kg/h	1.757	kg/h	-	-	2	-	-	-	-	-	10	-				
Dozers working on overburden for rehabilitation	109951	26767	11545	0	6570	h/y	16.7	kg/h	4.07415	kg/h	1.757	kg/h	-	-	2	-	-	-	-	-	10	-				
Drilling coal	0	0	0	70	0	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-	-	-				
Blasting coal	0	0	0	0	0	blasts/y	220.0	kg/blast	114.4	kg/blast	6.6	kg/blast	10000	-	-	-	-	-	-	-	-	-				
Dozers working on coal	262928	83815	5784	0	13140	h/y	20.0	kg/h	6.4	kg/h	0.440	kg/h	-	-	8	-	-	-	-	-	7	-				
Loading ROM coal to trucks	286993	41274	5453	0	6000000	t/y	0.04783	kg/t	0.00688	kg/t	0.001	kg/t	-	-	8	-	-	-	-	-	-	-				
Hauling ROM coal from pit to hopper / ROM pad	112000	33097	3360	85	6000000	t/y	0.12444	kg/t	0.03677	kg/t	0.004	kg/t	-	-	-	-	4	180	5.6	-	-					
Unloading ROM coal to ROM pad	18000	7560	342	70	6000000	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-	-				
ROM coal rehandle to hopper	6000	2520	114	0	600000	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-	-				
Transferring ROM coal by conveyor to CHPP	421	199	30	70	6000000	t/y	0.00023	kg/t	0.00011	kg/t	0.0000	kg/t	-	1.38	8	-	-	-	-	-	-	-				
Handling coal at CHPP	2105	996	30	70	6000000	t/y	0.00117	kg/t	0.00055	kg/t	0.0000	kg/t	-	1.38	8	-	-	-	-	-	-	-				
Dozers on ROM coal stockpiles	65732	20954	1446	50	6570	h/y	20.0	kg/h	6.4	kg/h	0.440	kg/h	-	-	8	-	-	-	-	-	7	-				
Dozers on product coal stockpiles	28106	8099	618	50	6570	h/y	8.6	kg/h	2.5	kg/h	0.188	kg/h	-	-	11	-	-	-	-	-	5	-				
Conveyer to product stockpiles	270	127	19	70	6000000	t/y	0.00015	kg/t	0.00007	kg/t	0.0000	kg/t	-	1.38	11	-	-	-	-	-	-	-				
Loading product coal to trains	2400	1020	120	0	6000000	t/y	0.00040	kg/t	0.00017	kg/t	0.0000	kg/t	-	-	-	-	-	-	-	-	-	-				
Wind erosion from active pits	150234	75117	11268	0	172	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-	-				
Wind erosion from active dumps	150234	75117	11268	0	172	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-	-				
Wind erosion from partially rehabilitated dumps	0	0	0	30	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-	-				
Wind erosion from ROM coal stockpiles	4380	2190	329	50	10	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-	-				
Wind erosion from product coal stockpile	2190	1095	164	50	5	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-	-				
Grading roads	18464	6528	202	50	60000	km	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	-	-	-	8				
Dragline working on overburden	0	0	0	0	0	t/bcm	0.03	kg/bcm	0.01	kg/bcm	0.002	kg/bcm	-	-	2	7	-	-	-	-	-	-				
	2088994	692468	109901																							

Notes: based on data from Holmes Air Sciences (2007)

Mt Owen 2026

Emission calculations																						
Mt Owen 2026																						
	Annual emissions (kg/y)						TSP		PM10		PM2.5					Variables						
	TSP	PM10	PM2.5		Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	Area (m2)	(wet) m3	Moisture (%)	Drop distance (m)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)
Activity																						
Stripping topsoil by scraper	2610	657	131	50		180000	t/y	0.029	kg/t	0.0073	kg/t	0.001	kg/t	-	-	-	-	-	-	-	-	-
Drilling overburden	12427	6462	373	70		70210	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-	-
Blasting overburden	136035	70738	4081	0		119	blasts/y	1143.2	kg/blast	594.4	kg/blast	34.3	kg/blast	30000	-	-	-	-	-	-	-	-
Excavators loading overburden to trucks	147546	69785	10567	0		90588946	t/y	0.00163	kg/t	0.00077	kg/t	0.0001	kg/t	-	1.38	2	-	-	-	-	-	-
Hauling overburden from pit to dump	1595695	471541	47871	85		90588946	t/y	0.11743	kg/t	0.0347	kg/t	0.004	kg/t	-	-	-	4	218	6.4	-	-	-
Unloading overburden to dump	147546	69785	10567	0		90588946	t/y	0.00163	kg/t	0.00077	kg/t	0.0001	kg/t	-	1.38	2	-	-	-	-	-	-
Dozers shaping overburden	295153	71854	30991	0		17637	h/y	16.7	kg/h	4.07415	kg/h	1.757	kg/h	-	-	2	-	-	-	-	10	-
Dozers working on overburden for rehabilitation	73786	17963	7748	0		4409	h/y	16.7	kg/h	4.07415	kg/h	1.757	kg/h	-	-	2	-	-	-	-	10	-
Drilling coal	0	0	0	70		0	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-	-
Blasting coal	0	0	0	0		0	blasts/y	220.0	kg/blast	114.4	kg/blast	6.6	kg/blast	10000	-	-	-	-	-	-	-	-
Dozers working on coal	352902	112496	7764	0		17637	h/y	20.0	kg/h	6.4	kg/h	0.440	kg/h	-	-	8	-	-	-	-	7	-
Loading ROM coal to trucks	342281	49225	6503	0		7155874	t/y	0.04783	kg/t	0.00688	kg/t	0.001	kg/t	-	-	8	-	-	-	-	-	-
Hauling ROM coal from pit to hopper / ROM pad	503601	148818	15108	85		7155874	t/y	0.46917	kg/t	0.13864	kg/t	0.014	kg/t	-	-	-	4	133	15.6	-	-	-
Unloading ROM coal to ROM pad, inc Glendell	21468	9016	408	70		7155874	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-
ROM coal rehandle to hopper	35779	15027	680	0		3577937	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-
Transferring ROM coal to CHPP, less Rav East conveyor	362	171	26	70		5155874	t/y	0.00023	kg/t	0.00011	kg/t	0.0000	kg/t	-	1.38	8	-	-	-	-	-	-
Handling coal at CHPP	1809	855	26	70		5155874	t/y	0.00117	kg/t	0.00055	kg/t	0.0000	kg/t	-	1.38	8	-	-	-	-	-	-
Dozers on ROM coal stockpiles	44111	14062	970	50		4409	h/y	20.0	kg/h	6.4	kg/h	0.440	kg/h	-	-	8	-	-	-	-	7	-
Dozers on product coal stockpiles	18861	5435	415	50		4409	h/y	8.6	kg/h	2.5	kg/h	0.188	kg/h	-	-	11	-	-	-	-	5	-
Conveyer to product stockpiles	127	60	9	70		2835731	t/y	0.00015	kg/t	0.00007	kg/t	0.0000	kg/t	-	1.38	11	-	-	-	-	-	-
Loading product coal to trains	1134	482	57	0		2835731	t/y	0.00040	kg/t	0.00017	kg/t	0.0000	kg/t	-	-	-	-	-	-	-	-	-
Wind erosion from active pits, inc topsoil stockpiles	195348	97674	14651	0		223	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-
Wind erosion from active dumps	176076	88038	13206	0		201	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-
Wind erosion from shaped or partially rehabilitated dumps	0	0	0	0		0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-
Wind erosion from ROM coal stockpiles	6001	3000	450	50		14	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-
Wind erosion from product coal stockpile	5431	2716	407	50		12	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-
Grading roads	18464	6528	202	50		60000	km	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	6	-	-	-	-	-	8
Dragline working on overburden	0	0	0	0		0	t/bcm	0.03	kg/bcm	0.01	kg/bcm	0.002	kg/bcm	-	-	2	7	-	-	-	-	-
Machinery exhausts	0	0	0	100		46768	kL/y	2.84	kg/kL	2.84	kg/kL	2.75	kg/kL	-	-	-	-	-	-	-	-	-
Gravel crushing in-pit	810	360	41	85		2000000	t/y	0.00270	kg/t	0.0012	kg/t	0.0001	kg/t	-	-	-	-	-	-	-	-	-
Loading ROM coal for transfer to Rav East conveyor	95664	13758	1818	0		2000000	t/y	0.04783	kg/t	0.00688	kg/t	0.001	kg/t	-	-	8	-	-	-	-	-	-
Hauling ROM coal to Rav East Conveyor	72180	21330	2165	85		2000000	t/y	0.24060	kg/t	0.0711	kg/t	0.007	kg/t	-	-	-	4	133	8	-	-	-
Transfer of ROM coal to Rav East Conveyor	20000	8400	380	0		2000000	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-
Haulage of Glendell ROM to ROM pad	0	0	0	0		0	t/y	0.30075	kg/t	0.08887	kg/t	0.009	kg/t	-	-	-	4	133	10	-	-	-
	4323209	1376239	177615																			

Emission calculations

Ravensworth East 2026 (BNP WE only)

Activity	Annual emissions (kg/y)			Control (%)	Intensity	Units	TSP		PM10		PM2.5		Area (m2)	(ws/2.2) ^{1.3}	Moisture (%)	Drop distance (m)	Variables					
	TSP	PM10	PM2.5				Factor	Units	Factor	Units	Factor	Units					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	0	0	0	70	0 holes/y		0.59 kg/hole	0.31 kg/hole	0.018 kg/hole	-	-	-	-	-	-	-	-	-	-	-	-	
Blasting overburden	0	0	0	0	0 blasts/y		622.3 kg/blast	323.6 kg/blast	18.7 kg/blast	20000	-	-	-	-	-	-	-	-	-	-	-	
Excavators loading overburden to trucks	0	0	0	0	0 t/y		0.00163 kg/t	0.00077 kg/t	0.0001 kg/t	-	1.38	2	-	-	-	-	-	-	-	-	-	
Hauling overburden from pit to dump	0	0	0	85	0 t/y		0.11009 kg/t	0.03253 kg/t	0.003 kg/t	-	-	-	-	-	-	4	218	6	-	-	-	
Unloading overburden to dump	0	0	0	0	0 t/y		0.00163 kg/t	0.00077 kg/t	0.0001 kg/t	-	1.38	2	-	-	-	-	-	-	-	-	-	
Dozers shaping overburden	0	0	0	0	0 h/y		16.7 kg/h	4.07415 kg/h	1.757 kg/h	-	-	2	-	-	-	-	-	-	-	10	-	
Dozers working on overburden for rehabilitation	0	0	0	0	0 h/y		16.7 kg/h	4.07415 kg/h	1.757 kg/h	-	-	2	-	-	-	-	-	-	-	10	-	
Drilling coal	0	0	0	70	0 holes/y		0.59 kg/hole	0.31 kg/hole	0.018 kg/hole	-	-	-	-	-	-	-	-	-	-	-	-	
Blasting coal	0	0	0	0	0 blasts/y		220.0 kg/blast	114.4 kg/blast	6.6 kg/blast	10000	-	-	-	-	-	-	-	-	-	-	-	
Dozers working on coal	0	0	0	0	0 h/y		20.0 kg/h	6.4 kg/h	0.440 kg/h	-	-	8	-	-	-	-	-	-	-	7	-	
Loading ROM coal to trucks	0	0	0	0	0 t/y		0.04783 kg/t	0.00688 kg/t	0.001 kg/t	-	-	8	-	-	-	-	-	-	-	-	-	
Hauling ROM coal from pit to hopper / ROM pad	0	0	0	85	0 t/y		0.18647 kg/t	0.0551 kg/t	0.006 kg/t	-	-	-	-	-	-	4	133	6.2	-	-	-	
Unloading ROM coal to ROM pad	0	0	0	70	0 t/y		0.01 kg/t	0.0042 kg/t	0.000 kg/t	-	-	-	-	-	-	-	-	-	-	-	-	
ROM coal rehandle to hopper	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 CHPP	0	0	0	70	0 t/y		0.00023 kg/t	0.00011 kg/t	0.0000 kg/t	-	1.38	8	-	-	-	-	-	-	-	-	-	
Handling coal at CHPP	0	0	0	70	0 t/y		0.00117 kg/t	0.00055 kg/t	0.0000 kg/t	-	1.38	8	-	-	-	-	-	-	-	-	-	
Dozers on ROM coal stockpiles	0	0	0	50	0 h/y		20.0 kg/h	6.4 kg/h	0.440 kg/h	-	-	8	-	-	-	-	-	-	-	7	-	
Dozers on product coal stockpiles	0	0	0	50	0 h/y		8.6 kg/h	2.5 kg/h	0.188 kg/h	-	-	11	-	-	-	-	-	-	-	5	-	
Conveyor to product stockpiles	0	0	0	70	0 t/y		0.00015 kg/t	0.00007 kg/t	0.0000 kg/t	-	1.38	11	-	-	-	-	-	-	-	-	-	
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 pits	0	0	0	0	0 ha		876.0 kg/ha/y	438.0 kg/ha/y	65.7 kg/ha/y	-	-	-	-	-	-	-	-	-	-	-	-	
Wind erosion from active dumps	41610	20805	3121	0	48 ha		876.0 kg/ha/y	438.0 kg/ha/y	65.7 kg/ha/y	-	-	-	-	-	-	-	-	-	-	-	-	
Wind erosion from partially rehabilitated dumps	0	0	0	30	0 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	0	0	0	50	0 km		0.61547 kg/VKT	0.2176 kg/VKT	0.007 kg/VKT	-	-	-	-	-	-	-	-	-	-	-	8	
Dragline working on overburden	0	0	0	0	0 t/bcm		0.03 kg/bcm	0.01 kg/bcm	0.002 kg/bcm	-	-	2	7	-	-	-	-	-	-	-	-	
	41610	20805	3121																			

Notes: BNP = Bayswater North Pit (not in operation at this time, wind erosion only)

Mt Owen 2033

[illegible]

28-Aug-2017 16:05

HOURS OF DAY :
1
ACTIVITY NAME : Unloading ROM coal to ROM pad
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 13110 kg/y TSP 5506 kg/y PM10 249 kg/y PM2.5
FROM SOURCES : 3
35 36 37
HOURS OF DAY :
1
ACTIVITY NAME : ROM coal rehandle to hopper
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 4370 kg/y TSP 1835 kg/y PM10 83 kg/y PM2.5
FROM SOURCES : 3
35 36 37
HOURS OF DAY :
1
ACTIVITY NAME : Transferring ROM coal by conveyor to CHPP
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 307 kg/y TSP 145 kg/y PM10 22 kg/y PM2.5
FROM SOURCES : 3
35 36 37
HOURS OF DAY :
1
ACTIVITY NAME : Handling coal at CHPP
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 1533 kg/y TSP 725 kg/y PM10 22 kg/y PM2.5
FROM SOURCES : 1
37
HOURS OF DAY :
1
ACTIVITY NAME : Dozers on ROM coal stockpiles
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 3
35 36 37
HOURS OF DAY :
1
ACTIVITY NAME : Dozers on product coal stockpiles
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 2
38 39
HOURS OF DAY :
1
ACTIVITY NAME : Conveyor to product stockpiles
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 196 kg/y TSP 93 kg/y PM10 14 kg/y PM2.5
FROM SOURCES : 2
38 39
HOURS OF DAY :
1
ACTIVITY NAME : Loading product coal to trains
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 1748 kg/y TSP 743 kg/y PM10 87 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1
ACTIVITY NAME : Wind erosion from active pits
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 78686 kg/y TSP 39343 kg/y PM10 5901 kg/y PM2.5
FROM SOURCES : 8
2 3 4 5 6 7 8 9
HOURS OF DAY :
1
ACTIVITY NAME : Wind erosion from active dumps
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 107246 kg/y TSP 53623 kg/y PM10 8043 kg/y PM2.5
FROM SOURCES : 11
10 11 12 13 14 15 16 17 18 19 20
HOURS OF DAY :
1
ACTIVITY NAME : Wind erosion from partially rehabilitated dumps
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 3
18 19 20
HOURS OF DAY :
1
ACTIVITY NAME : Wind erosion from ROM coal stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 3
35 36 37
HOURS OF DAY :
1
ACTIVITY NAME : Wind erosion from product coal stockpile
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 2
38 39
HOURS OF DAY :
1
ACTIVITY NAME : Grading roads
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 9232 kg/y TSP 3264 kg/y PM10 101 kg/y PM2.5
FROM SOURCES : 33
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
27 28 29 30 31 32 33 34

HOURS OF DAY :
1 1

ACTIVITY NAME : Dragline working on overburden
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1

HOURS OF DAY :
1 1

Pit retention sources:
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

----- 13-Oct-2017 12:49
DUST EMISSION CALCULATIONS XL1

Scenario : 2014\HVO
Number of dust sources : 17
Number of activities : 28

-----ACTIVITY SUMMARY-----

ACTIVITY NAME : Stripping topsoil by scraper
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 1450 kg/y TSP 365 kg/y PM10 73 kg/y PM2.5
FROM SOURCES : 17
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
HOURS OF DAY :
1 1

ACTIVITY NAME : Drilling overburden
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 14921 kg/y TSP 7759 kg/y PM10 448 kg/y PM2.5
FROM SOURCES : 17
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
HOURS OF DAY :
1 1

ACTIVITY NAME : Blasting overburden
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 65570 kg/y TSP 34096 kg/y PM10 1967 kg/y PM2.5
FROM SOURCES : 17
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
HOURS OF DAY :
0 0 0 0 0 0 0 0 0 1 0 1 0 1 0 1 0 0 0 0 0 0 0 0

ACTIVITY NAME : Excavators loading overburden to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 136912 kg/y TSP 64756 kg/y PM10 9806 kg/y PM2.5
FROM SOURCES : 17
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
HOURS OF DAY :
1 1

ACTIVITY NAME : Hauling overburden from pit to dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 611537 kg/y TSP 180714 kg/y PM10 18346 kg/y PM2.5
FROM SOURCES : 17
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
HOURS OF DAY :
1 1

ACTIVITY NAME : Unloading overburden to dump
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 136912 kg/y TSP 64756 kg/y PM10 9806 kg/y PM2.5
FROM SOURCES : 17
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
HOURS OF DAY :
1 1

ACTIVITY NAME : Dozers shaping overburden
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 1649267 kg/y TSP 401507 kg/y PM10 173173 kg/y PM2.5
FROM SOURCES : 17
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
HOURS OF DAY :
1 1

ACTIVITY NAME : Dozers working on overburden for rehabilitation
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 549756 kg/y TSP 133836 kg/y PM10 57724 kg/y PM2.5
FROM SOURCES : 17
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
HOURS OF DAY :
0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0

ACTIVITY NAME : Drilling coal
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 7461 kg/y TSP 3879 kg/y PM10 224 kg/y PM2.5
FROM SOURCES : 17
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
HOURS OF DAY :
1 1

ACTIVITY NAME : Blasting coal
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 23183 kg/y TSP 12055 kg/y PM10 695 kg/y PM2.5
FROM SOURCES : 17
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
HOURS OF DAY :
0 0 0 0 0 0 0 0 0 1 0 1 0 1 0 1 0 0 0 0 0 0 0 0

ACTIVITY NAME : Dozers working on coal
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 1314641 kg/y TSP 419073 kg/y PM10 28922 kg/y PM2.5
FROM SOURCES : 17
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

HOURS OF DAY :
1 1

ACTIVITY NAME : Loading ROM coal to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 860979 kg/y TSP 123822 kg/y PM10 16359 kg/y PM2.5
FROM SOURCES : 17
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

HOURS OF DAY :
1 1

ACTIVITY NAME : Hauling ROM coal from pit to hopper / ROM pad
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 882189 kg/y TSP 260694 kg/y PM10 26466 kg/y PM2.5
FROM SOURCES : 17
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

HOURS OF DAY :
1 1

ACTIVITY NAME : Unloading ROM coal to ROM pad
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 54000 kg/y TSP 22680 kg/y PM10 1026 kg/y PM2.5
FROM SOURCES : 17
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
HOURS OF DAY :
1 1

ACTIVITY NAME : ROM coal rehandle to hopper
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 18000 kg/y TSP 7560 kg/y PM10 342 kg/y PM2.5
FROM SOURCES : 17
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
HOURS OF DAY :
1 1

ACTIVITY NAME : Transferring ROM coal by conveyor to CHPP
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 1263 kg/y TSP 597 kg/y PM10 90 kg/y PM2.5
FROM SOURCES : 17
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
HOURS OF DAY :
1 1

ACTIVITY NAME : Handling coal at CHPP
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 6314 kg/y TSP 2987 kg/y PM10 90 kg/y PM2.5
FROM SOURCES : 17
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
HOURS OF DAY :
1 1

ACTIVITY NAME : Dozers on ROM coal stockpiles
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 525856 kg/y TSP 167629 kg/y PM10 11569 kg/y PM2.5
FROM SOURCES : 17
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
HOURS OF DAY :
1 1

ACTIVITY NAME : Dozers on product coal stockpiles
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 112424 kg/y TSP 32397 kg/y PM10 2473 kg/y PM2.5
FROM SOURCES : 17
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
HOURS OF DAY :
1 1

ACTIVITY NAME : Conveyer to product stockpiles
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 345 kg/y TSP 163 kg/y PM10 25 kg/y PM2.5
FROM SOURCES : 17
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
HOURS OF DAY :
1 1

ACTIVITY NAME : Loading product coal to trains
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 3068 kg/y TSP 1304 kg/y PM10 153 kg/y PM2.5
FROM SOURCES : 17
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
HOURS OF DAY :
1 1

ACTIVITY NAME : Wind erosion from active pits
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 507173 kg/y TSP 253587 kg/y PM10 38038 kg/y PM2.5
FROM SOURCES : 17
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
HOURS OF DAY :
1 1

ACTIVITY NAME : Wind erosion from partially rehabilitated dumps
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 507173 kg/y TSP 253587 kg/y PM10 38038 kg/y PM2.5
FROM SOURCES : 17
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
HOURS OF DAY :
1 1

ACTIVITY NAME : Wind erosion from ROM coal stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 17
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
HOURS OF DAY :
1 1

[illegible][illegible]

```
-----
DUST EMISSION CALCULATIONS XL1
-----
```

Scenario : 2014\MtOwen
Number of dust sources : 32
Number of activities : 28

-----ACTIVITY SUMMARY-----
ACTIVITY NAME : Stripping topsoil by scraper
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 2610 kg/y TSP 657 kg/y PM10 131 kg/y PM2.5
FROM SOURCES : 4

2 3 4 5
HOURS OF DAY :
1 1

ACTIVITY NAME : Drilling overburden
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 13594 kg/y TSP 7069 kg/y PM10 408 kg/y PM2.5
FROM SOURCES : 8

[illegible]

40
HOURS OF DAY :

1 1

```
ACTIVITY NAME : Grading roads
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 18464 kg/y TSP    6528 kg/y PM10    202 kg/y PM2.5
FROM SOURCES : 38
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
26 27 28 29 30 31 32 33 34 35 36 37 38
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

```
ACTIVITY NAME : Dragline working on overburden
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 43529 kg/y TSP    9559 kg/y PM10    2176 kg/y PM2.5
FROM SOURCES : 8
1 2 3 4 5 6 7 8
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

[illegible]

```

ACTIVITY NAME   Transferring ROM coal by conveyor to CHPP
ACTIVITY TYPE   Wind sensitive
DUST EMISSION   664 kg/y TSP   314 kg/y PM10   48 kg/y PM2.5
FROM SOURCES    2
18 39
HOURS OF DAY    :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

```

```
ACTIVITY NAME      : Handling coal at CHPP
ACTIVITY TYPE     : Wind insensitive
DUST EMISSION     : 4118 kg/y TSP   1948 kg/y PM10   59 kg/y PM2.5
FROM SOURCES      : 2
39 40
HOURS OF DAY      :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

```
ACTIVITY NAME : Dozers on ROM coal stockpiles
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 131464 kg/y TSP   41907 kg/y PM10   2892 kg/y PM2.5
FROM SOURCES  : 2
18 39
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

```
ACTIVITY NAME : dozers on product coal stockpiles
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 56212 kg/y TSP    16198 kg/y PM10   1237 kg/y PM2.5
FROM SOURCES  : 1
40
HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

```

ACTIVITY NAME : Conveyor to product stockpiles
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 527 kg/y TSP      249 kg/y PM10    38 kg/y PM2.5
FROM SOURCES  : 2
39 40
HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

```

```
ACTIVITY NAME : Loading product coal to trains
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 5427 kg/y TSP      2306 kg/y PM10    271 kg/y PM2.5
FROM SOURCES   : 1
40
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

```
ACTIVITY NAME : Wind erosion from active pits
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 368730 kg/y TSP      184365 kg/y PM10      27655 kg/y PM2.5
FROM SOURCES : 18
1 2 3 4 5 6 7 8 20 21 22 23 24 25 26 27 28 29
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

```
ACTIVITY NAME : Wind erosion from active dumps
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 368730 kg/y TSP      184365 kg/y PM10      27655 kg/y PM2.5
FROM SOURCES   : 15
8 9 10 11 12 13 30 31 32 33 34 35 36 37 38
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

```
ACTIVITY NAME : Wind erosion from partially rehabilitated dumps
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 129056 kg/y TSP      64528 kg/y PM10    9679 kg/y PM2.5
FROM SOURCES   :      8
31 32 33 34 35 36 37 38
HOURS OF DAY   :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

```
ACTIVITY NAME : Wind erosion from ROM coal stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 4380 kg/y TSP      2190 kg/y PM10    329 kg/y PM2.5
FROM SOURCES   : 2
18 39
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

ACTIVITY NAME : Wind erosion from product coal stockpile
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 2190 kg/y TSP 1095 kg/y PM10 164 kg/y PM2.5
FROM SOURCES : 1

DUST EMISSION CALCULATIONS XL1

```
Scenario          : 2014\RixsCk
Number of dust sources : 30
Number of activities : 28
```

```

-----ACTIVITY SUMMARY-----
ACTIVITY NAME : Stripping topsoil by scraper
ACTIVITY TYPE : Wind insensitive
DUST EMISSION :      869 kg/y TSP   219 kg/y PM10    43 kg/y PM2.5
FROM SOURCES   :      3
1 2 3
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

```

```
ACTIVITY NAME : Drilling overburden
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 16709 kg/y TSP   8689 kg/y PM10   501 kg/y PM2.5
FROM SOURCES  : 6
1 2 3 4 5 6
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

```
ACTIVITY NAME : blasting overburden
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 73426 kg/y TSP      38182 kg/y PM10      2203 kg/y PM2.5
FROM SOURCES  : 6
1 2 3 4 5 6
HOURS OF DAY  :
0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 1 0 1 0 0 0 0 0 0 0 0 0
```

```
ACTIVITY NAME : Excavators loading overburden to trucks
ACTIVITY TYPE : Wind Sensitive
DUST EMISSION : 51732 kg/y TSP      24468 kg/y PM10    3705 kg/y PM2.5
FROM SOURCES  : 6
1 2 3 4 5 6
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

```
ACTIVITY NAME : Hauling overburden from pit to dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 381142 kg/y TSP    112631 kg/y PM10    11434 kg/y
PM2.5
FROM SOURCES   : 13
1 2 3 4 5 6 7 8 9 10 11 12 13
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

```
ACTIVITY NAME : Unloading overburden to dump
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 51732 kg/y TSP      24468 kg/y PM10    3705 kg/y PM2.5
FROM SOURCES : 7
7 8 9 10 11 12 13
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

```
ACTIVITY NAME : Dozers shaping overburden
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 329853 kg/y TSP      80301 kg/y PM10    34635 kg/y PM2.5
FROM SOURCES   : 7
7 8 9 10 11 12 13
HOURS OF DAY   :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

```
ACTIVITY NAME : Dozers working on overburden for rehabilitation
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 219902 kg/y TSP      53534 kg/y PM10    23090 kg/y PM2.5
FROM SOURCES  : 7
7 8 9 10 11 12 13
HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

```

ACTIVITY NAME : Drilling coal
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
FROM SOURCES : 6
1 2 3 4 5 6
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

```

ACTIVITY NAME : Blasting coal
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 6
1 2 3 4 5 6
HOURS OF DAY :

0 0 0 0 0 0 0 0 0 1 0 1 0 1 0 1 0 0 0 0 0 0 0 0

ACTIVITY NAME : Dozers working on coal
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 262928 kg/y TSP 83815 kg/y PM10 5784 kg/y PM2.5
FROM SOURCES : 6
1 2 3 4 5 6
HOURS OF DAY :
1 1

ACTIVITY NAME : Loading ROM coal to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 132050 kg/y TSP 18991 kg/y PM10 2509 kg/y PM2.5
FROM SOURCES : 6
1 2 3 4 5 6
HOURS OF DAY :
1 1

ACTIVITY NAME : Hauling ROM coal from pit to hopper / ROM pad
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 62576 kg/y TSP 18492 kg/y PM10 1877 kg/y PM2.5
FROM SOURCES : 9
1 2 3 4 5 6 17 18 19
HOURS OF DAY :
1 1

ACTIVITY NAME : Unloading ROM coal to ROM pad
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 8282 kg/y TSP 3478 kg/y PM10 157 kg/y PM2.5
FROM SOURCES : 2
18 19
HOURS OF DAY :
1 1

ACTIVITY NAME : ROM coal rehandle to hopper
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 2761 kg/y TSP 1159 kg/y PM10 52 kg/y PM2.5
FROM SOURCES : 2
18 19
HOURS OF DAY :
1 1

ACTIVITY NAME : Transferring ROM coal by conveyor to CHPP
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 194 kg/y TSP 92 kg/y PM10 14 kg/y PM2.5
FROM SOURCES : 2
18 19
HOURS OF DAY :
1 1

ACTIVITY NAME : Handling coal at CHPP
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 968 kg/y TSP 458 kg/y PM10 14 kg/y PM2.5
FROM SOURCES : 2
18 19
HOURS OF DAY :
1 1

ACTIVITY NAME : Dozers on ROM coal stockpiles
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 131464 kg/y TSP 41907 kg/y PM10 2892 kg/y PM2.5
FROM SOURCES : 2
18 19
HOURS OF DAY :
1 1

ACTIVITY NAME : Dozers on product coal stockpiles
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 56212 kg/y TSP 16198 kg/y PM10 1237 kg/y PM2.5
FROM SOURCES : 2
18 19
HOURS OF DAY :
1 1

ACTIVITY NAME : Conveyor to product stockpiles
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 67 kg/y TSP 31 kg/y PM10 5 kg/y PM2.5
FROM SOURCES : 2
18 19
HOURS OF DAY :
1 1

ACTIVITY NAME : Loading product coal to trains
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 593 kg/y TSP 252 kg/y PM10 30 kg/y PM2.5
FROM SOURCES : 1
19
HOURS OF DAY :
1 1

ACTIVITY NAME : Wind erosion from active pits
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 146703 kg/y TSP 73351 kg/y PM10 11003 kg/y PM2.5
FROM SOURCES : 6
1 2 3 4 5 6
HOURS OF DAY :
1 1

ACTIVITY NAME : Wind erosion from active dumps
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 146703 kg/y TSP 73351 kg/y PM10 11003 kg/y PM2.5
FROM SOURCES : 10
7 8 9 10 11 12 13 14 15 16
HOURS OF DAY :
1 1

ACTIVITY NAME : Wind erosion from partially rehabilitated dumps
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 11
20 21 22 23 24 25 26 27 28 29 30
HOURS OF DAY :
1 1

ACTIVITY NAME : Wind erosion from ROM coal stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 4380 kg/y TSP 2190 kg/y PM10 329 kg/y PM2.5
FROM SOURCES : 2
18 19
HOURS OF DAY :
1 1

ACTIVITY NAME : Wind erosion from product coal stockpile
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 2190 kg/y TSP 1095 kg/y PM10 164 kg/y PM2.5
FROM SOURCES : 2
18 19
HOURS OF DAY :
1 1

ACTIVITY NAME : Grading roads
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 18464 kg/y TSP 6528 kg/y PM10 202 kg/y PM2.5
FROM SOURCES : 19
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
HOURS OF DAY :
1 1

ACTIVITY NAME : Dragline working on overburden
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
18 19
HOURS OF DAY :
1 1

Pit retention sources:
1 2 3 4 5 6 11 12 13 14 15 16

----- 10-Mar-2018 14:10
DUST EMISSION CALCULATIONS XL1

Output emissions file : 2014\Ashton
Number of dust sources : 13
Number of activities : 4

-----ACTIVITY SUMMARY-----
ACTIVITY NAME : UG - ROM coal by conveyor to ROM stockpile
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 194 kg/y TSP 92 kg/y PM10 14 kg/y PM2.5
FROM SOURCES : 1
13
HOURS OF DAY :
1 1

ACTIVITY NAME : UG - Dozers on ROM coal stockpiles
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 65732 kg/y TSP 20954 kg/y PM10 1446 kg/y PM2.5
FROM SOURCES : 1
13
HOURS OF DAY :
1 1

ACTIVITY NAME : UG Wind erosion from ROM coal stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 2190 kg/y TSP 1095 kg/y PM10 164 kg/y PM2.5
FROM SOURCES : 1
13
HOURS OF DAY :
1 1

ACTIVITY NAME : UG Ventilation outlet(s)
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 31536 kg/y TSP 15768 kg/y PM10 1577 kg/y PM2.5
FROM SOURCES : 1
13
HOURS OF DAY :
1 1

Pit retention sources:
1 2 3 4 5 6

----- 10-Mar-2018 14:16
DUST EMISSION CALCULATIONS XL1

Output emissions file : Year_02\Ashton
Number of dust sources : 13
Number of activities : 32

-----ACTIVITY SUMMARY-----
ACTIVITY NAME : Stripping topsoil by scraper
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 261 kg/y TSP 66 kg/y PM10 13 kg/y PM2.5
FROM SOURCES : 6
1 2 3 4 5 6
HOURS OF DAY :
1 1

ACTIVITY NAME : Drilling overburden
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 8496 kg/y TSP 4418 kg/y PM10 255 kg/y PM2.5
FROM SOURCES : 6
1 2 3 4 5 6
HOURS OF DAY :
1 1

ACTIVITY NAME : Blasting overburden
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 23613 kg/y TSP 12279 kg/y PM10 708 kg/y PM2.5
FROM SOURCES : 6
1 2 3 4 5 6
HOURS OF DAY :

0 0 0 0 0 0 0 0 0 1 0 1 0 1 0 1 0 0 0 0 0 0 0 0

ACTIVITY NAME : Excavators loading overburden to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 43629 kg/y TSP 20636 kg/y PM10 3125 kg/y PM2.5
FROM SOURCES : 6
1 2 3 4 5 6
HOURS OF DAY :
1 1

ACTIVITY NAME : Hauling overburden from pit to dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 148608 kg/y TSP 43915 kg/y PM10 4458 kg/y PM2.5
FROM SOURCES : 11
1 2 3 4 5 6 7 8 9 10 11
HOURS OF DAY :
1 1

ACTIVITY NAME : Unloading overburden to dump
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 43629 kg/y TSP 20636 kg/y PM10 3125 kg/y PM2.5
FROM SOURCES : 5
7 8 9 10 11
HOURS OF DAY :
1 1

ACTIVITY NAME : Dozers shaping overburden
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 219902 kg/y TSP 53534 kg/y PM10 23090 kg/y PM2.5
FROM SOURCES : 5
7 8 9 10 11
HOURS OF DAY :
1 1

ACTIVITY NAME : Dozers working on overburden for rehabilitation
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 109951 kg/y TSP 26767 kg/y PM10 11545 kg/y PM2.5
FROM SOURCES : 5
7 8 9 10 11
HOURS OF DAY :
1 1

ACTIVITY NAME : Drilling coal
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 6
1 2 3 4 5 6
HOURS OF DAY :
1 1

ACTIVITY NAME : Blasting coal
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 6
1 2 3 4 5 6
HOURS OF DAY :
0 0 0 0 0 0 0 0 0 1 0 1 0 1 0 1 0 0 0 0 0 0 0 0

ACTIVITY NAME : Dozers working on coal
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 131464 kg/y TSP 41907 kg/y PM10 2892 kg/y PM2.5
FROM SOURCES : 6
1 2 3 4 5 6
HOURS OF DAY :
1 1

ACTIVITY NAME : Loading ROM coal to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 172196 kg/y TSP 24764 kg/y PM10 3272 kg/y PM2.5
FROM SOURCES : 10
1 2 3 4 5 6 7 8 11 12
HOURS OF DAY :
1 1

ACTIVITY NAME : Hauling ROM coal from pit to hopper / ROM pad
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 38400 kg/y TSP 11348 kg/y PM10 1152 kg/y PM2.5
FROM SOURCES : 1
12
HOURS OF DAY :
1 1

ACTIVITY NAME : Unloading ROM coal to ROM pad
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 10800 kg/y TSP 4536 kg/y PM10 205 kg/y PM2.5
FROM SOURCES : 1
12
HOURS OF DAY :
1 1

ACTIVITY NAME : ROM coal rehandle to hopper
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 3600 kg/y TSP 1512 kg/y PM10 68 kg/y PM2.5
FROM SOURCES : 1
12
HOURS OF DAY :
1 1

ACTIVITY NAME : Transferring ROM coal by conveyor to CHPP
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 219 kg/y TSP 103 kg/y PM10 16 kg/y PM2.5
FROM SOURCES : 2
12 13
HOURS OF DAY :
1 1

ACTIVITY NAME : Handling coal at CHPP
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 1093 kg/y TSP 517 kg/y PM10 16 kg/y PM2.5
FROM SOURCES : 1
13
HOURS OF DAY :
1 1

ACTIVITY NAME : Dozers on ROM coal stockpiles
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 65732 kg/y TSP 20954 kg/y PM10 1446 kg/y PM2.5
FROM SOURCES : 1
12
HOURS OF DAY :
1 1

ACTIVITY NAME : Dozers on product coal stockpiles
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 28106 kg/y TSP 8099 kg/y PM10 618 kg/y PM2.5
FROM SOURCES : 1
13
HOURS OF DAY :
1 1

ACTIVITY NAME : Conveyer to product stockpiles
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 58 kg/y TSP 27 kg/y PM10 4 kg/y PM2.5
FROM SOURCES : 1
13
HOURS OF DAY :
1 1

ACTIVITY NAME : Loading product coal to trains
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 593 kg/y TSP 252 kg/y PM10 30 kg/y PM2.5
FROM SOURCES : 1
13
HOURS OF DAY :
1 1

ACTIVITY NAME : Wind erosion from active pits
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 63072 kg/y TSP 31536 kg/y PM10 4730 kg/y PM2.5
FROM SOURCES : 6
1 2 3 4 5 6
HOURS OF DAY :
1 1

ACTIVITY NAME : Wind erosion from active dumps
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 63072 kg/y TSP 31536 kg/y PM10 4730 kg/y PM2.5
FROM SOURCES : 5
7 8 9 10 11
HOURS OF DAY :
1 1

ACTIVITY NAME : Wind erosion from partially rehabilitated dumps
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 2
10 11
HOURS OF DAY :
1 1

ACTIVITY NAME : Wind erosion from ROM coal stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 4380 kg/y TSP 2190 kg/y PM10 329 kg/y PM2.5
FROM SOURCES : 1
12
HOURS OF DAY :
1 1

ACTIVITY NAME : Wind erosion from product coal stockpile
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 2190 kg/y TSP 1095 kg/y PM10 164 kg/y PM2.5
FROM SOURCES : 1
13
HOURS OF DAY :
1 1

ACTIVITY NAME : Grading roads
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 18464 kg/y TSP 6528 kg/y PM10 202 kg/y PM2.5
FROM SOURCES : 11
1 2 3 4 5 6 7 8 9 10 11
HOURS OF DAY :
1 1

ACTIVITY NAME : Dragline working on overburden
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1

ACTIVITY NAME : UG - ROM coal by conveyor to ROM stockpile
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 382 kg/y TSP 181 kg/y PM10 27 kg/y PM2.5
FROM SOURCES : 1
13
HOURS OF DAY :
1 1

ACTIVITY NAME : UG - Dozers on ROM coal stockpiles
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 65732 kg/y TSP 20954 kg/y PM10 1446 kg/y PM2.5
FROM SOURCES : 1
13
HOURS OF DAY :
1 1

ACTIVITY NAME : UG Wind erosion from ROM coal stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 2190 kg/y TSP 1095 kg/y PM10 164 kg/y PM2.5
FROM SOURCES : 1
13
HOURS OF DAY :
1 1

ACTIVITY NAME : Transferring ROM coal by conveyor to CHPP
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 561 kg/y TSP 265 kg/y PM10 40 kg/y PM2.5
FROM SOURCES : 3

ACTIVITY NAME : Unloading overburden to dump
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 44432 kg/y TSP 21015 kg/y PM10 3182 kg/y PM2.5
FROM SOURCES : 5

```

FROM SOURCES      : 12
2 3 4 21 22 23 24 25 26 27 28 29
HOURS OF DAY      :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

```

```
ACTIVITY NAME : Hauling overburden from pit to dump  
ACTIVITY TYPE : Wind insensitive  
DUST EMISSION : 2464574 kg/y TSP    728302 kg/y PM10   73937 kg/y PM2.5  
FROM SOURCES : 28  
2 3 4 5 6 7 8 9 10 11 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35  
36 37 38  
HOURS OF DAY :  
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
  
ACTIVITY NAME : Unloading overburden to dump  
ACTIVITY TYPE : Wind sensitive  
DUST EMISSION : 401414 kg/y TSP    189858 kg/y PM10   28750 kg/y PM2.5  
FROM SOURCES : 16  
5 6 7 8 9 10 11 31 32 33 34 35 36 37 38 39  
HOURS OF DAY :  
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
  
ACTIVITY NAME : Dozers shaping overburden  
ACTIVITY TYPE : Wind insensitive  
DUST EMISSION : 439805 kg/y TSP    107069 kg/y PM10   46179 kg/y PM2.5  
FROM SOURCES : 16  
5 6 7 8 9 10 11 31 32 33 34 35 36 37 38 39  
HOURS OF DAY :  
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
  
ACTIVITY NAME : Dozers working on overburden for rehabilitation  
ACTIVITY TYPE : Wind insensitive  
DUST EMISSION : 439805 kg/y TSP    107069 kg/y PM10   46179 kg/y PM2.5  
FROM SOURCES : 11  
9 10 11 31 32 33 34 35 36 37 38  
HOURS OF DAY :  
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
  
ACTIVITY NAME : Drilling coal  
ACTIVITY TYPE : Wind insensitive  
DUST EMISSION : 0 kg/y TSP    0 kg/y PM10   0 kg/y PM2.5  
FROM SOURCES : 12  
2 3 4 21 22 23 24 25 26 27 28 29  
HOURS OF DAY :  
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
  
ACTIVITY NAME : Blasting coal  
ACTIVITY TYPE : Wind insensitive  
DUST EMISSION : 0 kg/y TSP    0 kg/y PM10   0 kg/y PM2.5  
FROM SOURCES : 12  
2 3 4 21 22 23 24 25 26 27 28 29  
HOURS OF DAY :  
0 0 0 0 0 0 0 0 0 1 0 1 0 1 0 1 0 0 0 0 0 0 0 0 0  
  
ACTIVITY NAME : Dozers working on coal  
ACTIVITY TYPE : Wind insensitive  
DUST EMISSION : 525856 kg/y TSP    167629 kg/y PM10   11569 kg/y PM2.5  
FROM SOURCES : 12  
2 3 4 21 22 23 24 25 26 27 28 29  
HOURS OF DAY :  
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
  
ACTIVITY NAME : Loading ROM coal to trucks  
ACTIVITY TYPE : Wind sensitive  
DUST EMISSION : 765315 kg/y TSP    110064 kg/y PM10   14541 kg/y PM2.5  
FROM SOURCES : 12  
2 3 4 21 22 23 24 25 26 27 28 29  
HOURS OF DAY :  
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
  
ACTIVITY NAME : Hauling ROM coal from pit to hopper / ROM pad  
ACTIVITY TYPE : Wind insensitive  
DUST EMISSION : 320000 kg/y TSP    94563 kg/y PM10   9600 kg/y PM2.5  
FROM SOURCES : 29  
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26  
27 28 29 30  
HOURS OF DAY :  
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
  
ACTIVITY NAME : Unloading ROM coal to ROM pad  
ACTIVITY TYPE : Wind sensitive  
DUST EMISSION : 48000 kg/y TSP    20160 kg/y PM10   912 kg/y PM2.5  
FROM SOURCES : 1  
18  
HOURS OF DAY :  
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
  
ACTIVITY NAME : ROM coal rehandle to hopper  
ACTIVITY TYPE : Wind sensitive  
DUST EMISSION : 16000 kg/y TSP    6720 kg/y PM10   304 kg/y PM2.5  
FROM SOURCES : 1  
18  
HOURS OF DAY :  
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
  
ACTIVITY NAME : Transferring ROM coal by conveyor to CHPP  
ACTIVITY TYPE : Wind sensitive  
DUST EMISSION : 1123 kg/y TSP    531 kg/y PM10   80 kg/y PM2.5  
FROM SOURCES : 2  
18 39  
HOURS OF DAY :  
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
  
ACTIVITY NAME : Handling coal at CHPP  
ACTIVITY TYPE : Wind insensitive  
DUST EMISSION : 7367 kg/y TSP    3484 kg/y PM10   106 kg/y PM2.5  
FROM SOURCES : 2  
39 40  
HOURS OF DAY :  
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
  
ACTIVITY NAME : Dozers on ROM coal stockpiles
```

```
ACTIVITY TYPE : Wind insensitive  
DUST EMISSION : 131464 kg/y TSP   41907 kg/y PM10   2892 kg/y PM2.5  
FROM SOURCES : 2  
18 39  
HOURS OF DAY :  
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
  
ACTIVITY NAME : Dozers on product coal stockpiles  
ACTIVITY TYPE : Wind insensitive  
DUST EMISSION : 56212 kg/y TSP   16198 kg/y PM10   1237 kg/y PM2.5  
FROM SOURCES : 1  
40  
HOURS OF DAY :  
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
  
ACTIVITY NAME : Conveyor to product stockpiles  
ACTIVITY TYPE : Wind sensitive  
DUST EMISSION : 943 kg/y TSP    446 kg/y PM10    68 kg/y PM2.5  
FROM SOURCES : 2  
39 40  
HOURS OF DAY :  
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
  
ACTIVITY NAME : Loading product coal to trains  
ACTIVITY TYPE : Wind sensitive  
DUST EMISSION : 8400 kg/y TSP   3570 kg/y PM10   420 kg/y PM2.5  
FROM SOURCES : 1  
40  
HOURS OF DAY :  
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
  
ACTIVITY NAME : Wind erosion from active pits  
ACTIVITY TYPE : Wind erosion  
DUST EMISSION : 368730 kg/y TSP  184365 kg/y PM10  27655 kg/y  
PM2.5  
FROM SOURCES : 18  
1 2 3 4 5 6 7 8 20 21 22 23 24 25 26 27 28 29  
HOURS OF DAY :  
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
  
ACTIVITY NAME : Wind erosion from active dumps  
ACTIVITY TYPE : Wind erosion  
DUST EMISSION : 368730 kg/y TSP  184365 kg/y PM10  27655 kg/y  
PM2.5  
FROM SOURCES : 15  
8 9 10 11 12 13 30 31 32 33 34 35 36 37 38  
HOURS OF DAY :  
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
  
ACTIVITY NAME : Wind erosion from partially rehabilitated dumps  
ACTIVITY TYPE : Wind erosion  
DUST EMISSION : 129056 kg/y TSP  64528 kg/y PM10  9679 kg/y PM2.5  
FROM SOURCES : 8  
31 32 33 34 35 36 37 38  
HOURS OF DAY :  
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
  
ACTIVITY NAME : Wind erosion from ROM coal stockpiles  
ACTIVITY TYPE : Wind erosion  
DUST EMISSION : 4380 kg/y TSP   2190 kg/y PM10   329 kg/y PM2.5  
FROM SOURCES : 2  
18 39  
HOURS OF DAY :  
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
  
ACTIVITY NAME : Wind erosion from product coal stockpile  
ACTIVITY TYPE : Wind erosion  
DUST EMISSION : 2190 kg/y TSP   1095 kg/y PM10   164 kg/y PM2.5  
FROM SOURCES : 1  
40  
HOURS OF DAY :  
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
  
ACTIVITY NAME : Grading roads  
ACTIVITY TYPE : Wind insensitive  
DUST EMISSION : 18464 kg/y TSP   6528 kg/y PM10   202 kg/y PM2.5  
FROM SOURCES : 38  
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25  
26 27 28 29 30 31 32 33 34 35 36 37 38  
HOURS OF DAY :  
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
  
ACTIVITY NAME : Dragline working on overburden  
ACTIVITY TYPE : Wind sensitive  
DUST EMISSION : 63657 kg/y TSP   13979 kg/y PM10   3183 kg/y PM2.5  
FROM SOURCES : 8  
1 2 3 4 5 6 7 8  
HOURS OF DAY :  
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
  
Pit retention sources:  
1 2 3 4 5 6 7 8 9 10 11 12 13 14 22 23 24 25 26 27 28 29
```

28-Aug-2017 16:38

DUST EMISSION CALCULATIONS XL1

Scenario : Year_2\RixsCk
Number of dust sources : 19
Number of activities : 28

-----ACTIVITY SUMMARY-----
ACTIVITY NAME : Stripping topsoil by scraper
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 869 kg/y TSP 219 kg/y PM10 43 kg/y PM2.5
FROM SOURCES : 3
1 2 3
HOURS OF DAY :
1

ACTIVITY NAME : Drilling overburden
ACTIVITY TYPE : Wind insensitive

[illegible]

```
----- 15-Nov-2017 15:47
DUST EMISSION CALCULATIONS XL1
-----

Scenario           : Year_2\RixsCkNorth
Number of dust sources : 23
Number of activities : 28
```

ACTIVITY NAME : ROM coal rehandle to hopper

```
ACTIVITY NAME : Dragline working on overburden  
ACTIVITY TYPE : Wind sensitive  
DUST EMISSION : 0 kg/y TSP    0 kg/y PM10   0 kg/y PM2.5  
FROM SOURCES : 1
```

1

```
HOURS OF DAY : 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

FROM SOURCES : 1
34
HOURS OF DAY :


```
ACTIVITY NAME : Excavators loading overburden to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 5
26 27 28 29 30
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
ACTIVITY NAME : Hauling overburden from pit to dump
ACTIVITY TYPE : Wind insensitive
```

DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 7
26 27 28 29 30 31 32
HOURS OF DAY :
1 1

ACTIVITY NAME : Unloading overburden to dump
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 5
28 29 30 31 32
HOURS OF DAY :
1 1

ACTIVITY NAME : Dozers shaping overburden
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 5
28 29 30 31 32
HOURS OF DAY :
1 1

ACTIVITY NAME : Dozers working on overburden for reha
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 5
28 29 30 31 32
HOURS OF DAY :
1 1

ACTIVITY NAME : Drilling coal
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 5
26 27 28 29 30
HOURS OF DAY :
1 1

ACTIVITY NAME : Blasting coal
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 5
26 27 28 29 30
HOURS OF DAY :
0 0 0 0 0 0 0 0 0 1 0 1 0 1 0 1 0 0 0 0 0 0 0 0

ACTIVITY NAME : Dozers working on coal
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 5
26 27 28 29 30
HOURS OF DAY :
1 1

ACTIVITY NAME : Loading ROM coal to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 5
26 27 28 29 30
HOURS OF DAY :
1 1

ACTIVITY NAME : Hauling ROM coal from pit to hopper /
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 8
18 19 20 26 27 28 29 30
HOURS OF DAY :
1 1

ACTIVITY NAME : Unloading ROM coal to ROM pad
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
20
HOURS OF DAY :
1 1

ACTIVITY NAME : ROM coal rehandle to hopper
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 3
20 24 25
HOURS OF DAY :
1 1

ACTIVITY NAME : Transferring ROM coal by conveyor to
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 3
20 24 25
HOURS OF DAY :
1 1

ACTIVITY NAME : Handling coal at CHPP
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 2
24 25
HOURS OF DAY :
1 1

ACTIVITY NAME : Dozers on ROM coal stockpiles
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
20
HOURS OF DAY :
1 1

ACTIVITY NAME : Dozers on product coal stockpiles
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 ka/y TSP 0 ka/y PM10 0 ka/y PM2.5

Appendix C. Peer Review Outcomes

11 June 2018

Dear Penelope,

Peer view - Air Quality Assessment for Section 96 Modification to SSD-5850 (Mount Owen Continued Operations Project)

Introduction

I have reviewed the final report (Draft 5 prepared by Jacobs) assessing the air quality effects of the proposed modifications to the Section 96 Modification to SSD-5850 Mount Owen Continued Operations (MOCO) Project. This letter provides you with a summary of the review and its conclusions. The review covered the following:

1. The appropriateness of the impact assessment criteria
2. Model selection and approach to the assessment
3. Meteorological data used
4. Emissions estimation methods
5. Methods used in accounting for background levels and cumulative effects of other mines
6. Identification of sensitive receptors
7. The results, interpretations and mitigation measures.

Assessment criteria

The assessment methodology has followed the “Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales” published by NSW EPA (2016). The pollutants considered were PM_{2.5}, PM₁₀, TSP, deposited dust and NO₂. The assessment criteria used were those specified in the 2016 Approved Methods and the Department of Planning’s “Voluntary Land Acquisition and Mitigation Policy” (Department of Planning, 2014).

Model and approach to assessment

The model used in the assessment was CALPUFF. In my opinion, using CALPUFF represents best-practice for assessing complex mining projects with multiple distributed sources and large modelling domains. The basic modelling approach has been used with realistic estimates of emissions including the way emissions vary with meteorological conditions and the locations of sources as the mine develops.

The assessment report provides a comparison of predicted and observed particulate matter concentration and deposition levels for 2014. These comparisons indicate how well the model performs and provides some confidence that model predictions can be relied on to indicate future impacts.

Meteorological data

Five years of meteorological data have been reviewed (2012 to 2016 inclusive). Data collected during 2014 was selected for modelling. In my opinion, the data from any of the five years could have been selected for the modelling. All years showed the wind characteristics that are typical of the Hunter Valley, namely predominantly north-westerlies in winter and south-easterlies in summer. Autumn and spring showing both north-westerlies and south-easterlies rather similar to annual conditions.

Estimating emissions

The methods used by different consultants to estimate emissions from mining activities vary depending on the professional judgements of the consultant. The methods used by Jacobs have been developed over a number of years and attempt to reflect real-world variations including a dependence on wind speed and rainfall as well as reductions that can be implemented by the mine operators to mitigate impacts on special receptors. It is difficult to see how this aspect of the modelling could be improved.

Accounting for background particulate matter and cumulative effects of other mines

Accounting for background particulate matter and accounting for the contributions of other mines to cumulative effects is always a challenge. The rate at which neighbouring mines will be developed depends on unpredictable factors such as market conditions and board decisions. The only practical way of proceeding is to assume that published EIS information will be adhered to. In my experience the most common variations from published plans are delays and slowdowns rather than accelerations. In my opinion, the approach taken in the EIS is the best available.

Identification of sensitive receptors

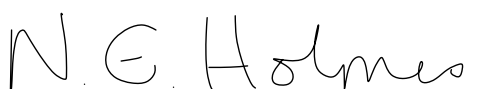
Sensitive receptors include, residences (not owned by the proponent or other mining companies), schools, churches, etc. As far as I can tell the identification of sensitive receptors is comprehensive.

Interpretation of results and mitigation measures

The interpretation of the results appears to me to have been undertaken correctly and mitigation measures are appropriate.

Feel free to contact me if you would like me to elaborate on any of these points.

Yours sincerely,
Nigel Holmes PhD



Atmospheric Physicist

Appendix D. Model Receptors

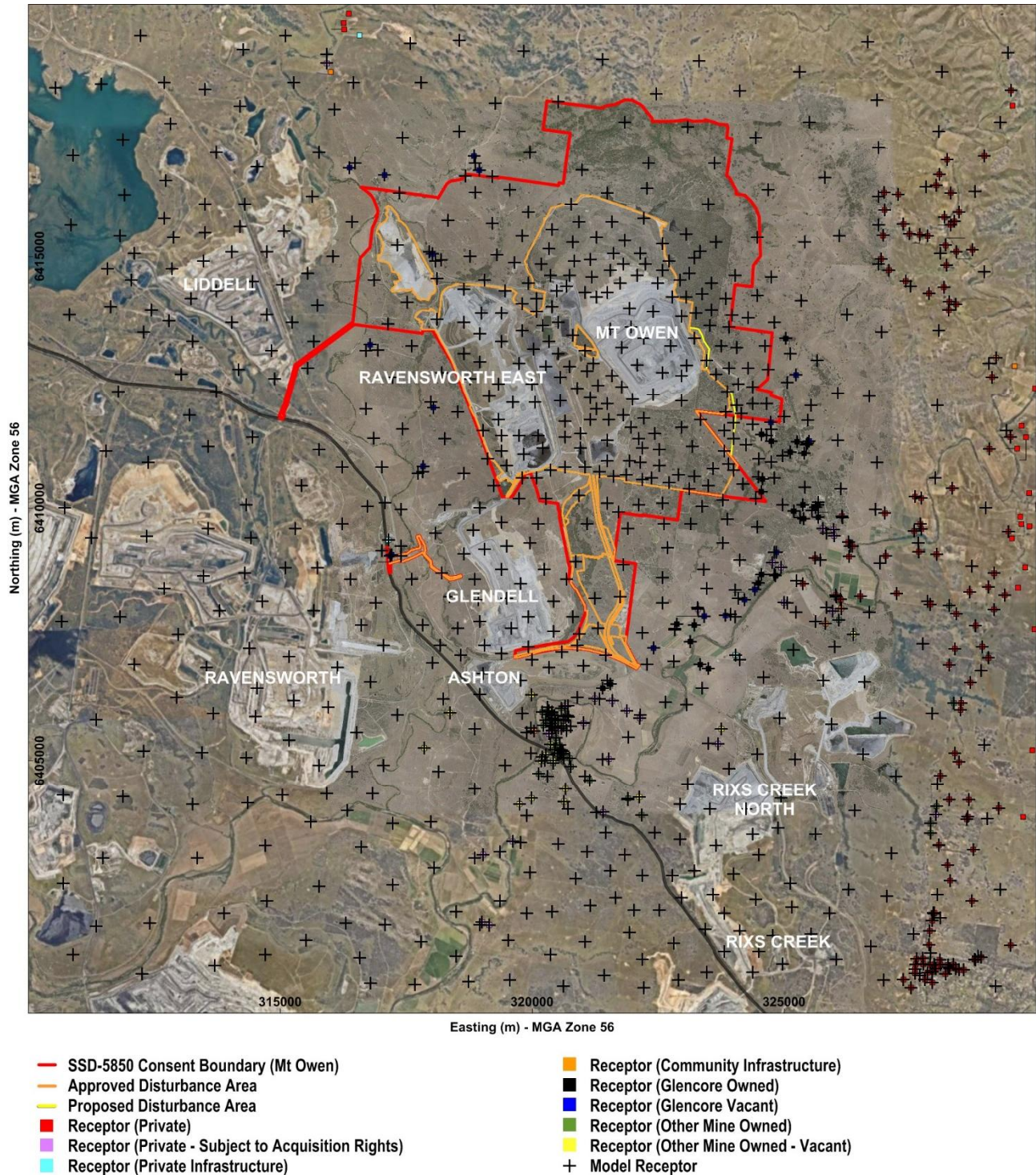


Figure D1 Location of model receptors

Appendix E. Sensitive Receptor Labels and Tabulated Results

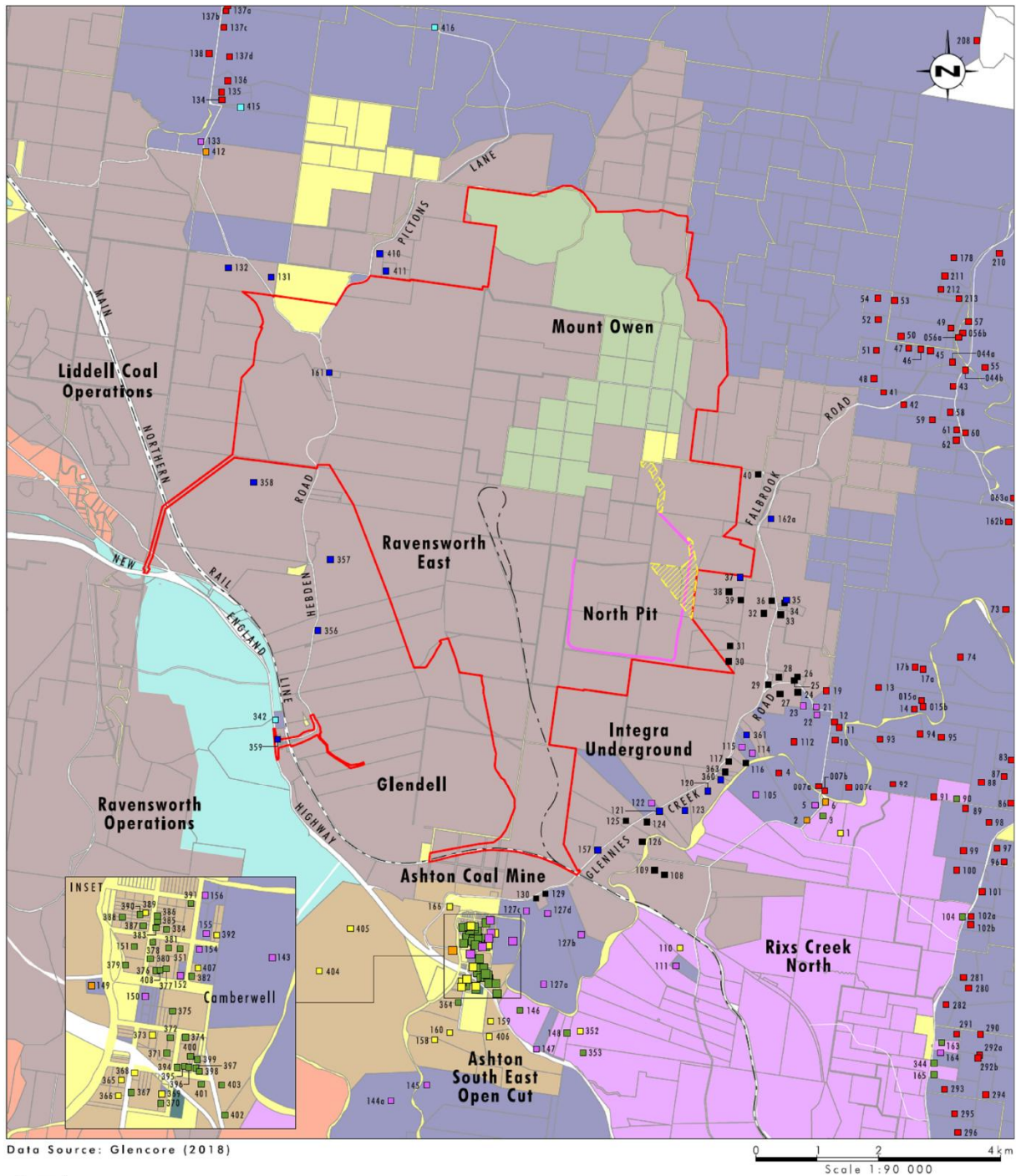


Figure E1 Identification labels for receptors

Model predictions at properties

ID	Status	Proposed Modification			Cumulative All Sources				Cumulative (no SEOC or RCN)			Criteria
		Year 2	Year 8	Year 15	2014	Year 2	Year 8	Year 15	Year 2	Year 8	Year 15	
Maximum 24-hour average PM10 (ug/m3)												
1	Other Mine Owned - Vacant	21	25	16	48	64	63	63	49	49	48	50
2	Community Infrastructure	20	19	16	48	61	60	60	49	49	48	50
3	Other Mine Owned	22	25	17	48	58	58	57	49	49	48	50
4	Private	23	27	19	49	54	53	53	50	49	48	50
5	Private - Subject to Acquisition Rights	22	26	17	48	55	55	55	49	49	48	50
6	Community Infrastructure	24	28	17	48	53	53	53	49	49	48	50
10	Private	24	27	19	48	54	52	50	54	52	48	50
11	Private	26	28	20	48	53	52	50	53	52	48	50
12	Private	26	28	20	48	54	53	50	54	53	48	50
13	Private	25	23	11	48	53	50	49	53	50	48	50
14	Private	22	20	10	48	50	49	48	50	48	48	50
19	Private	29	33	19	48	59	60	50	59	60	48	50
21	Private - Subject to Acquisition Rights	29	31	22	48	56	57	50	56	57	49	50
22	Private - Subject to Acquisition Rights	28	31	22	48	56	55	50	56	55	49	50
23	Private - Subject to Acquisition Rights	29	33	23	48	57	58	51	57	58	51	50
24	Glencore Owned	32	35	24	49	59	62	51	59	62	51	50
25	Glencore Owned	33	39	25	49	61	65	51	61	65	51	50
26	Glencore Owned	33	39	25	49	62	66	50	62	66	50	50
27	Glencore Owned	32	38	27	49	60	64	54	60	64	54	50
28	Glencore Owned	35	46	30	50	62	67	53	62	67	53	50
29	Glencore Owned	34	45	31	50	62	68	56	62	68	56	50
30	Glencore Owned	54	90	50	51	73	106	67	73	106	67	50
31	Glencore Owned	56	91	50	53	74	107	67	74	107	67	50
32	Glencore Owned	45	58	26	60	72	72	52	72	70	52	50
33	Glencore Owned	37	45	21	57	63	60	50	63	59	49	50
34	Glencore Owned	33	36	19	53	54	54	50	54	54	49	50
35	Glencore Owned - Vacant	32	34	19	52	54	54	50	53	54	49	50
36	Glencore Owned	38	45	22	57	60	60	51	60	60	50	50
37	Glencore Owned - Vacant	51	74	31	62	68	88	53	67	88	53	50
38	Glencore Owned	57	90	38	67	85	104	56	85	104	56	50
39	Glencore Owned	51	74	32	64	79	89	53	79	88	53	50
40	Glencore Owned	25	18	9	49	51	51	49	51	51	49	50
41	Private	6	4	2	48	48	48	48	48	48	47	50
42	Private	7	4	2	48	48	48	47	48	48	47	50
43	Private	5	3	1	47	48	48	47	48	47	47	50
45	Private	4	3	1	47	48	48	47	48	47	47	50
46	Private	4	3	2	47	48	48	47	48	47	47	50
47	Private	4	3	2	47	48	48	47	48	47	47	50
48	Private	5	4	2	48	48	48	48	48	48	47	50
49	Private	3	2	1	47	48	47	47	47	47	47	50
50	Private	4	3	2	47	48	48	47	48	47	47	50
51	Private	5	4	2	48	48	48	47	48	48	47	50
52	Private	4	4	2	48	48	48	47	48	48	47	50
53	Private	3	3	2	47	48	48	47	48	47	47	50
54	Private	3	4	2	47	48	48	47	48	47	47	50
55	Private	3	2	1	47	48	47	47	47	47	47	50
57	Private	3	2	1	47	48	47	47	47	47	47	50
58	Private	7	4	2	47	48	48	47	48	47	47	50
59	Private	8	4	2	47	48	48	47	48	48	47	50
60	Private	8	4	2	47	48	48	47	48	47	47	50
61	Private	8	4	2	47	48	48	47	48	47	47	50
62	Private	9	5	2	47	48	48	47	48	47	47	50
73	Private	9	7	5	47	48	48	47	48	47	47	50
74	Private	12	11	6	47	48	48	48	48	48	47	50
83	Private	16	15	8	47	48	48	48	48	47	47	50
85	Private	15	15	9	47	48	48	48	47	47	47	50
86	Private	16	16	11	47	48	48	48	48	47	47	50
87	Private	17	17	10	47	48	48	48	48	47	47	50
88	Private	18	18	12	47	48	48	48	48	48	47	50
89	Private	18	17	13	47	49	49	48	48	48	47	50
90	Other Mine Owned	18	17	13	47	49	49	48	48	48	47	50
91	Private	20	19	14	48	49	49	49	48	48	47	50
92	Private	20	22	15	48	50	50	50	49	48	48	50
93	Private	22	24	16	48	51	51	49	51	51	48	50
94	Private	22	22	12	48	51	50	49	51	50	48	50
95	Private	21	20	11	48	50	49	48	50	48	47	50
96	Private	16	15	10	47	48	48	48	48	47	47	50
97	Private	16	16	10	47	48	48	48	48	47	47	50
98	Private	16	15	12	47	48	48	48	48	48	47	50
99	Private	17	17	12	47	49	49	48	48	48	47	50

ID	Status	Proposed Modification			Cumulative All Sources				Cumulative (no SEOC or RCN)			Criteria
		Year 2	Year 8	Year 15	2014	Year 2	Year 8	Year 15	Year 2	Year 8	Year 15	
100	Private	17	18	12	47	50	49	49	48	48	47	50
101	Private	16	16	11	47	49	48	48	48	48	47	50
104	Other Mine Owned	20	21	11	47	49	49	48	48	48	47	50
105	Private - Subject to Acquisition Rights	22	18	13	49	56	55	55	50	49	49	50
107	Private Infrastructure	18	13	8	52	60	59	59	52	52	51	50
108	Glencore Owned	17	13	8	51	58	57	57	52	51	51	50
109	Glencore Owned	18	13	8	52	57	56	56	52	51	50	50
110	Other Mine Owned - Vacant	11	8	5	53	67	67	66	53	53	53	50
111	Private - Subject to Acquisition Rights	10	8	5	52	84	84	84	53	52	52	50
112	Private	30	35	20	48	54	52	51	53	51	48	50
114	Private - Subject to Acquisition Rights	28	31	21	49	54	54	53	52	52	49	50
115	Private - Subject to Acquisition Rights	33	38	25	49	56	59	54	56	58	49	50
116	Glencore Owned	27	27	19	49	55	54	54	51	50	49	50
117	Glencore Owned	32	32	24	49	57	56	55	56	53	50	50
120	Glencore Owned - Vacant	27	25	16	50	57	57	56	53	50	50	50
121	Glencore Owned - Vacant	27	21	14	50	58	56	55	55	51	50	50
122	Private - Subject to Acquisition Rights	29	22	15	51	59	56	55	57	51	50	50
123	Glencore Owned - Vacant	24	21	14	50	58	57	56	53	50	50	50
124	Glencore Owned	26	18	12	51	58	56	55	56	51	50	50
125	Glencore Owned	27	18	13	52	62	55	55	60	51	50	50
126	Glencore Owned	22	16	11	53	58	56	55	55	51	50	50
129	Glencore Owned	19	10	8	79	86	60	59	84	52	51	50
130	Glencore Owned	19	10	8	83	90	60	59	87	51	51	50
131	Glencore Owned - Vacant	29	13	8	58	66	56	53	65	55	52	50
132	Glencore Owned - Vacant	27	11	6	58	65	54	52	64	54	51	50
133	Private - Subject to Acquisition Rights	15	10	5	54	57	52	50	56	52	50	50
143	Private - Subject to Acquisition Rights	12	6	4	52	61	59	58	53	51	51	50
145	Private - Subject to Acquisition Rights	4	3	2	56	220	211	208	55	55	55	50
146	Other Mine Owned	8	5	3	53	70	69	62	54	53	53	50
147	Private - Subject to Acquisition Rights	7	5	3	55	102	98	93	56	56	55	50
148	Other Mine Owned	8	5	3	54	79	79	79	55	55	54	50
149	Community Infrastructure	10	5	3	53	64	62	61	54	52	51	50
150	Private - Subject to Acquisition Rights	10	5	4	53	62	61	60	54	52	51	50
151	Other Mine Owned	11	5	4	53	62	60	59	54	52	51	50
152	Private - Subject to Acquisition Rights	11	6	4	53	62	60	59	54	52	51	50
154	Private - Subject to Acquisition Rights	12	6	4	53	61	59	59	53	52	51	50
155	Private - Subject to Acquisition Rights	12	6	4	52	61	59	59	53	51	51	50
156	Private - Subject to Acquisition Rights	13	6	4	56	63	59	58	58	51	50	50
157	Glencore Owned - Vacant	23	14	10	65	69	56	55	66	51	50	50
158	Other Mine Owned - Vacant	6	3	2	56	437	436	435	57	57	57	50
159	Other Mine Owned - Vacant	8	4	3	54	91	90	80	55	54	53	50
160	Other Mine Owned - Vacant	6	3	2	54	238	236	233	55	55	55	50
161	Glencore Owned - Vacant	92	18	11	58	109	57	54	106	56	53	50
163	Other Mine Owned	11	5	5	48	53	48	48	48	48	48	50
164	Private - Subject to Acquisition Rights	11	5	4	48	52	48	48	48	48	48	50
165	Other Mine Owned	9	5	3	48	52	48	48	48	48	48	50
166	Other Mine Owned - Vacant	14	6	5	82	90	65	60	86	52	51	50
178	Private	2	2	1	47	47	47	47	47	47	47	50
210	Private	2	2	1	47	47	47	47	47	47	47	50
211	Private	2	2	1	47	48	47	47	47	47	47	50
212	Private	3	2	1	47	48	47	47	47	47	47	50
213	Private	3	2	1	47	48	47	47	47	47	47	50
259	Private	8	8	5	47	48	48	48	47	47	47	50
280	Private	15	13	10	47	54	49	48	48	48	47	50
281	Private	15	14	11	47	54	49	48	48	48	47	50
282	Private	13	9	8	48	56	50	48	48	48	48	50
289	Private	11	9	8	47	48	48	48	47	47	47	50
290	Private	12	8	7	47	52	48	48	48	47	47	50
291	Private	12	7	6	48	53	48	48	48	48	47	50
293	Private	9	4	3	48	51	48	48	48	48	48	50
294	Private	9	5	4	47	49	48	48	47	47	47	50
295	Private	8	4	3	47	51	49	48	48	48	47	50
296	Private	7	4	2	47	51	49	48	48	48	47	50
299	Private	5	3	2	48	54	50	48	48	48	48	50
300	Private	4	3	2	48	55	51	49	48	48	48	50
302	Private	4	3	2	48	56	51	49	48	48	48	50
303	Private	4	2	1	47	47	47	47	47	47	47	50
305	Private	4	2	1	47	48	47	47	47	47	47	50
306	Private	3	2	1	47	49	48	47	47	47	47	50
307	Private	3	2	1	47	50	48	47	47	47	47	50
308	Private	3	2	1	47	50	48	47	47	47	47	50
309	Private	3	2	1	47	51	48	48	47	47	47	50
310	Private	3	2	1	47	52	48	48	47	47	47	50
311	Private	3	2	1	47	51	48	48	47	47	47	50

ID	Status	Proposed Modification			Cumulative All Sources				Cumulative (no SEOC or RCN)			Criteria
		Year 2	Year 8	Year 15	2014	Year 2	Year 8	Year 15	Year 2	Year 8	Year 15	
312	Private	3	2	1	47	51	48	48	47	47	47	50
314	Private	3	2	1	47	51	48	48	48	47	47	50
315	Private	3	2	1	47	52	48	48	48	48	47	50
316	Private	3	3	1	47	53	49	48	48	48	47	50
317	Private	3	3	1	47	53	49	48	48	48	47	50
318	Private	3	3	1	47	53	49	48	48	48	47	50
319	Private	3	3	1	47	53	49	48	48	47	47	50
320	Private	3	3	1	47	54	49	48	48	48	47	50
321	Private	3	3	1	47	54	50	48	48	48	47	50
322	Private	3	3	1	47	54	50	49	48	48	47	50
323	Private	3	3	1	48	55	51	50	48	48	48	50
324	Private	4	3	2	48	56	52	50	48	48	48	50
325	Private	4	3	2	48	57	53	51	48	48	48	50
326	Private	3	3	2	48	56	52	50	48	48	48	50
327	Private	3	3	1	48	55	51	50	48	48	48	50
328	Private	3	3	1	48	54	50	49	48	48	48	50
329	Private	3	3	1	48	54	51	49	48	48	48	50
330	Private	3	2	1	48	52	49	48	48	48	48	50
337	Private	1	1	1	47	47	47	47	47	47	47	50
342	Private Infrastructure	10	4	3	59	64	58	56	61	55	53	50
344	Other Mine Owned	10	5	4	48	52	48	48	48	48	48	50
351	Other Mine Owned	12	6	4	53	61	59	59	54	52	51	50
352	Other Mine Owned - Vacant	8	5	3	53	73	70	70	54	53	53	50
353	Other Mine Owned	7	5	3	55	91	90	89	56	56	55	50
356	Glencore Owned - Vacant	17	7	4	66	71	55	54	68	52	51	50
357	Glencore Owned - Vacant	42	12	9	70	70	54	53	67	52	51	50
358	Glencore Owned - Vacant	32	11	7	59	66	53	52	66	51	50	50
359	Glencore Owned - Vacant	9	4	3	59	64	58	57	61	55	54	50
360	Glencore Owned - Vacant	29	26	19	50	57	56	56	53	50	50	50
361	Glencore Owned - Vacant	33	41	26	49	57	62	53	56	62	49	50
363	Glencore Owned	30	28	22	50	56	56	55	54	51	50	50
364	Other Mine Owned	8	4	3	53	87	85	82	54	53	53	50
365	Other Mine Owned - Vacant	8	4	3	53	65	64	63	54	53	52	50
366	Other Mine Owned - Vacant	8	4	3	53	68	66	64	54	53	52	50
367	Other Mine Owned	8	4	3	53	68	67	63	54	53	52	50
368	Other Mine Owned - Vacant	9	5	3	53	65	63	62	54	53	52	50
369	Other Mine Owned - Vacant	9	5	3	53	69	69	61	54	53	52	50
370	Other Mine Owned	9	5	3	53	71	70	62	54	53	52	50
371	Other Mine Owned	10	5	4	53	65	62	61	54	53	52	50
372	Other Mine Owned	10	5	4	53	64	61	60	54	52	52	50
373	Other Mine Owned - Vacant	10	5	4	53	63	61	61	54	52	52	50
374	Other Mine Owned	11	6	4	53	64	61	60	54	52	52	50
375	Other Mine Owned	11	6	4	53	62	61	60	54	52	52	50
376	Other Mine Owned	11	5	4	53	62	60	59	54	52	51	50
377	Other Mine Owned	11	6	4	53	62	60	59	54	52	51	50
378	Other Mine Owned	11	6	4	53	62	60	59	54	52	51	50
379	Other Mine Owned	10	5	3	53	62	60	60	54	52	51	50
380	Other Mine Owned	11	5	4	53	62	60	59	54	52	51	50
381	Other Mine Owned	12	6	4	53	62	60	59	54	52	51	50
382	Other Mine Owned	12	6	4	53	62	60	59	54	52	51	50
383	Other Mine Owned	12	6	4	53	62	59	59	54	52	51	50
384	Other Mine Owned	12	6	4	53	62	59	59	54	51	51	50
385	Other Mine Owned	12	6	4	53	62	59	59	54	51	51	50
386	Other Mine Owned	12	6	4	53	63	59	59	54	51	51	50
387	Other Mine Owned	12	6	4	53	63	60	59	54	52	51	50
388	Other Mine Owned	11	5	4	53	63	59	59	54	52	51	50
389	Other Mine Owned - Vacant	12	6	4	53	63	59	59	55	51	51	50
390	Other Mine Owned	12	6	4	53	63	59	59	55	52	51	50
391	Other Mine Owned	13	6	4	54	63	59	58	56	51	51	50
392	Other Mine Owned - Vacant	13	6	4	52	61	59	59	54	51	51	50
394	Other Mine Owned	10	5	4	53	66	65	60	54	53	52	50
395	Other Mine Owned	10	5	4	53	66	64	60	54	53	52	50
396	Other Mine Owned	10	5	4	53	67	65	60	54	53	52	50
397	Other Mine Owned	10	5	4	53	67	65	60	54	53	52	50
398	Other Mine Owned	10	5	4	53	67	65	60	54	53	52	50
399	Other Mine Owned	10	5	4	53	66	63	60	54	53	52	50
400	Other Mine Owned	10	5	4	53	65	63	60	54	53	52	50
401	Other Mine Owned	10	5	4	53	68	67	60	54	53	52	50
402	Other Mine Owned	9	5	3	53	72	71	62	54	53	52	50
403	Other Mine Owned	10	5	4	53	68	66	59	54	53	52	50
404	Other Mine Owned - Vacant	5	2	2	89	78	77	77	78	77	77	50
405	Other Mine Owned - Vacant	7	3	2	76	88	68	66	64	63	62	50
406	Other Mine Owned - Vacant	7	4	3	54	116	113	107	55	54	54	50
407	Other Mine Owned - Vacant	12	6	4	53	62	60	59	54	52	51	50

ID	Status	Proposed Modification			Cumulative All Sources				Cumulative (no SEOC or RCN)			Criteria
		Year 2	Year 8	Year 15	2014	Year 2	Year 8	Year 15	Year 2	Year 8	Year 15	
408	Other Mine Owned	11	5	4	53	62	60	59	54	52	51	50
409	Glencore Owned - Vacant	9	4	3	59	64	58	57	61	55	53	50
410	Glencore Owned - Vacant	20	17	10	58	60	56	52	59	55	52	50
411	Glencore Owned - Vacant	22	19	10	59	61	57	53	61	56	52	50
412	Community Infrastructure	16	10	5	54	57	53	51	57	52	50	50
007a	Private	26	30	17	48	52	52	52	49	49	48	50
007b	Private	25	30	16	48	52	52	52	49	49	48	50
007c	Private	24	27	16	48	51	51	51	50	48	48	50
015a	Private	20	17	8	48	49	49	48	48	48	48	50
015b	Private	21	18	9	48	49	49	48	49	48	47	50
044a	Private	4	3	1	47	48	48	47	48	47	47	50
044b	Private	4	3	1	47	48	47	47	47	47	47	50
056a	Private	3	2	1	47	48	47	47	47	47	47	50
056b	Private	3	2	1	47	48	47	47	47	47	47	50
063a	Community Infrastructure	10	7	3	47	48	48	47	47	47	47	50
069a	Private	7	6	4	47	48	48	47	47	47	47	50
102a	Private	19	21	11	47	49	48	48	48	48	47	50
102b	Private	19	21	11	47	49	48	48	48	48	47	50
127a	Private - Subject to Acquisition Rights	10	6	4	52	62	61	61	53	52	51	50
127b	Private - Subject to Acquisition Rights	14	8	6	55	64	63	62	59	51	50	50
127c	Private - Subject to Acquisition Rights	17	9	7	75	81	60	59	78	51	51	50
127d	Private - Subject to Acquisition Rights	17	9	7	72	79	61	60	76	51	51	50
144a	Private - Subject to Acquisition Rights	4	2	2	64	108	99	96	55	55	55	50
144b	Private - Subject to Acquisition Rights	3	2	1	52	54	54	53	50	50	49	50
144c	Private - Subject to Acquisition Rights	3	2	1	51	54	54	53	50	50	49	50
162a	Glencore Owned - Vacant	35	29	11	49	56	52	50	56	52	49	50
162b	Private	10	8	4	47	48	48	47	47	47	47	50
17a	Private	14	14	8	48	49	49	48	48	48	47	50
17b	Private	15	15	9	48	49	49	48	48	48	48	50
292a	Private	11	7	6	47	51	48	48	48	47	47	50
292b	Private	11	7	5	47	50	48	48	48	47	47	50
297a	Private	5	3	2	48	53	51	48	48	48	48	50
297b	Private	5	3	2	48	54	51	48	48	48	48	50
297c	Private	5	3	2	48	53	50	48	48	48	48	50
297d	Private	6	3	2	47	49	48	48	47	47	47	50
349a	Private	4	2	1	47	49	47	47	47	47	47	50
349b	Private	4	2	1	47	49	47	47	47	47	47	50
-												
Days above PM10 criterion (days)												
1	Other Mine Owned - Vacant	0	0	0	0	6	3	3	0	0	0	0
2	Community Infrastructure	0	0	0	0	1	1	1	0	0	0	0
3	Other Mine Owned	0	0	0	0	1	1	1	0	0	0	0
4	Private	0	0	0	0	1	1	1	0	0	0	0
5	Private - Subject to Acquisition Rights	0	0	0	0	1	1	1	0	0	0	0
6	Community Infrastructure	0	0	0	0	1	1	1	0	0	0	0
10	Private	0	0	0	0	2	2	1	1	1	0	0
11	Private	0	0	0	0	3	3	0	2	2	0	0
12	Private	0	0	0	0	3	3	0	2	2	0	0
13	Private	0	0	0	0	1	0	0	1	0	0	0
14	Private	0	0	0	0	1	0	0	1	0	0	0
19	Private	0	0	0	0	3	3	0	2	2	0	0
21	Private - Subject to Acquisition Rights	0	0	0	0	3	3	1	2	2	0	0
22	Private - Subject to Acquisition Rights	0	0	0	0	3	3	1	2	2	0	0
23	Private - Subject to Acquisition Rights	0	0	0	0	3	3	2	2	2	1	0
24	Glencore Owned	0	0	0	0	4	5	2	2	3	1	0
25	Glencore Owned	0	0	0	0	4	6	2	2	6	1	0
26	Glencore Owned	0	0	0	0	4	5	1	2	5	0	0
27	Glencore Owned	0	0	0	0	6	7	3	4	7	2	0
28	Glencore Owned	0	0	0	0	8	11	3	7	10	2	0
29	Glencore Owned	0	0	0	1	9	15	3	7	12	2	0
30	Glencore Owned	1	60	1	2	57	121	41	56	116	40	0
31	Glencore Owned	1	68	0	1	59	128	34	57	123	33	0
32	Glencore Owned	0	4	0	1	16	36	2	16	35	2	0
33	Glencore Owned	0	0	0	1	7	13	1	7	13	0	0
34	Glencore Owned	0	0	0	1	7	6	1	5	6	0	0
35	Glencore Owned - Vacant	0	0	0	1	5	6	0	5	4	0	0
36	Glencore Owned	0	0	0	1	9	15	1	7	13	0	0
37	Glencore Owned - Vacant	2	17	0	2	30	59	3	28	55	3	0
38	Glencore Owned	5	48	0	2	59	122	8	59	116	8	0
39	Glencore Owned	1	26	0	2	38	83	6	37	80	5	0
40	Glencore Owned	0	0	0	0	1	1	0	1	1	0	0
41	Private	0	0	0	0	0	0	0	0	0	0	0
42	Private	0	0	0	0	0	0	0	0	0	0	0
43	Private	0	0	0	0	0	0	0	0	0	0	0

ID	Status	Proposed Modification			Cumulative All Sources				Cumulative (no SEOC or RCN)			Criteria
		Year 2	Year 8	Year 15	2014	Year 2	Year 8	Year 15	Year 2	Year 8	Year 15	
45	Private	0	0	0	0	0	0	0	0	0	0	0
46	Private	0	0	0	0	0	0	0	0	0	0	0
47	Private	0	0	0	0	0	0	0	0	0	0	0
48	Private	0	0	0	0	0	0	0	0	0	0	0
49	Private	0	0	0	0	0	0	0	0	0	0	0
50	Private	0	0	0	0	0	0	0	0	0	0	0
51	Private	0	0	0	0	0	0	0	0	0	0	0
52	Private	0	0	0	0	0	0	0	0	0	0	0
53	Private	0	0	0	0	0	0	0	0	0	0	0
54	Private	0	0	0	0	0	0	0	0	0	0	0
55	Private	0	0	0	0	0	0	0	0	0	0	0
57	Private	0	0	0	0	0	0	0	0	0	0	0
58	Private	0	0	0	0	0	0	0	0	0	0	0
59	Private	0	0	0	0	0	0	0	0	0	0	0
60	Private	0	0	0	0	0	0	0	0	0	0	0
61	Private	0	0	0	0	0	0	0	0	0	0	0
62	Private	0	0	0	0	0	0	0	0	0	0	0
73	Private	0	0	0	0	0	0	0	0	0	0	0
74	Private	0	0	0	0	0	0	0	0	0	0	0
83	Private	0	0	0	0	0	0	0	0	0	0	0
85	Private	0	0	0	0	0	0	0	0	0	0	0
86	Private	0	0	0	0	0	0	0	0	0	0	0
87	Private	0	0	0	0	0	0	0	0	0	0	0
88	Private	0	0	0	0	0	0	0	0	0	0	0
89	Private	0	0	0	0	0	0	0	0	0	0	0
90	Other Mine Owned	0	0	0	0	0	0	0	0	0	0	0
91	Private	0	0	0	0	0	0	0	0	0	0	0
92	Private	0	0	0	0	1	0	0	0	0	0	0
93	Private	0	0	0	0	1	1	0	1	1	0	0
94	Private	0	0	0	0	1	0	0	1	0	0	0
95	Private	0	0	0	0	0	0	0	0	0	0	0
96	Private	0	0	0	0	0	0	0	0	0	0	0
97	Private	0	0	0	0	0	0	0	0	0	0	0
98	Private	0	0	0	0	0	0	0	0	0	0	0
99	Private	0	0	0	0	0	0	0	0	0	0	0
100	Private	0	0	0	0	1	0	0	0	0	0	0
101	Private	0	0	0	0	0	0	0	0	0	0	0
104	Other Mine Owned	0	0	0	0	0	0	0	0	0	0	0
105	Private - Subject to Acquisition Rights	0	0	0	0	1	1	1	0	0	0	0
107	Private Infrastructure	0	0	0	1	4	1	1	1	1	1	0
108	Glencore Owned	0	0	0	4	10	1	1	5	1	1	0
109	Glencore Owned	0	0	0	4	11	1	1	5	1	1	0
110	Other Mine Owned - Vacant	0	0	0	1	30	12	12	1	1	1	0
111	Private - Subject to Acquisition Rights	0	0	0	1	115	81	72	2	1	1	0
112	Private	0	0	0	0	2	2	1	1	1	0	0
114	Private - Subject to Acquisition Rights	0	0	0	0	3	2	1	2	1	0	0
115	Private - Subject to Acquisition Rights	0	0	0	0	5	4	1	3	3	0	0
116	Glencore Owned	0	0	0	0	3	1	1	3	0	0	0
117	Glencore Owned	0	0	0	0	8	4	1	4	4	0	0
120	Glencore Owned - Vacant	0	0	0	0	7	1	1	5	1	0	0
121	Glencore Owned - Vacant	0	0	0	1	10	1	1	5	1	0	0
122	Private - Subject to Acquisition Rights	0	0	0	1	12	1	1	6	1	1	0
123	Glencore Owned - Vacant	0	0	0	1	8	1	1	3	1	0	0
124	Glencore Owned	0	0	0	1	14	1	1	6	1	1	0
125	Glencore Owned	0	0	0	4	24	1	1	15	1	1	0
126	Glencore Owned	0	0	0	3	15	1	1	9	1	1	0
129	Glencore Owned	0	0	0	59	90	1	1	72	1	1	0
130	Glencore Owned	0	0	0	61	93	1	1	70	1	1	0
131	Glencore Owned - Vacant	0	0	0	1	2	1	1	2	1	1	0
132	Glencore Owned - Vacant	0	0	0	1	2	1	1	2	1	1	0
133	Private - Subject to Acquisition Rights	0	0	0	1	1	1	1	1	1	1	0
143	Private - Subject to Acquisition Rights	0	0	0	1	18	2	2	3	1	1	0
145	Private - Subject to Acquisition Rights	0	0	0	4	289	285	282	4	4	3	0
146	Other Mine Owned	0	0	0	1	22	9	5	1	1	1	0
147	Private - Subject to Acquisition Rights	0	0	0	2	74	54	44	1	1	1	0
148	Other Mine Owned	0	0	0	1	84	66	54	1	1	1	0
149	Community Infrastructure	0	0	0	1	26	4	3	2	1	1	0
150	Private - Subject to Acquisition Rights	0	0	0	1	24	5	3	1	1	1	0
151	Other Mine Owned	0	0	0	2	22	4	2	4	1	1	0
152	Private - Subject to Acquisition Rights	0	0	0	1	26	5	3	2	1	1	0
154	Private - Subject to Acquisition Rights	0	0	0	2	26	4	2	4	1	1	0
155	Private - Subject to Acquisition Rights	0	0	0	3	22	3	2	4	1	1	0
156	Private - Subject to Acquisition Rights	0	0	0	6	24	1	1	8	1	1	0
157	Glencore Owned - Vacant	0	0	0	14	44	1	1	32	1	1	0

ID	Status	Proposed Modification			Cumulative All Sources				Cumulative (no SEOC or RCN)			Criteria
		Year 2	Year 8	Year 15	2014	Year 2	Year 8	Year 15	Year 2	Year 8	Year 15	
158	Other Mine Owned - Vacant	0	0	0	3	359	359	359	3	3	3	0
159	Other Mine Owned - Vacant	0	0	0	2	81	55	38	1	1	1	0
160	Other Mine Owned - Vacant	0	0	0	2	339	339	338	3	3	3	0
161	Glencore Owned - Vacant	48	0	0	1	153	2	1	150	2	1	0
163	Other Mine Owned	0	0	0	0	1	0	0	0	0	0	0
164	Private - Subject to Acquisition Rights	0	0	0	0	1	0	0	0	0	0	0
165	Other Mine Owned	0	0	0	0	2	0	0	0	0	0	0
166	Other Mine Owned - Vacant	0	0	0	59	107	9	6	55	1	1	0
178	Private	0	0	0	0	0	0	0	0	0	0	0
210	Private	0	0	0	0	0	0	0	0	0	0	0
211	Private	0	0	0	0	0	0	0	0	0	0	0
212	Private	0	0	0	0	0	0	0	0	0	0	0
213	Private	0	0	0	0	0	0	0	0	0	0	0
259	Private	0	0	0	0	0	0	0	0	0	0	0
280	Private	0	0	0	0	1	0	0	0	0	0	0
281	Private	0	0	0	0	1	0	0	0	0	0	0
282	Private	0	0	0	0	1	0	0	0	0	0	0
289	Private	0	0	0	0	0	0	0	0	0	0	0
290	Private	0	0	0	0	1	0	0	0	0	0	0
291	Private	0	0	0	0	1	0	0	0	0	0	0
293	Private	0	0	0	0	2	0	0	0	0	0	0
294	Private	0	0	0	0	0	0	0	0	0	0	0
295	Private	0	0	0	0	2	0	0	0	0	0	0
296	Private	0	0	0	0	1	0	0	0	0	0	0
299	Private	0	0	0	0	3	1	0	0	0	0	0
300	Private	0	0	0	0	3	2	0	0	0	0	0
302	Private	0	0	0	0	2	1	0	0	0	0	0
303	Private	0	0	0	0	0	0	0	0	0	0	0
305	Private	0	0	0	0	0	0	0	0	0	0	0
306	Private	0	0	0	0	0	0	0	0	0	0	0
307	Private	0	0	0	0	0	0	0	0	0	0	0
308	Private	0	0	0	0	1	0	0	0	0	0	0
309	Private	0	0	0	0	1	0	0	0	0	0	0
310	Private	0	0	0	0	1	0	0	0	0	0	0
311	Private	0	0	0	0	1	0	0	0	0	0	0
312	Private	0	0	0	0	1	0	0	0	0	0	0
314	Private	0	0	0	0	1	0	0	0	0	0	0
315	Private	0	0	0	0	1	0	0	0	0	0	0
316	Private	0	0	0	0	1	0	0	0	0	0	0
317	Private	0	0	0	0	1	0	0	0	0	0	0
318	Private	0	0	0	0	1	0	0	0	0	0	0
319	Private	0	0	0	0	1	0	0	0	0	0	0
320	Private	0	0	0	0	1	0	0	0	0	0	0
321	Private	0	0	0	0	1	0	0	0	0	0	0
322	Private	0	0	0	0	1	1	0	0	0	0	0
323	Private	0	0	0	0	1	1	0	0	0	0	0
324	Private	0	0	0	0	2	1	1	0	0	0	0
325	Private	0	0	0	0	2	1	1	0	0	0	0
326	Private	0	0	0	0	1	1	1	0	0	0	0
327	Private	0	0	0	0	1	1	0	0	0	0	0
328	Private	0	0	0	0	1	1	0	0	0	0	0
329	Private	0	0	0	0	2	1	0	0	0	0	0
330	Private	0	0	0	0	2	0	0	0	0	0	0
337	Private	0	0	0	0	0	0	0	0	0	0	0
342	Private Infrastructure	0	0	0	5	21	2	1	13	1	1	0
344	Other Mine Owned	0	0	0	0	1	0	0	0	0	0	0
351	Other Mine Owned	0	0	0	1	24	4	2	4	1	1	0
352	Other Mine Owned - Vacant	0	0	0	1	72	50	42	1	1	1	0
353	Other Mine Owned	0	0	0	1	109	94	91	1	1	1	0
356	Glencore Owned - Vacant	0	0	0	32	59	1	1	35	1	1	0
357	Glencore Owned - Vacant	0	0	0	14	29	1	1	18	1	1	0
358	Glencore Owned - Vacant	0	0	0	7	26	1	1	23	1	1	0
359	Glencore Owned - Vacant	0	0	0	7	19	2	1	12	1	1	0
360	Glencore Owned - Vacant	0	0	0	0	7	2	1	3	1	0	0
361	Glencore Owned - Vacant	0	0	0	0	5	5	1	3	3	0	0
363	Glencore Owned	0	0	0	0	7	2	1	3	2	0	0
364	Other Mine Owned	0	0	0	2	150	122	107	3	2	2	0
365	Other Mine Owned - Vacant	0	0	0	1	48	24	19	1	1	1	0
366	Other Mine Owned - Vacant	0	0	0	1	65	33	27	1	1	1	0
367	Other Mine Owned	0	0	0	1	56	29	23	1	1	1	0
368	Other Mine Owned - Vacant	0	0	0	1	42	18	11	1	1	1	0
369	Other Mine Owned - Vacant	0	0	0	1	46	23	12	1	1	1	0
370	Other Mine Owned	0	0	0	1	51	26	14	1	1	1	0
371	Other Mine Owned	0	0	0	1	37	12	5	1	1	1	0

Annual average PM10 (ug/m3)

ID	Status	Proposed Modification			Cumulative All Sources				Cumulative (no SEOC or RCN)			Criteria
		Year 2	Year 8	Year 15	2014	Year 2	Year 8	Year 15	Year 2	Year 8	Year 15	
1	Other Mine Owned - Vacant	3.9	3.2	2.3	18	32	30	29	20	18	17	25
2	Community Infrastructure	4.2	3.4	2.5	19	29	26	25	21	19	17	25
3	Other Mine Owned	4.2	3.6	2.6	19	27	25	24	21	19	17	25
4	Private	5.4	5.0	3.6	19	25	23	22	22	20	18	25
5	Private - Subject to Acquisition Rights	4.4	3.8	2.7	19	25	23	22	21	19	17	25
6	Community Infrastructure	4.4	3.9	2.7	18	24	22	21	20	19	17	25
10	Private	5.3	5.3	3.2	18	23	22	19	21	20	18	25
11	Private	5.3	5.3	3.1	18	22	21	19	21	20	17	25
12	Private	5.5	5.6	3.2	18	22	21	19	21	20	18	25
13	Private	4.2	4.1	2.1	17	20	19	17	19	18	16	25
14	Private	3.5	3.3	1.7	17	19	18	17	18	17	16	25
19	Private	6.1	6.5	3.5	19	22	22	19	21	21	18	25
21	Private - Subject to Acquisition Rights	6.4	6.8	3.8	19	23	23	20	22	21	18	25
22	Private - Subject to Acquisition Rights	6.2	6.5	3.7	19	23	22	20	22	21	18	25
23	Private - Subject to Acquisition Rights	6.9	7.5	4.3	19	24	24	20	22	22	19	25
24	Glencore Owned	7.7	8.6	4.8	20	25	24	20	23	23	19	25
25	Glencore Owned	8.2	9.5	5.1	20	25	25	21	24	24	19	25
26	Glencore Owned	8.1	9.4	5.0	20	25	25	20	23	24	19	25
27	Glencore Owned	8.5	10.0	5.7	20	26	26	22	24	25	20	25
28	Glencore Owned	9.4	11.4	6.2	20	26	27	22	25	26	21	25
29	Glencore Owned	9.9	12.2	7.0	21	27	28	23	26	27	21	25
30	Glencore Owned	15.3	25.1	15.4	22	33	41	31	31	40	30	25
31	Glencore Owned	15.8	26.2	14.8	23	33	42	30	31	41	29	25
32	Glencore Owned	11.5	15.1	7.0	21	27	30	22	27	29	21	25
33	Glencore Owned	8.9	10.6	5.0	20	25	26	20	24	25	19	25
34	Glencore Owned	7.7	8.7	4.1	19	23	24	19	23	23	18	25
35	Glencore Owned - Vacant	7.4	8.2	3.9	19	23	23	19	22	22	18	25
36	Glencore Owned	9.3	11.1	5.1	20	25	26	20	24	25	19	25
37	Glencore Owned - Vacant	13.6	18.6	8.1	22	29	34	23	29	33	22	25
38	Glencore Owned	16.6	25.9	11.2	23	33	41	26	32	40	25	25
39	Glencore Owned	14.3	20.8	9.3	22	30	36	24	30	35	23	25
40	Glencore Owned	3.8	3.6	1.6	17	19	18	16	18	18	16	25
41	Private	0.9	0.6	0.3	15	15	15	14	15	14	14	25
42	Private	0.8	0.6	0.3	15	15	15	14	15	14	14	25
43	Private	0.6	0.4	0.2	14	15	14	14	15	14	14	25
45	Private	0.6	0.4	0.2	14	15	14	14	15	14	14	25
46	Private	0.6	0.4	0.2	14	15	14	14	15	14	14	25
47	Private	0.6	0.4	0.2	14	15	14	14	15	14	14	25
48	Private	0.8	0.6	0.3	15	15	15	14	15	14	14	25
49	Private	0.5	0.3	0.2	14	14	14	14	14	14	14	25
50	Private	0.6	0.4	0.2	14	15	14	14	15	14	14	25
51	Private	0.7	0.5	0.3	14	15	14	14	15	14	14	25
52	Private	0.6	0.4	0.2	14	15	14	14	15	14	14	25
53	Private	0.5	0.4	0.2	14	15	14	14	14	14	14	25
54	Private	0.5	0.4	0.2	14	15	14	14	14	14	14	25
55	Private	0.5	0.3	0.2	14	14	14	14	14	14	14	25
57	Private	0.4	0.3	0.1	14	14	14	14	14	14	14	25
58	Private	0.7	0.5	0.3	14	15	14	14	15	14	14	25
59	Private	0.8	0.6	0.3	15	15	15	14	15	14	14	25
60	Private	0.7	0.5	0.3	14	15	14	14	15	14	14	25
61	Private	0.7	0.5	0.3	14	15	14	14	15	14	14	25
62	Private	0.8	0.6	0.3	15	15	14	14	15	14	14	25
73	Private	1.2	1.0	0.5	15	16	15	15	15	15	14	25
74	Private	2.1	1.8	0.9	16	17	16	15	17	16	15	25
83	Private	2.1	1.9	1.0	16	17	17	16	17	16	15	25
85	Private	1.9	1.7	1.0	16	17	16	16	17	16	15	25
86	Private	2.2	1.9	1.1	16	18	17	16	17	16	15	25
87	Private	2.2	2.0	1.1	16	18	17	16	17	16	15	25
88	Private	2.6	2.3	1.3	16	18	17	16	17	17	15	25
89	Private	2.8	2.5	1.5	17	19	18	17	18	17	16	25
90	Other Mine Owned	2.9	2.6	1.5	17	19	18	17	18	17	16	25
91	Private	3.2	2.9	1.8	17	20	19	17	18	17	16	25
92	Private	3.8	3.5	2.1	17	21	20	18	19	18	16	25
93	Private	4.2	4.1	2.3	18	21	20	18	19	18	17	25
94	Private	3.4	3.3	1.8	17	19	18	17	18	18	16	25
95	Private	3.1	2.9	1.6	17	19	18	16	18	17	16	25
96	Private	2.2	1.9	1.2	16	18	17	17	17	16	15	25
97	Private	2.3	2.0	1.3	16	18	17	16	17	16	15	25
98	Private	2.5	2.2	1.3	16	18	17	16	17	16	15	25
99	Private	2.8	2.4	1.5	17	20	18	17	18	17	16	25
100	Private	2.8	2.4	1.5	17	20	19	18	18	17	16	25
101	Private	2.4	2.1	1.3	17	20	18	18	18	17	16	25
104	Other Mine Owned	2.4	1.9	1.3	17	21	20	19	18	17	16	25
105	Private - Subject to Acquisition Rights	5.0	3.8	2.9	19	26	23	22	22	19	18	25

ID	Status	Proposed Modification			Cumulative All Sources				Cumulative (no SEOC or RCN)			Criteria
		Year 2	Year 8	Year 15	2014	Year 2	Year 8	Year 15	Year 2	Year 8	Year 15	
107	Private Infrastructure	3.8	2.1	1.5	23	31	26	26	25	20	20	25
108	Glencore Owned	3.3	1.9	1.3	24	32	26	26	26	20	19	25
109	Glencore Owned	3.4	1.8	1.3	24	32	26	25	26	20	19	25
110	Other Mine Owned - Vacant	1.9	1.1	0.8	24	37	32	32	25	20	20	25
111	Private - Subject to Acquisition Rights	1.7	1.1	0.7	24	45	40	40	25	20	20	25
112	Private	6.1	6.1	4.0	19	24	23	21	22	21	19	25
114	Private - Subject to Acquisition Rights	6.7	6.6	4.8	20	26	25	23	23	22	20	25
115	Private - Subject to Acquisition Rights	7.6	8.0	5.8	20	28	26	24	24	23	21	25
116	Glencore Owned	6.4	5.9	4.4	20	27	25	23	23	21	19	25
117	Glencore Owned	7.3	6.9	5.2	20	28	26	24	25	22	20	25
120	Glencore Owned - Vacant	6.4	4.5	3.6	21	30	26	24	25	20	19	25
121	Glencore Owned - Vacant	5.8	3.1	2.5	23	31	25	24	26	20	19	25
122	Private - Subject to Acquisition Rights	6.3	3.4	2.7	24	31	25	24	27	20	19	25
123	Glencore Owned - Vacant	5.9	3.4	2.7	22	31	25	24	25	20	19	25
124	Glencore Owned	5.2	2.7	2.0	24	31	24	24	26	20	19	25
125	Glencore Owned	5.3	2.6	2.0	25	32	25	24	28	21	20	25
126	Glencore Owned	4.3	2.3	1.7	25	31	25	24	26	20	19	25
129	Glencore Owned	2.8	1.4	1.0	33	41	28	27	34	21	20	25
130	Glencore Owned	2.7	1.3	1.0	33	42	28	27	35	21	20	25
131	Glencore Owned - Vacant	7.1	2.5	1.5	21	26	18	16	25	17	16	25
132	Glencore Owned - Vacant	6.3	2.2	1.3	21	25	17	16	25	17	16	25
133	Private - Subject to Acquisition Rights	2.7	1.3	0.7	17	19	16	15	19	16	15	25
143	Private - Subject to Acquisition Rights	1.7	0.8	0.6	25	34	28	27	26	20	19	25
145	Private - Subject to Acquisition Rights	0.6	0.3	0.2	24	85	83	82	26	24	23	25
146	Other Mine Owned	1.1	0.6	0.4	23	34	31	31	25	22	21	25
147	Private - Subject to Acquisition Rights	1.0	0.6	0.4	26	41	39	38	28	26	25	25
148	Other Mine Owned	1.1	0.7	0.4	25	42	39	38	27	24	23	25
149	Community Infrastructure	1.3	0.7	0.4	25	36	32	31	26	21	20	25
150	Private - Subject to Acquisition Rights	1.4	0.7	0.5	25	36	31	30	26	21	20	25
151	Other Mine Owned	1.5	0.7	0.5	26	35	30	29	26	21	20	25
152	Private - Subject to Acquisition Rights	1.6	0.8	0.5	26	36	31	30	26	21	20	25
154	Private - Subject to Acquisition Rights	1.7	0.8	0.6	26	35	29	28	27	21	20	25
155	Private - Subject to Acquisition Rights	1.7	0.8	0.6	26	35	29	28	27	21	20	25
156	Private - Subject to Acquisition Rights	1.8	0.9	0.6	27	35	27	27	28	20	19	25
157	Glencore Owned - Vacant	3.9	1.9	1.4	28	35	26	25	30	21	20	25
158	Other Mine Owned - Vacant	0.8	0.4	0.3	24	196	194	193	26	24	23	25
159	Other Mine Owned - Vacant	1.1	0.6	0.4	24	41	38	37	26	24	23	25
160	Other Mine Owned - Vacant	0.9	0.5	0.3	24	107	105	103	26	24	23	25
161	Glencore Owned - Vacant	26.7	4.3	2.5	25	46	20	18	45	19	17	25
163	Other Mine Owned	1.4	0.7	0.6	17	22	20	20	18	16	16	25
164	Private - Subject to Acquisition Rights	1.3	0.6	0.5	17	22	20	20	18	16	16	25
165	Other Mine Owned	1.1	0.6	0.4	18	22	20	20	18	16	16	25
166	Other Mine Owned - Vacant	2.0	0.9	0.7	34	43	32	31	34	22	21	25
178	Private	0.3	0.2	0.1	14	14	14	14	14	14	14	25
210	Private	0.3	0.2	0.1	14	14	14	14	14	14	14	25
211	Private	0.4	0.2	0.1	14	14	14	14	14	14	14	25
212	Private	0.4	0.3	0.1	14	14	14	14	14	14	14	25
213	Private	0.4	0.3	0.1	14	14	14	14	14	14	14	25
259	Private	1.6	1.4	0.7	15	16	16	15	16	15	15	25
280	Private	1.8	1.2	0.9	17	22	20	19	18	16	16	25
281	Private	1.9	1.3	1.0	17	22	20	20	18	16	16	25
282	Private	1.7	1.0	0.8	17	23	20	20	18	16	16	25
289	Private	1.3	0.8	0.6	16	20	18	18	17	16	15	25
290	Private	1.4	0.8	0.7	17	21	19	19	18	16	16	25
291	Private	1.5	0.8	0.6	17	22	20	19	18	16	16	25
293	Private	1.1	0.5	0.4	18	22	20	20	18	16	16	25
294	Private	1.0	0.5	0.4	17	20	19	18	18	16	16	25
295	Private	0.9	0.4	0.3	17	21	20	19	18	16	16	25
296	Private	0.8	0.4	0.3	17	21	20	19	18	16	16	25
299	Private	0.6	0.3	0.2	18	22	20	20	18	17	16	25
300	Private	0.5	0.3	0.2	18	22	20	20	19	17	17	25
302	Private	0.5	0.3	0.2	18	22	21	20	19	17	17	25
303	Private	0.4	0.2	0.2	16	18	17	17	16	15	15	25
305	Private	0.4	0.2	0.2	17	19	18	18	17	16	16	25
306	Private	0.4	0.2	0.1	17	20	19	19	17	16	16	25
307	Private	0.4	0.2	0.1	17	20	19	19	18	16	16	25
308	Private	0.4	0.2	0.1	17	20	19	19	18	16	16	25
309	Private	0.4	0.2	0.1	17	20	19	19	18	17	16	25
310	Private	0.4	0.2	0.1	17	21	19	19	18	17	16	25
311	Private	0.4	0.2	0.1	17	21	19	19	18	17	16	25
312	Private	0.4	0.2	0.1	17	21	19	19	18	17	16	25
314	Private	0.4	0.2	0.1	18	21	20	19	18	17	17	25
315	Private	0.4	0.2	0.1	18	21	20	20	18	17	17	25
316	Private	0.4	0.2	0.1	18	21	20	20	19	17	17	25

ID	Status	Proposed Modification			Cumulative All Sources				Cumulative (no SEOC or RCN)			Criteria
		Year 2	Year 8	Year 15	2014	Year 2	Year 8	Year 15	Year 2	Year 8	Year 15	
317	Private	0.4	0.2	0.1	18	21	20	20	18	17	17	25
318	Private	0.4	0.2	0.1	18	21	20	20	18	17	17	25
319	Private	0.4	0.2	0.1	18	21	20	20	18	17	17	25
320	Private	0.4	0.2	0.2	18	21	20	20	18	17	17	25
321	Private	0.4	0.2	0.1	18	21	20	20	18	17	17	25
322	Private	0.4	0.2	0.1	18	22	20	20	19	17	17	25
323	Private	0.4	0.2	0.1	18	22	21	20	19	18	17	25
324	Private	0.4	0.2	0.2	18	22	21	20	19	18	17	25
325	Private	0.4	0.2	0.2	19	23	21	21	19	18	17	25
326	Private	0.4	0.2	0.1	18	22	21	21	19	18	18	25
327	Private	0.4	0.2	0.1	18	22	21	21	19	18	18	25
328	Private	0.4	0.2	0.1	18	22	21	20	19	18	17	25
329	Private	0.4	0.2	0.1	19	22	21	21	20	18	18	25
330	Private	0.3	0.2	0.1	18	22	21	20	19	18	18	25
337	Private	0.2	0.1	0.1	14	14	14	14	14	14	14	25
342	Private Infrastructure	1.9	0.7	0.5	31	36	25	24	33	21	20	25
344	Other Mine Owned	1.2	0.6	0.5	18	22	20	20	18	16	16	25
351	Other Mine Owned	1.6	0.8	0.6	26	35	30	29	26	21	20	25
352	Other Mine Owned - Vacant	1.1	0.6	0.4	23	41	38	37	24	22	21	25
353	Other Mine Owned	1.0	0.6	0.4	25	44	42	41	27	24	23	25
356	Glencore Owned - Vacant	4.0	1.2	0.8	37	41	21	20	38	19	18	25
357	Glencore Owned - Vacant	7.2	1.7	1.2	34	37	20	19	35	18	17	25
358	Glencore Owned - Vacant	5.1	1.3	0.9	33	37	19	18	36	18	17	25
359	Glencore Owned - Vacant	1.8	0.7	0.5	31	36	26	25	33	22	21	25
360	Glencore Owned - Vacant	6.6	5.2	4.1	21	29	25	24	24	21	19	25
361	Glencore Owned - Vacant	7.9	8.8	6.2	20	27	26	24	24	24	21	25
363	Glencore Owned	6.9	5.9	4.6	20	29	26	24	24	21	20	25
364	Other Mine Owned	1.0	0.6	0.4	24	47	44	43	26	23	22	25
365	Other Mine Owned - Vacant	1.2	0.6	0.4	24	38	35	34	25	22	21	25
366	Other Mine Owned - Vacant	1.1	0.6	0.4	24	39	36	35	25	22	21	25
367	Other Mine Owned	1.2	0.6	0.4	24	39	36	35	26	22	21	25
368	Other Mine Owned - Vacant	1.2	0.6	0.4	24	38	34	33	26	22	21	25
369	Other Mine Owned - Vacant	1.2	0.6	0.4	24	38	35	34	26	22	21	25
370	Other Mine Owned	1.2	0.6	0.4	24	39	35	34	26	23	22	25
371	Other Mine Owned	1.4	0.7	0.5	25	38	34	33	26	22	21	25
372	Other Mine Owned	1.4	0.7	0.5	25	37	33	32	27	22	21	25
373	Other Mine Owned - Vacant	1.4	0.7	0.5	25	37	33	32	26	22	21	25
374	Other Mine Owned	1.5	0.8	0.5	26	37	33	32	27	22	21	25
375	Other Mine Owned	1.5	0.8	0.5	26	37	32	31	27	22	21	25
376	Other Mine Owned	1.5	0.7	0.5	25	35	30	30	26	21	20	25
377	Other Mine Owned	1.5	0.8	0.5	25	35	30	29	26	21	20	25
378	Other Mine Owned	1.6	0.8	0.5	26	35	30	29	26	21	20	25
379	Other Mine Owned	1.4	0.7	0.5	25	35	30	29	26	21	20	25
380	Other Mine Owned	1.5	0.8	0.5	25	35	30	29	26	21	20	25
381	Other Mine Owned	1.6	0.8	0.5	26	35	30	29	26	21	20	25
382	Other Mine Owned	1.6	0.8	0.6	26	36	30	30	27	21	20	25
383	Other Mine Owned	1.6	0.8	0.5	26	35	29	28	27	21	20	25
384	Other Mine Owned	1.6	0.8	0.5	26	35	29	28	27	21	20	25
385	Other Mine Owned	1.6	0.8	0.5	26	35	29	28	27	21	20	25
386	Other Mine Owned	1.7	0.8	0.6	26	35	29	28	27	21	20	25
387	Other Mine Owned	1.6	0.8	0.5	26	35	29	29	27	21	20	25
388	Other Mine Owned	1.6	0.8	0.5	26	35	29	28	26	21	20	25
389	Other Mine Owned - Vacant	1.6	0.8	0.5	26	35	29	28	27	21	20	25
390	Other Mine Owned	1.6	0.8	0.5	26	35	29	28	27	21	20	25
391	Other Mine Owned	1.7	0.8	0.6	26	35	28	27	27	20	19	25
392	Other Mine Owned - Vacant	1.7	0.9	0.6	26	35	29	28	27	21	20	25
394	Other Mine Owned	1.3	0.7	0.5	25	38	34	33	26	23	22	25
395	Other Mine Owned	1.4	0.7	0.5	25	37	34	33	27	23	22	25
396	Other Mine Owned	1.4	0.7	0.5	25	37	33	32	26	23	22	25
397	Other Mine Owned	1.4	0.7	0.5	25	37	33	32	26	23	22	25
398	Other Mine Owned	1.4	0.7	0.5	25	37	33	32	26	23	22	25
399	Other Mine Owned	1.4	0.7	0.5	25	37	33	32	27	22	21	25
400	Other Mine Owned	1.4	0.7	0.5	25	37	33	32	27	22	21	25
401	Other Mine Owned	1.3	0.7	0.5	25	37	33	32	26	23	22	25
402	Other Mine Owned	1.2	0.7	0.5	24	36	33	32	26	22	21	25
403	Other Mine Owned	1.3	0.7	0.5	25	36	33	32	26	22	21	25
404	Other Mine Owned - Vacant	0.8	0.4	0.3	32	43	40	38	34	31	30	25
405	Other Mine Owned - Vacant	1.1	0.5	0.3	32	43	38	36	31	26	25	25
406	Other Mine Owned - Vacant	1.0	0.5	0.4	24	46	43	42	26	24	23	25
407	Other Mine Owned - Vacant	1.6	0.8	0.6	26	36	30	29	27	21	20	25
408	Other Mine Owned	1.5	0.8	0.5	25	35	30	30	26	21	20	25
409	Glencore Owned - Vacant	1.8	0.7	0.5	31	36	26	25	32	22	21	25
410	Glencore Owned - Vacant	4.8	2.6	1.4	19	21	17	16	20	17	16	25
411	Glencore Owned - Vacant	5.6	3.0	1.6	19	22	18	16	21	17	16	25

ID	Status	Proposed Modification			Cumulative All Sources				Cumulative (no SEOC or RCN)			Criteria
		Year 2	Year 8	Year 15	2014	Year 2	Year 8	Year 15	Year 2	Year 8	Year 15	
412	Community Infrastructure	2.9	1.4	0.8	18	19	16	15	19	16	15	25
007a	Private	4.7	4.3	2.9	18	23	22	20	21	19	18	25
007b	Private	4.5	4.1	2.8	18	23	22	20	21	19	17	25
007c	Private	4.4	4.0	2.6	18	22	21	19	20	19	17	25
015a	Private	3.2	3.0	1.6	17	19	18	16	18	17	16	25
015b	Private	3.2	3.0	1.6	17	19	18	16	18	17	16	25
044a	Private	0.5	0.4	0.2	14	15	14	14	14	14	14	25
044b	Private	0.5	0.4	0.2	14	15	14	14	14	14	14	25
056a	Private	0.5	0.3	0.2	14	14	14	14	14	14	14	25
056b	Private	0.4	0.3	0.2	14	14	14	14	14	14	14	25
063a	Community Infrastructure	0.8	0.6	0.3	14	15	14	14	15	14	14	25
069a	Private	1.0	0.8	0.4	15	15	15	14	15	15	14	25
102a	Private	2.4	1.9	1.3	17	21	19	19	18	17	16	25
102b	Private	2.3	1.9	1.2	17	21	20	19	18	17	16	25
127a	Private - Subject to Acquisition Rights	1.4	0.8	0.5	24	36	32	31	25	21	20	25
127b	Private - Subject to Acquisition Rights	2.0	1.1	0.8	26	38	30	29	28	20	19	25
127c	Private - Subject to Acquisition Rights	2.4	1.2	0.9	31	40	28	28	32	21	20	25
127d	Private - Subject to Acquisition Rights	2.4	1.3	0.9	30	40	29	28	32	21	20	25
144a	Private - Subject to Acquisition Rights	0.6	0.3	0.2	25	46	45	43	28	27	25	25
144b	Private - Subject to Acquisition Rights	0.4	0.2	0.1	22	28	27	25	24	23	21	25
144c	Private - Subject to Acquisition Rights	0.4	0.2	0.1	22	28	27	25	24	23	21	25
162a	Glencore Owned - Vacant	5.0	4.9	2.2	18	20	19	17	20	19	16	25
162b	Private	0.9	0.7	0.3	15	15	15	14	15	14	14	25
17a	Private	2.9	2.6	1.3	16	18	17	16	18	17	15	25
17b	Private	3.1	2.8	1.5	17	18	17	16	18	17	15	25
292a	Private	1.3	0.7	0.6	17	21	19	19	18	16	16	25
292b	Private	1.3	0.7	0.5	17	21	19	19	18	16	16	25
297a	Private	0.6	0.3	0.2	18	22	20	20	18	17	16	25
297b	Private	0.6	0.3	0.2	18	22	20	20	18	17	16	25
297c	Private	0.6	0.3	0.2	18	22	20	20	18	17	16	25
297d	Private	0.7	0.3	0.2	17	20	19	18	17	16	16	25
349a	Private	0.4	0.2	0.1	17	20	18	18	17	16	16	25
349b	Private	0.4	0.2	0.2	17	20	19	18	17	16	16	25
-												
Maximum 24-hour average PM2.5 (ug/m3)												
1	Other Mine Owned - Vacant	3	4	3	19	25	24	24	19	19	19	25
2	Community Infrastructure	3	3	2	19	23	23	22	19	19	19	25
3	Other Mine Owned	3	4	3	19	22	22	22	19	19	19	25
4	Private	4	4	3	19	20	20	20	19	19	19	25
5	Private - Subject to Acquisition Rights	3	4	3	19	21	21	21	19	19	19	25
6	Community Infrastructure	4	4	3	19	21	21	21	19	19	19	25
10	Private	4	5	3	19	20	20	20	19	19	19	25
11	Private	4	5	3	19	20	20	20	19	19	19	25
12	Private	4	5	4	19	20	20	20	19	19	19	25
13	Private	4	4	2	19	19	19	19	19	19	19	25
14	Private	4	4	2	19	19	19	19	19	19	19	25
19	Private	5	6	3	19	20	20	20	19	19	19	25
21	Private - Subject to Acquisition Rights	5	5	4	19	20	20	20	19	19	19	25
22	Private - Subject to Acquisition Rights	5	5	4	19	20	20	20	19	19	19	25
23	Private - Subject to Acquisition Rights	5	6	4	19	20	20	20	19	19	19	25
24	Glencore Owned	5	6	4	19	20	20	20	19	19	19	25
25	Glencore Owned	5	6	4	19	20	20	20	19	19	19	25
26	Glencore Owned	6	6	4	19	20	20	20	19	19	19	25
27	Glencore Owned	5	6	5	19	20	20	20	19	19	19	25
28	Glencore Owned	6	7	5	19	20	20	20	19	20	19	25
29	Glencore Owned	6	7	5	19	20	20	20	20	20	19	25
30	Glencore Owned	8	12	8	19	20	21	20	20	20	20	25
31	Glencore Owned	8	12	8	19	20	21	20	20	20	20	25
32	Glencore Owned	7	9	5	19	20	20	20	20	20	19	25
33	Glencore Owned	6	7	4	19	20	20	20	20	20	19	25
34	Glencore Owned	6	6	3	19	20	20	20	19	20	19	25
35	Glencore Owned - Vacant	5	6	3	19	20	20	20	19	20	19	25
36	Glencore Owned	6	7	4	19	20	20	20	20	20	19	25
37	Glencore Owned - Vacant	8	11	6	19	20	21	20	20	21	20	25
38	Glencore Owned	9	13	7	19	20	21	20	20	21	20	25
39	Glencore Owned	8	11	6	19	20	21	20	20	20	20	25
40	Glencore Owned	5	3	2	19	20	20	19	20	20	19	25
41	Private	1	1	0	19	19	19	19	19	19	19	25
42	Private	1	1	0	19	19	19	19	19	19	19	25
43	Private	1	1	0	19	19	19	19	19	19	19	25
45	Private	1	0	0	19	19	19	19	19	19	19	25
46	Private	1	1	0	19	19	19	19	19	19	19	25
47	Private	1	1	0	19	19	19	19	19	19	19	25
48	Private	1	1	0	19	19	19	19	19	19	19	25

ID	Status	Proposed Modification			Cumulative All Sources				Cumulative (no SEOC or RCN)			Criteria
		Year 2	Year 8	Year 15	2014	Year 2	Year 8	Year 15	Year 2	Year 8	Year 15	
49	Private	1	0	0	19	19	19	19	19	19	19	25
50	Private	1	1	0	19	19	19	19	19	19	19	25
51	Private	1	1	0	19	19	19	19	19	19	19	25
52	Private	1	1	0	19	19	19	19	19	19	19	25
53	Private	1	1	0	19	19	19	19	19	19	19	25
54	Private	1	1	0	19	19	19	19	19	19	19	25
55	Private	1	0	0	19	19	19	19	19	19	19	25
57	Private	1	0	0	19	19	19	19	19	19	19	25
58	Private	1	1	0	19	19	19	19	19	19	19	25
59	Private	2	1	0	19	19	19	19	19	19	19	25
60	Private	2	1	0	19	19	19	19	19	19	19	25
61	Private	2	1	0	19	19	19	19	19	19	19	25
62	Private	2	1	0	19	19	19	19	19	19	19	25
73	Private	1	1	1	19	19	19	19	19	19	19	25
74	Private	2	2	1	19	19	19	19	19	19	19	25
83	Private	3	3	1	19	19	19	19	19	19	19	25
85	Private	3	3	2	19	19	19	19	19	19	19	25
86	Private	3	3	2	19	19	19	19	19	19	19	25
87	Private	3	3	2	19	19	19	19	19	19	19	25
88	Private	3	3	2	19	19	19	19	19	19	19	25
89	Private	3	3	2	19	19	19	19	19	19	19	25
90	Other Mine Owned	3	3	3	19	19	19	19	19	19	19	25
91	Private	3	3	3	19	20	20	19	19	19	19	25
92	Private	4	4	3	19	20	20	20	19	19	19	25
93	Private	4	4	3	19	20	20	19	19	19	19	25
94	Private	4	4	2	19	19	19	19	19	19	19	25
95	Private	4	4	2	19	19	19	19	19	19	19	25
96	Private	3	3	2	19	19	19	19	19	19	19	25
97	Private	3	3	2	19	19	19	19	19	19	19	25
98	Private	3	3	2	19	19	19	19	19	19	19	25
99	Private	3	3	2	19	19	19	19	19	19	19	25
100	Private	3	3	2	19	19	19	19	19	19	19	25
101	Private	2	3	2	19	19	19	19	19	19	19	25
104	Other Mine Owned	3	3	2	19	19	19	19	19	19	19	25
105	Private - Subject to Acquisition Rights	4	3	2	19	21	21	21	19	19	19	25
107	Private Infrastructure	3	2	2	20	21	21	21	20	20	19	25
108	Glencore Owned	3	2	2	20	21	21	21	20	20	19	25
109	Glencore Owned	3	2	2	20	21	21	21	20	20	19	25
110	Other Mine Owned - Vacant	2	2	1	20	23	23	23	20	20	20	25
111	Private - Subject to Acquisition Rights	2	2	1	20	25	25	25	20	20	20	25
112	Private	4	5	3	19	20	20	20	19	19	19	25
114	Private - Subject to Acquisition Rights	4	5	3	19	21	20	20	19	19	19	25
115	Private - Subject to Acquisition Rights	5	6	4	19	21	21	20	20	19	19	25
116	Glencore Owned	4	4	3	19	21	21	20	19	19	19	25
117	Glencore Owned	5	5	4	19	21	21	21	20	19	19	25
120	Glencore Owned - Vacant	5	4	3	19	21	21	21	20	19	19	25
121	Glencore Owned - Vacant	5	4	3	20	21	21	21	20	20	19	25
122	Private - Subject to Acquisition Rights	5	4	3	20	21	21	21	20	20	19	25
123	Glencore Owned - Vacant	4	4	2	20	21	21	21	20	19	19	25
124	Glencore Owned	5	3	2	20	21	21	21	20	20	19	25
125	Glencore Owned	5	3	2	20	21	21	20	20	20	19	25
126	Glencore Owned	4	3	2	20	21	21	21	20	20	19	25
129	Glencore Owned	4	2	2	21	23	22	22	21	20	20	25
130	Glencore Owned	4	2	2	21	23	22	22	22	20	20	25
131	Glencore Owned - Vacant	6	2	1	21	23	20	20	23	20	20	25
132	Glencore Owned - Vacant	5	2	1	21	23	20	20	22	20	20	25
133	Private - Subject to Acquisition Rights	3	2	1	20	21	20	19	21	20	19	25
143	Private - Subject to Acquisition Rights	3	1	1	20	22	22	21	20	20	20	25
145	Private - Subject to Acquisition Rights	1	1	0	20	56	53	52	20	20	20	25
146	Other Mine Owned	2	1	1	20	22	22	22	20	20	20	25
147	Private - Subject to Acquisition Rights	2	1	1	21	34	33	30	21	21	21	25
148	Other Mine Owned	2	1	1	21	27	26	23	21	21	20	25
149	Community Infrastructure	2	1	1	20	23	23	22	21	20	20	25
150	Private - Subject to Acquisition Rights	2	1	1	20	23	22	22	21	20	20	25
151	Other Mine Owned	2	1	1	20	23	22	22	21	20	20	25
152	Private - Subject to Acquisition Rights	3	1	1	20	23	22	22	21	20	20	25
154	Private - Subject to Acquisition Rights	3	1	1	20	22	22	22	20	20	20	25
155	Private - Subject to Acquisition Rights	3	1	1	20	22	22	22	20	20	20	25
156	Private - Subject to Acquisition Rights	3	1	1	20	22	22	21	20	20	20	25
157	Glencore Owned - Vacant	4	3	2	20	21	21	21	20	20	19	25
158	Other Mine Owned - Vacant	1	1	1	20	110	109	108	21	20	20	25
159	Other Mine Owned - Vacant	2	1	1	20	27	27	24	21	20	20	25
160	Other Mine Owned - Vacant	2	1	1	20	80	79	78	21	20	20	25
161	Glencore Owned - Vacant	21	3	2	21	27	21	20	27	20	20	25

ID	Status	Proposed Modification			Cumulative All Sources				Cumulative (no SEOC or RCN)			Criteria
		Year 2	Year 8	Year 15	2014	Year 2	Year 8	Year 15	Year 2	Year 8	Year 15	
163	Other Mine Owned	2	1	1	19	19	19	19	19	19	19	25
164	Private - Subject to Acquisition Rights	2	1	1	19	19	19	19	19	19	19	25
165	Other Mine Owned	2	1	0	19	19	19	19	19	19	19	25
166	Other Mine Owned - Vacant	3	1	1	22	23	22	22	22	20	20	25
178	Private	0	0	0	19	19	19	19	19	19	19	25
210	Private	0	0	0	19	19	19	19	19	19	19	25
211	Private	0	0	0	19	19	19	19	19	19	19	25
212	Private	1	0	0	19	19	19	19	19	19	19	25
213	Private	1	0	0	19	19	19	19	19	19	19	25
259	Private	1	1	1	19	19	19	19	19	19	19	25
280	Private	2	2	2	19	19	19	19	19	19	19	25
281	Private	2	2	2	19	19	19	19	19	19	19	25
282	Private	2	1	1	19	19	19	19	19	19	19	25
289	Private	2	1	1	19	19	19	19	19	19	19	25
290	Private	2	1	1	19	19	19	19	19	19	19	25
291	Private	2	1	1	19	19	19	19	19	19	19	25
293	Private	1	1	0	19	19	19	19	19	19	19	25
294	Private	2	1	1	19	19	19	19	19	19	19	25
295	Private	1	1	0	19	19	19	19	19	19	19	25
296	Private	1	1	0	19	19	19	19	19	19	19	25
299	Private	1	1	0	19	19	19	19	19	19	19	25
300	Private	1	1	0	19	19	19	19	19	19	19	25
302	Private	1	1	0	19	19	19	19	19	19	19	25
303	Private	1	0	0	19	19	19	19	19	19	19	25
305	Private	1	0	0	19	19	19	19	19	19	19	25
306	Private	1	0	0	19	19	19	19	19	19	19	25
307	Private	1	0	0	19	19	19	19	19	19	19	25
308	Private	1	0	0	19	19	19	19	19	19	19	25
309	Private	1	0	0	19	19	19	19	19	19	19	25
310	Private	1	0	0	19	19	19	19	19	19	19	25
311	Private	1	0	0	19	19	19	19	19	19	19	25
312	Private	1	0	0	19	19	19	19	19	19	19	25
314	Private	1	0	0	19	19	19	19	19	19	19	25
315	Private	1	0	0	19	19	19	19	19	19	19	25
316	Private	1	0	0	19	19	19	19	19	19	19	25
317	Private	1	0	0	19	19	19	19	19	19	19	25
318	Private	1	0	0	19	19	19	19	19	19	19	25
319	Private	1	0	0	19	19	19	19	19	19	19	25
320	Private	1	0	0	19	19	19	19	19	19	19	25
321	Private	1	0	0	19	19	19	19	19	19	19	25
322	Private	1	0	0	19	19	19	19	19	19	19	25
323	Private	1	1	0	19	19	19	19	19	19	19	25
324	Private	1	1	0	19	19	19	19	19	19	19	25
325	Private	1	1	0	19	19	19	19	19	19	19	25
326	Private	1	1	0	19	19	19	19	19	19	19	25
327	Private	1	1	0	19	19	19	19	19	19	19	25
328	Private	1	0	0	19	19	19	19	19	19	19	25
329	Private	1	0	0	19	19	19	19	19	19	19	25
330	Private	1	0	0	19	19	19	19	19	19	19	25
337	Private	0	0	0	19	19	19	19	19	19	19	25
342	Private Infrastructure	2	1	1	22	23	21	21	22	21	20	25
344	Other Mine Owned	2	1	1	19	19	19	19	19	19	19	25
351	Other Mine Owned	3	1	1	20	22	22	22	20	20	20	25
352	Other Mine Owned - Vacant	2	1	1	20	23	23	23	20	20	20	25
353	Other Mine Owned	2	1	1	21	28	27	25	21	21	21	25
356	Glencore Owned - Vacant	3	1	1	24	25	21	20	24	20	20	25
357	Glencore Owned - Vacant	6	2	2	23	23	20	20	23	20	20	25
358	Glencore Owned - Vacant	6	2	1	22	23	20	20	23	20	20	25
359	Glencore Owned - Vacant	2	1	1	22	23	21	21	22	21	20	25
360	Glencore Owned - Vacant	5	4	3	19	21	21	21	20	19	19	25
361	Glencore Owned - Vacant	5	6	4	19	21	20	20	20	19	19	25
363	Glencore Owned	5	5	3	19	21	21	21	20	19	19	25
364	Other Mine Owned	2	1	1	20	28	27	26	21	20	20	25
365	Other Mine Owned - Vacant	2	1	1	20	24	23	23	21	20	20	25
366	Other Mine Owned - Vacant	2	1	1	20	24	24	23	21	20	20	25
367	Other Mine Owned	2	1	1	20	24	23	23	21	20	20	25
368	Other Mine Owned - Vacant	2	1	1	20	23	23	23	21	20	20	25
369	Other Mine Owned - Vacant	2	1	1	20	23	23	23	21	20	20	25
370	Other Mine Owned	2	1	1	20	23	23	23	21	20	20	25
371	Other Mine Owned	2	1	1	20	23	22	22	21	20	20	25
372	Other Mine Owned	2	1	1	20	23	22	22	21	20	20	25
373	Other Mine Owned - Vacant	2	1	1	20	23	23	22	21	20	20	25
374	Other Mine Owned	2	1	1	20	23	22	22	21	20	20	25
375	Other Mine Owned	2	1	1	20	23	22	22	21	20	20	25

ID	Status	Proposed Modification			Cumulative All Sources				Cumulative (no SEOC or RCN)			Criteria
		Year 2	Year 8	Year 15	2014	Year 2	Year 8	Year 15	Year 2	Year 8	Year 15	
376	Other Mine Owned	2	1	1	20	23	22	22	20	20	20	25
377	Other Mine Owned	2	1	1	20	23	22	22	20	20	20	25
378	Other Mine Owned	3	1	1	20	23	22	22	21	20	20	25
379	Other Mine Owned	2	1	1	20	23	22	22	20	20	20	25
380	Other Mine Owned	2	1	1	20	23	22	22	20	20	20	25
381	Other Mine Owned	3	1	1	20	23	22	22	20	20	20	25
382	Other Mine Owned	3	1	1	20	23	22	22	20	20	20	25
383	Other Mine Owned	3	1	1	20	23	22	22	21	20	20	25
384	Other Mine Owned	3	1	1	20	22	22	22	20	20	20	25
385	Other Mine Owned	3	1	1	20	22	22	22	20	20	20	25
386	Other Mine Owned	3	1	1	20	22	22	22	20	20	20	25
387	Other Mine Owned	3	1	1	20	23	22	22	21	20	20	25
388	Other Mine Owned	3	1	1	20	23	22	22	21	20	20	25
389	Other Mine Owned - Vacant	3	1	1	20	23	22	22	21	20	20	25
390	Other Mine Owned	3	1	1	20	23	22	22	21	20	20	25
391	Other Mine Owned	3	1	1	20	22	22	21	20	20	20	25
392	Other Mine Owned - Vacant	3	1	1	20	22	22	22	20	20	20	25
394	Other Mine Owned	2	1	1	20	23	22	22	21	20	20	25
395	Other Mine Owned	2	1	1	20	23	22	22	21	20	20	25
396	Other Mine Owned	2	1	1	20	23	22	22	21	20	20	25
397	Other Mine Owned	2	1	1	20	23	22	22	21	20	20	25
398	Other Mine Owned	2	1	1	20	23	22	22	21	20	20	25
399	Other Mine Owned	2	1	1	20	23	22	22	21	20	20	25
400	Other Mine Owned	2	1	1	20	23	22	22	21	20	20	25
401	Other Mine Owned	2	1	1	20	23	22	22	21	20	20	25
402	Other Mine Owned	2	1	1	20	22	22	22	21	20	20	25
403	Other Mine Owned	2	1	1	20	22	22	22	21	20	20	25
404	Other Mine Owned - Vacant	1	1	0	22	23	23	22	21	21	20	25
405	Other Mine Owned - Vacant	2	1	1	21	23	22	22	21	20	20	25
406	Other Mine Owned - Vacant	2	1	1	20	37	36	33	21	20	20	25
407	Other Mine Owned - Vacant	3	1	1	20	22	22	22	20	20	20	25
408	Other Mine Owned	2	1	1	20	23	22	22	20	20	20	25
409	Glencore Owned - Vacant	2	1	1	22	23	21	21	22	21	20	25
410	Glencore Owned - Vacant	3	3	1	21	21	20	20	21	20	20	25
411	Glencore Owned - Vacant	3	3	2	21	22	21	20	22	20	20	25
412	Community Infrastructure	3	2	1	20	21	20	19	21	20	19	25
007a	Private	4	5	3	19	20	20	20	19	19	19	25
007b	Private	4	5	3	19	20	20	20	19	19	19	25
007c	Private	4	4	3	19	20	20	20	19	19	19	25
015a	Private	4	3	1	19	19	19	19	19	19	19	25
015b	Private	4	3	2	19	19	19	19	19	19	19	25
044a	Private	1	1	0	19	19	19	19	19	19	19	25
044b	Private	1	0	0	19	19	19	19	19	19	19	25
056a	Private	1	0	0	19	19	19	19	19	19	19	25
056b	Private	1	0	0	19	19	19	19	19	19	19	25
063a	Community Infrastructure	2	1	1	19	19	19	19	19	19	19	25
069a	Private	1	1	1	19	19	19	19	19	19	19	25
102a	Private	3	3	2	19	19	19	19	19	19	19	25
102b	Private	3	3	2	19	19	19	19	19	19	19	25
127a	Private - Subject to Acquisition Rights	2	1	1	20	22	22	22	20	20	20	25
127b	Private - Subject to Acquisition Rights	3	2	1	20	23	22	22	20	20	20	25
127c	Private - Subject to Acquisition Rights	4	2	1	20	22	22	22	20	20	20	25
127d	Private - Subject to Acquisition Rights	4	2	1	20	22	22	22	20	20	20	25
144a	Private - Subject to Acquisition Rights	1	1	0	20	30	28	27	20	20	20	25
144b	Private - Subject to Acquisition Rights	1	0	0	19	21	21	20	20	20	19	25
144c	Private - Subject to Acquisition Rights	1	0	0	19	21	21	20	20	19	19	25
162a	Glencore Owned - Vacant	6	5	2	19	20	20	19	20	20	19	25
162b	Private	2	1	1	19	19	19	19	19	19	19	25
17a	Private	2	2	1	19	19	19	19	19	19	19	25
17b	Private	2	2	1	19	19	19	19	19	19	19	25
292a	Private	2	1	1	19	19	19	19	19	19	19	25
292b	Private	2	1	1	19	19	19	19	19	19	19	25
297a	Private	1	1	0	19	19	19	19	19	19	19	25
297b	Private	1	1	0	19	19	19	19	19	19	19	25
297c	Private	1	1	0	19	19	19	19	19	19	19	25
297d	Private	1	1	0	19	19	19	19	19	19	19	25
349a	Private	1	0	0	19	19	19	19	19	19	19	25
349b	Private	1	0	0	19	19	19	19	19	19	19	25
-												
Annual average PM2.5 (ug/m3)												
1	Other Mine Owned - Vacant	0.7	0.5	0.4	7	11	10	10	7	6	6	8
2	Community Infrastructure	0.7	0.6	0.4	7	9	9	9	7	6	6	8
3	Other Mine Owned	0.7	0.6	0.5	7	9	9	8	7	6	6	8
4	Private	0.9	0.8	0.6	7	8	8	7	7	7	6	8

ID	Status	Proposed Modification			Cumulative All Sources				Cumulative (no SEOC or RCN)			Criteria
		Year 2	Year 8	Year 15	2014	Year 2	Year 8	Year 15	Year 2	Year 8	Year 15	
5	Private - Subject to Acquisition Rights	0.8	0.6	0.5	7	8	8	8	7	6	6	8
6	Community Infrastructure	0.8	0.6	0.5	7	8	8	7	7	6	6	8
10	Private	0.9	0.9	0.6	7	7	7	7	7	7	6	8
11	Private	0.9	0.9	0.5	7	7	7	7	7	7	6	8
12	Private	0.9	0.9	0.6	7	7	7	7	7	7	6	8
13	Private	0.7	0.7	0.4	6	7	7	6	7	6	6	8
14	Private	0.6	0.6	0.3	6	7	6	6	6	6	6	8
19	Private	1.0	1.1	0.6	7	7	7	7	7	7	6	8
21	Private - Subject to Acquisition Rights	1.1	1.1	0.7	7	8	7	7	7	7	6	8
22	Private - Subject to Acquisition Rights	1.0	1.1	0.7	7	8	7	7	7	7	6	8
23	Private - Subject to Acquisition Rights	1.2	1.2	0.8	7	8	7	7	7	7	6	8
24	Glencore Owned	1.3	1.4	0.9	7	8	8	7	7	7	6	8
25	Glencore Owned	1.4	1.5	0.9	7	8	8	7	7	7	7	8
26	Glencore Owned	1.3	1.5	0.9	7	8	8	7	7	7	7	8
27	Glencore Owned	1.4	1.6	1.0	7	8	8	7	7	7	7	8
28	Glencore Owned	1.5	1.8	1.1	7	8	8	7	8	8	7	8
29	Glencore Owned	1.6	1.9	1.2	7	8	8	7	8	8	7	8
30	Glencore Owned	2.4	3.7	2.5	7	9	10	9	8	9	8	8
31	Glencore Owned	2.4	3.9	2.4	7	9	10	8	8	10	8	8
32	Glencore Owned	1.8	2.4	1.3	7	8	8	7	8	8	7	8
33	Glencore Owned	1.5	1.7	0.9	7	8	8	7	7	7	7	8
34	Glencore Owned	1.3	1.4	0.8	7	7	7	7	7	7	6	8
35	Glencore Owned - Vacant	1.2	1.4	0.7	7	7	7	7	7	7	6	8
36	Glencore Owned	1.5	1.8	1.0	7	8	8	7	7	7	7	8
37	Glencore Owned - Vacant	2.2	2.9	1.5	7	8	9	7	8	9	7	8
38	Glencore Owned	2.5	3.9	2.0	7	9	10	8	8	10	8	8
39	Glencore Owned	2.2	3.2	1.7	7	8	9	8	8	9	7	8
40	Glencore Owned	0.7	0.7	0.3	6	7	6	6	6	6	6	8
41	Private	0.2	0.1	0.1	6	6	6	6	6	6	6	8
42	Private	0.2	0.1	0.1	6	6	6	6	6	6	6	8
43	Private	0.1	0.1	0.0	6	6	6	6	6	6	6	8
45	Private	0.1	0.1	0.0	6	6	6	6	6	6	6	8
46	Private	0.1	0.1	0.0	6	6	6	6	6	6	6	8
47	Private	0.1	0.1	0.1	6	6	6	6	6	6	6	8
48	Private	0.2	0.1	0.1	6	6	6	6	6	6	6	8
49	Private	0.1	0.1	0.0	6	6	6	6	6	6	6	8
50	Private	0.1	0.1	0.0	6	6	6	6	6	6	6	8
51	Private	0.2	0.1	0.1	6	6	6	6	6	6	6	8
52	Private	0.1	0.1	0.1	6	6	6	6	6	6	6	8
53	Private	0.1	0.1	0.0	6	6	6	6	6	6	6	8
54	Private	0.1	0.1	0.0	6	6	6	6	6	6	6	8
55	Private	0.1	0.1	0.0	6	6	6	6	6	6	6	8
57	Private	0.1	0.1	0.0	6	6	6	6	6	6	6	8
58	Private	0.1	0.1	0.1	6	6	6	6	6	6	6	8
59	Private	0.2	0.1	0.1	6	6	6	6	6	6	6	8
60	Private	0.2	0.1	0.1	6	6	6	6	6	6	6	8
61	Private	0.2	0.1	0.1	6	6	6	6	6	6	6	8
62	Private	0.2	0.1	0.1	6	6	6	6	6	6	6	8
73	Private	0.2	0.2	0.1	6	6	6	6	6	6	6	8
74	Private	0.4	0.3	0.2	6	6	6	6	6	6	6	8
83	Private	0.4	0.3	0.2	6	6	6	6	6	6	6	8
85	Private	0.3	0.3	0.2	6	6	6	6	6	6	6	8
86	Private	0.4	0.3	0.2	6	6	6	6	6	6	6	8
87	Private	0.4	0.3	0.2	6	6	6	6	6	6	6	8
88	Private	0.5	0.4	0.2	6	7	6	6	6	6	6	8
89	Private	0.5	0.4	0.3	6	7	6	6	6	6	6	8
90	Other Mine Owned	0.5	0.4	0.3	6	7	6	6	6	6	6	8
91	Private	0.6	0.5	0.3	6	7	7	6	6	6	6	8
92	Private	0.7	0.6	0.4	6	7	7	7	7	6	6	8
93	Private	0.7	0.7	0.4	6	7	7	6	7	6	6	8
94	Private	0.6	0.6	0.3	6	7	6	6	6	6	6	8
95	Private	0.5	0.5	0.3	6	7	6	6	6	6	6	8
96	Private	0.4	0.3	0.2	6	7	6	6	6	6	6	8
97	Private	0.4	0.3	0.2	6	7	6	6	6	6	6	8
98	Private	0.4	0.4	0.2	6	7	6	6	6	6	6	8
99	Private	0.5	0.4	0.3	6	7	7	6	6	6	6	8
100	Private	0.5	0.4	0.3	6	7	7	7	6	6	6	8
101	Private	0.4	0.4	0.2	6	7	7	7	6	6	6	8
104	Other Mine Owned	0.4	0.3	0.2	6	7	7	7	6	6	6	8
105	Private - Subject to Acquisition Rights	0.9	0.6	0.5	7	8	8	7	7	6	6	8
107	Private Infrastructure	0.7	0.4	0.3	8	9	8	8	8	7	6	8
108	Glencore Owned	0.6	0.4	0.3	8	10	8	8	8	7	7	8
109	Glencore Owned	0.6	0.4	0.3	8	9	8	8	8	7	6	8
110	Other Mine Owned - Vacant	0.4	0.2	0.2	8	11	10	9	8	7	7	8

ID	Status	Proposed Modification			Cumulative All Sources				Cumulative (no SEOC or RCN)			Criteria
		Year 2	Year 8	Year 15	2014	Year 2	Year 8	Year 15	Year 2	Year 8	Year 15	
111	Private - Subject to Acquisition Rights	0.4	0.2	0.2	8	12	11	11	8	7	7	8
112	Private	1.0	1.0	0.7	7	8	7	7	7	7	6	8
114	Private - Subject to Acquisition Rights	1.1	1.1	0.8	7	8	8	7	7	7	7	8
115	Private - Subject to Acquisition Rights	1.3	1.3	1.0	7	9	8	8	8	7	7	8
116	Glencore Owned	1.1	1.0	0.8	7	8	8	7	7	7	7	8
117	Glencore Owned	1.3	1.1	0.9	7	9	8	8	8	7	7	8
120	Glencore Owned - Vacant	1.1	0.8	0.6	7	9	8	8	8	7	7	8
121	Glencore Owned - Vacant	1.0	0.6	0.5	8	9	8	8	8	7	6	8
122	Private - Subject to Acquisition Rights	1.1	0.6	0.5	8	9	8	8	8	7	7	8
123	Glencore Owned - Vacant	1.0	0.6	0.5	7	9	8	8	8	7	6	8
124	Glencore Owned	0.9	0.5	0.4	8	9	8	8	8	7	6	8
125	Glencore Owned	1.0	0.5	0.4	8	10	8	8	8	7	7	8
126	Glencore Owned	0.8	0.4	0.3	8	9	8	8	8	7	6	8
129	Glencore Owned	0.6	0.3	0.2	10	12	9	8	10	7	7	8
130	Glencore Owned	0.5	0.3	0.2	10	12	9	9	10	7	7	8
131	Glencore Owned - Vacant	1.4	0.4	0.2	7	8	6	6	8	6	6	8
132	Glencore Owned - Vacant	1.2	0.4	0.2	7	8	6	6	8	6	6	8
133	Private - Subject to Acquisition Rights	0.5	0.2	0.1	6	7	6	6	7	6	6	8
143	Private - Subject to Acquisition Rights	0.3	0.2	0.1	8	10	9	9	8	7	7	8
145	Private - Subject to Acquisition Rights	0.1	0.1	0.1	8	21	20	20	8	8	7	8
146	Other Mine Owned	0.2	0.1	0.1	8	11	10	10	8	7	7	8
147	Private - Subject to Acquisition Rights	0.2	0.1	0.1	9	13	12	12	9	9	8	8
148	Other Mine Owned	0.2	0.1	0.1	8	12	12	11	9	8	8	8
149	Community Infrastructure	0.3	0.1	0.1	8	11	10	10	8	7	7	8
150	Private - Subject to Acquisition Rights	0.3	0.2	0.1	8	11	10	9	8	7	7	8
151	Other Mine Owned	0.3	0.2	0.1	8	11	9	9	8	7	7	8
152	Private - Subject to Acquisition Rights	0.3	0.2	0.1	8	11	10	9	9	7	7	8
154	Private - Subject to Acquisition Rights	0.3	0.2	0.1	8	11	9	9	9	7	7	8
155	Private - Subject to Acquisition Rights	0.4	0.2	0.1	8	10	9	9	9	7	7	8
156	Private - Subject to Acquisition Rights	0.4	0.2	0.1	8	10	9	8	9	7	7	8
157	Glencore Owned - Vacant	0.7	0.4	0.3	9	10	8	8	9	7	7	8
158	Other Mine Owned - Vacant	0.2	0.1	0.1	8	56	56	56	8	8	7	8
159	Other Mine Owned - Vacant	0.2	0.1	0.1	8	13	12	12	9	8	8	8
160	Other Mine Owned - Vacant	0.2	0.1	0.1	8	33	33	32	8	8	7	8
161	Glencore Owned - Vacant	6.0	0.7	0.4	8	13	7	6	13	6	6	8
163	Other Mine Owned	0.3	0.1	0.1	6	7	7	7	7	6	6	8
164	Private - Subject to Acquisition Rights	0.2	0.1	0.1	6	7	7	7	7	6	6	8
165	Other Mine Owned	0.2	0.1	0.1	6	7	7	7	7	6	6	8
166	Other Mine Owned - Vacant	0.4	0.2	0.1	10	12	9	9	10	7	7	8
178	Private	0.1	0.1	0.0	6	6	6	6	6	6	5	8
210	Private	0.1	0.0	0.0	6	6	6	6	6	6	5	8
211	Private	0.1	0.1	0.0	6	6	6	6	6	6	5	8
212	Private	0.1	0.1	0.0	6	6	6	6	6	6	6	8
213	Private	0.1	0.1	0.0	6	6	6	6	6	6	5	8
259	Private	0.3	0.2	0.1	6	6	6	6	6	6	6	8
280	Private	0.3	0.2	0.2	6	7	7	7	6	6	6	8
281	Private	0.3	0.2	0.2	6	7	7	7	6	6	6	8
282	Private	0.3	0.2	0.1	6	8	7	7	7	6	6	8
289	Private	0.2	0.1	0.1	6	7	7	6	6	6	6	8
290	Private	0.3	0.1	0.1	6	7	7	7	6	6	6	8
291	Private	0.3	0.1	0.1	6	7	7	7	6	6	6	8
293	Private	0.2	0.1	0.1	6	7	7	7	7	6	6	8
294	Private	0.2	0.1	0.1	6	7	7	7	6	6	6	8
295	Private	0.2	0.1	0.1	6	7	7	7	6	6	6	8
296	Private	0.2	0.1	0.1	6	7	7	7	6	6	6	8
299	Private	0.1	0.1	0.0	6	7	7	7	7	6	6	8
300	Private	0.1	0.1	0.0	7	7	7	7	7	6	6	8
302	Private	0.1	0.1	0.0	7	7	7	7	7	6	6	8
303	Private	0.1	0.0	0.0	6	7	6	6	6	6	6	8
305	Private	0.1	0.0	0.0	6	7	7	6	6	6	6	8
306	Private	0.1	0.0	0.0	6	7	7	7	6	6	6	8
307	Private	0.1	0.0	0.0	6	7	7	7	6	6	6	8
308	Private	0.1	0.0	0.0	6	7	7	7	6	6	6	8
309	Private	0.1	0.0	0.0	6	7	7	7	6	6	6	8
310	Private	0.1	0.0	0.0	6	7	7	7	6	6	6	8
311	Private	0.1	0.0	0.0	6	7	7	7	6	6	6	8
312	Private	0.1	0.0	0.0	6	7	7	7	6	6	6	8
314	Private	0.1	0.0	0.0	6	7	7	7	6	6	6	8
315	Private	0.1	0.0	0.0	6	7	7	7	7	6	6	8
316	Private	0.1	0.0	0.0	6	7	7	7	7	6	6	8
317	Private	0.1	0.0	0.0	6	7	7	7	7	6	6	8
318	Private	0.1	0.0	0.0	6	7	7	7	7	6	6	8
319	Private	0.1	0.0	0.0	6	7	7	7	7	6	6	8
320	Private	0.1	0.0	0.0	6	7	7	7	7	6	6	8

ID	Status	Proposed Modification			Cumulative All Sources				Cumulative (no SEOC or RCN)			Criteria
		Year 2	Year 8	Year 15	2014	Year 2	Year 8	Year 15	Year 2	Year 8	Year 15	
321	Private	0.1	0.0	0.0	6	7	7	7	7	6	6	8
322	Private	0.1	0.0	0.0	6	7	7	7	7	6	6	8
323	Private	0.1	0.0	0.0	7	7	7	7	7	6	6	8
324	Private	0.1	0.1	0.0	7	7	7	7	7	6	6	8
325	Private	0.1	0.1	0.0	7	8	7	7	7	6	6	8
326	Private	0.1	0.0	0.0	7	7	7	7	7	6	6	8
327	Private	0.1	0.0	0.0	7	7	7	7	7	6	6	8
328	Private	0.1	0.0	0.0	7	7	7	7	7	6	6	8
329	Private	0.1	0.0	0.0	7	7	7	7	7	6	6	8
330	Private	0.1	0.0	0.0	7	7	7	7	7	6	6	8
337	Private	0.0	0.0	0.0	6	6	6	5	6	5	5	8
342	Private Infrastructure	0.4	0.2	0.1	10	11	8	8	10	7	7	8
344	Other Mine Owned	0.2	0.1	0.1	6	7	7	7	7	6	6	8
351	Other Mine Owned	0.3	0.2	0.1	8	11	9	9	9	7	7	8
352	Other Mine Owned - Vacant	0.2	0.1	0.1	8	12	11	11	8	7	7	8
353	Other Mine Owned	0.2	0.1	0.1	8	13	12	12	9	8	8	8
356	Glencore Owned - Vacant	0.8	0.3	0.2	11	12	7	7	12	7	6	8
357	Glencore Owned - Vacant	1.3	0.3	0.2	11	11	7	7	11	6	6	8
358	Glencore Owned - Vacant	1.1	0.2	0.2	10	11	7	6	11	6	6	8
359	Glencore Owned - Vacant	0.4	0.2	0.1	10	11	8	8	10	7	7	8
360	Glencore Owned - Vacant	1.2	0.9	0.7	7	9	8	8	8	7	7	8
361	Glencore Owned - Vacant	1.3	1.4	1.0	7	8	8	8	8	7	7	8
363	Glencore Owned	1.2	1.0	0.8	7	9	8	8	8	7	7	8
364	Other Mine Owned	0.2	0.1	0.1	8	14	14	13	8	8	7	8
365	Other Mine Owned - Vacant	0.3	0.1	0.1	8	12	11	11	8	7	7	8
366	Other Mine Owned - Vacant	0.2	0.1	0.1	8	12	11	11	8	7	7	8
367	Other Mine Owned	0.3	0.1	0.1	8	12	11	11	8	7	7	8
368	Other Mine Owned - Vacant	0.3	0.1	0.1	8	12	11	10	8	7	7	8
369	Other Mine Owned - Vacant	0.3	0.1	0.1	8	12	11	11	8	8	7	8
370	Other Mine Owned	0.3	0.1	0.1	8	12	11	11	8	8	7	8
371	Other Mine Owned	0.3	0.2	0.1	8	12	10	10	9	8	7	8
372	Other Mine Owned	0.3	0.2	0.1	8	11	10	10	9	8	7	8
373	Other Mine Owned - Vacant	0.3	0.2	0.1	8	11	10	10	9	7	7	8
374	Other Mine Owned	0.3	0.2	0.1	8	11	10	10	9	8	7	8
375	Other Mine Owned	0.3	0.2	0.1	8	11	10	10	9	7	7	8
376	Other Mine Owned	0.3	0.2	0.1	8	11	9	9	8	7	7	8
377	Other Mine Owned	0.3	0.2	0.1	8	11	9	9	9	7	7	8
378	Other Mine Owned	0.3	0.2	0.1	8	11	9	9	9	7	7	8
379	Other Mine Owned	0.3	0.2	0.1	8	11	9	9	8	7	7	8
380	Other Mine Owned	0.3	0.2	0.1	8	11	9	9	8	7	7	8
381	Other Mine Owned	0.3	0.2	0.1	8	11	9	9	9	7	7	8
382	Other Mine Owned	0.3	0.2	0.1	8	11	9	9	9	7	7	8
383	Other Mine Owned	0.3	0.2	0.1	8	11	9	9	9	7	7	8
384	Other Mine Owned	0.3	0.2	0.1	8	11	9	9	9	7	7	8
385	Other Mine Owned	0.3	0.2	0.1	8	11	9	9	9	7	7	8
386	Other Mine Owned	0.3	0.2	0.1	8	11	9	9	9	7	7	8
387	Other Mine Owned	0.3	0.2	0.1	8	11	9	9	9	7	7	8
388	Other Mine Owned	0.3	0.2	0.1	8	11	9	9	9	7	7	8
389	Other Mine Owned - Vacant	0.3	0.2	0.1	8	11	9	9	9	7	7	8
390	Other Mine Owned	0.3	0.2	0.1	8	11	9	9	9	7	7	8
391	Other Mine Owned	0.4	0.2	0.1	8	10	9	9	9	7	7	8
392	Other Mine Owned - Vacant	0.4	0.2	0.1	8	11	9	9	9	7	7	8
394	Other Mine Owned	0.3	0.2	0.1	8	12	10	10	9	8	7	8
395	Other Mine Owned	0.3	0.2	0.1	8	12	10	10	9	8	7	8
396	Other Mine Owned	0.3	0.2	0.1	8	11	10	10	9	8	7	8
397	Other Mine Owned	0.3	0.2	0.1	8	11	10	10	9	8	7	8
398	Other Mine Owned	0.3	0.2	0.1	8	11	10	10	9	8	7	8
399	Other Mine Owned	0.3	0.2	0.1	8	11	10	10	9	8	7	8
400	Other Mine Owned	0.3	0.2	0.1	8	11	10	10	9	8	7	8
401	Other Mine Owned	0.3	0.2	0.1	8	11	10	10	9	8	7	8
402	Other Mine Owned	0.3	0.1	0.1	8	11	10	10	8	8	7	8
403	Other Mine Owned	0.3	0.2	0.1	8	11	10	10	9	8	7	8
404	Other Mine Owned - Vacant	0.2	0.1	0.1	9	12	11	11	10	9	9	8
405	Other Mine Owned - Vacant	0.2	0.1	0.1	9	12	10	10	10	8	8	8
406	Other Mine Owned - Vacant	0.2	0.1	0.1	8	14	14	13	9	8	8	8
407	Other Mine Owned - Vacant	0.3	0.2	0.1	8	11	9	9	9	7	7	8
408	Other Mine Owned	0.3	0.2	0.1	8	11	9	9	8	7	7	8
409	Glencore Owned - Vacant	0.4	0.2	0.1	10	11	8	8	10	7	7	8
410	Glencore Owned - Vacant	0.9	0.5	0.2	7	7	6	6	7	6	6	8
411	Glencore Owned - Vacant	1.1	0.5	0.3	7	7	6	6	7	6	6	8
412	Community Infrastructure	0.6	0.2	0.1	6	7	6	6	7	6	6	8
007a	Private	0.8	0.7	0.5	7	8	7	7	7	6	6	8
007b	Private	0.8	0.7	0.5	7	8	7	7	7	6	6	8
007c	Private	0.8	0.7	0.5	6	8	7	7	7	6	6	8

ID	Status	Proposed Modification			Cumulative All Sources				Cumulative (no SEOC or RCN)			Criteria
		Year 2	Year 8	Year 15	2014	Year 2	Year 8	Year 15	Year 2	Year 8	Year 15	
015a	Private	0.6	0.5	0.3	6	7	6	6	6	6	6	8
015b	Private	0.6	0.5	0.3	6	7	6	6	6	6	6	8
044a	Private	0.1	0.1	0.0	6	6	6	6	6	6	6	8
044b	Private	0.1	0.1	0.0	6	6	6	6	6	6	6	8
056a	Private	0.1	0.1	0.0	6	6	6	6	6	6	6	8
056b	Private	0.1	0.1	0.0	6	6	6	6	6	6	6	8
063a	Community Infrastructure	0.2	0.1	0.1	6	6	6	6	6	6	6	8
069a	Private	0.2	0.1	0.1	6	6	6	6	6	6	6	8
102a	Private	0.4	0.3	0.2	6	7	7	7	6	6	6	8
102b	Private	0.4	0.3	0.2	6	7	7	7	6	6	6	8
127a	Private - Subject to Acquisition Rights	0.3	0.2	0.1	8	11	10	10	8	7	7	8
127b	Private - Subject to Acquisition Rights	0.4	0.2	0.2	8	11	9	9	9	7	7	8
127c	Private - Subject to Acquisition Rights	0.5	0.2	0.2	9	11	9	9	10	7	7	8
127d	Private - Subject to Acquisition Rights	0.5	0.3	0.2	9	12	9	9	10	7	7	8
144a	Private - Subject to Acquisition Rights	0.1	0.1	0.0	8	14	13	13	9	8	8	8
144b	Private - Subject to Acquisition Rights	0.1	0.1	0.0	7	9	9	8	8	8	7	8
144c	Private - Subject to Acquisition Rights	0.1	0.1	0.0	7	9	9	8	8	8	7	8
162a	Glencore Owned - Vacant	0.9	0.9	0.5	6	7	7	6	7	6	6	8
162b	Private	0.2	0.1	0.1	6	6	6	6	6	6	6	8
17a	Private	0.5	0.5	0.3	6	6	6	6	6	6	6	8
17b	Private	0.5	0.5	0.3	6	6	6	6	6	6	6	8
292a	Private	0.2	0.1	0.1	6	7	7	7	6	6	6	8
292b	Private	0.2	0.1	0.1	6	7	7	7	6	6	6	8
297a	Private	0.1	0.1	0.0	6	7	7	7	7	6	6	8
297b	Private	0.1	0.1	0.0	6	7	7	7	7	6	6	8
297c	Private	0.1	0.1	0.0	6	7	7	7	7	6	6	8
297d	Private	0.1	0.1	0.0	6	7	7	7	6	6	6	8
349a	Private	0.1	0.0	0.0	6	7	7	7	6	6	6	8
349b	Private	0.1	0.0	0.0	6	7	7	7	6	6	6	8
-												
Annual average TSP (ug/m3)												
1	Other Mine Owned - Vacant	3.0	2.2	1.7	70	83	82	81	72	71	70	90
2	Community Infrastructure	3.1	2.0	1.7	71	79	77	76	72	71	70	90
3	Other Mine Owned	3.2	2.5	2.0	71	78	76	75	72	71	70	90
4	Private	4.1	3.3	2.7	71	75	74	73	73	72	71	90
5	Private - Subject to Acquisition Rights	3.4	2.7	2.1	71	76	74	74	73	71	70	90
6	Community Infrastructure	3.5	2.9	2.2	71	75	74	73	73	71	71	90
10	Private	4.6	4.6	3.0	71	74	74	72	73	73	71	90
11	Private	4.6	4.7	3.0	71	74	74	72	73	73	71	90
12	Private	4.8	4.9	3.2	71	74	74	72	74	73	71	90
13	Private	3.8	3.6	2.1	71	72	72	70	72	72	70	90
14	Private	3.1	2.9	1.7	70	72	71	70	72	71	70	90
19	Private	5.4	5.7	3.5	71	74	74	72	74	74	72	90
21	Private - Subject to Acquisition Rights	5.5	5.8	3.7	71	75	75	72	74	74	72	90
22	Private - Subject to Acquisition Rights	5.3	5.6	3.6	71	75	74	72	74	74	72	90
23	Private - Subject to Acquisition Rights	5.8	6.3	4.1	72	75	75	73	75	75	72	90
24	Glencore Owned	6.4	7.1	4.5	72	76	76	73	75	75	73	90
25	Glencore Owned	6.8	7.8	4.9	72	76	76	74	75	76	73	90
26	Glencore Owned	6.8	7.7	4.8	72	76	76	73	75	76	73	90
27	Glencore Owned	6.9	7.9	5.3	72	76	77	74	76	76	74	90
28	Glencore Owned	7.6	9.0	5.8	72	77	78	75	76	77	74	90
29	Glencore Owned	7.7	9.2	6.4	72	77	78	75	77	78	75	90
30	Glencore Owned	11.1	16.5	13.4	74	81	85	82	80	85	82	90
31	Glencore Owned	12.2	18.4	13.9	74	81	87	83	81	87	82	90
32	Glencore Owned	9.0	10.5	6.5	73	78	79	75	78	79	75	90
33	Glencore Owned	7.1	7.5	4.5	73	76	76	73	76	76	73	90
34	Glencore Owned	6.1	6.0	3.4	72	75	74	72	75	74	72	90
35	Glencore Owned - Vacant	5.8	5.5	3.2	72	75	74	72	74	74	71	90
36	Glencore Owned	7.2	7.5	4.4	73	76	76	73	76	76	73	90
37	Glencore Owned - Vacant	9.8	11.1	7.3	74	79	79	76	78	79	75	90
38	Glencore Owned	13.6	18.4	12.0	75	83	87	80	82	87	80	90
39	Glencore Owned	11.7	14.9	9.4	74	81	83	78	80	83	78	90
40	Glencore Owned	2.2	1.6	0.8	70	71	70	69	71	70	69	90
41	Private	0.5	0.3	0.2	68	69	68	68	69	68	68	90
42	Private	0.5	0.3	0.2	68	69	68	68	69	68	68	90
43	Private	0.3	0.2	0.1	68	68	68	68	68	68	68	90
45	Private	0.3	0.2	0.1	68	68	68	68	68	68	68	90
46	Private	0.3	0.2	0.1	68	68	68	68	68	68	68	90
47	Private	0.3	0.2	0.1	68	68	68	68	68	68	68	90
48	Private	0.4	0.3	0.1	68	69	68	68	69	68	68	90
49	Private	0.2	0.1	0.1	68	68	68	68	68	68	68	90
50	Private	0.3	0.2	0.1	68	68	68	68	68	68	68	90
51	Private	0.4	0.2	0.1	68	69	68	68	69	68	68	90
52	Private	0.3	0.2	0.1	68	68	68	68	68	68	68	90

ID	Status	Proposed Modification			Cumulative All Sources				Cumulative (no SEOC or RCN)			Criteria
		Year 2	Year 8	Year 15	2014	Year 2	Year 8	Year 15	Year 2	Year 8	Year 15	
53	Private	0.2	0.2	0.1	68	68	68	68	68	68	68	90
54	Private	0.3	0.2	0.1	68	68	68	68	68	68	68	90
55	Private	0.2	0.2	0.1	68	68	68	68	68	68	68	90
57	Private	0.2	0.1	0.1	68	68	68	68	68	68	68	90
58	Private	0.4	0.2	0.1	68	69	68	68	69	68	68	90
59	Private	0.5	0.3	0.1	68	69	68	68	69	68	68	90
60	Private	0.4	0.3	0.1	68	69	68	68	69	68	68	90
61	Private	0.4	0.3	0.1	68	69	68	68	69	68	68	90
62	Private	0.5	0.3	0.2	68	69	68	68	69	68	68	90
73	Private	0.9	0.7	0.4	69	69	69	68	69	69	68	90
74	Private	1.8	1.4	0.8	69	70	70	69	70	70	69	90
83	Private	1.9	1.7	1.0	69	70	70	69	70	70	69	90
85	Private	1.7	1.5	0.9	69	70	70	69	70	70	69	90
86	Private	1.9	1.7	1.1	70	71	70	69	70	70	69	90
87	Private	2.0	1.8	1.1	70	71	70	69	70	70	69	90
88	Private	2.3	2.1	1.3	70	71	70	70	71	70	69	90
89	Private	2.5	2.2	1.4	70	71	71	70	71	70	70	90
90	Other Mine Owned	2.6	2.4	1.5	70	72	71	70	71	71	70	90
91	Private	2.9	2.6	1.7	70	72	71	70	72	71	70	90
92	Private	3.4	3.1	2.1	70	73	72	71	72	71	70	90
93	Private	3.8	3.7	2.3	71	73	72	71	72	72	70	90
94	Private	3.1	3.0	1.8	70	72	71	70	72	71	70	90
95	Private	2.8	2.6	1.5	70	72	71	70	71	71	70	90
96	Private	2.0	1.7	1.1	70	71	70	70	71	70	69	90
97	Private	2.1	1.8	1.2	70	71	70	70	71	70	69	90
98	Private	2.2	2.0	1.3	70	71	70	70	71	70	69	90
99	Private	2.4	2.1	1.4	70	72	71	70	71	70	70	90
100	Private	2.4	2.0	1.4	70	72	71	71	71	70	70	90
101	Private	2.1	1.8	1.2	70	72	71	70	71	70	69	90
104	Other Mine Owned	2.0	1.5	1.1	70	73	72	71	71	70	69	90
105	Private - Subject to Acquisition Rights	3.4	1.8	1.7	71	76	74	73	73	70	70	90
107	Private Infrastructure	1.8	0.4	0.3	74	79	76	76	75	72	72	90
108	Glencore Owned	1.1	0.3	0.2	74	77	74	74	74	71	71	90
109	Glencore Owned	1.1	0.3	0.2	73	77	74	73	74	71	70	90
110	Other Mine Owned - Vacant	0.5	0.2	0.1	73	81	78	77	74	71	71	90
111	Private - Subject to Acquisition Rights	0.4	0.1	0.1	73	85	83	82	73	70	70	90
112	Private	5.0	4.9	3.6	71	75	74	73	74	73	72	90
114	Private - Subject to Acquisition Rights	4.7	4.0	3.4	71	76	74	74	74	72	72	90
115	Private - Subject to Acquisition Rights	5.1	4.3	3.8	71	76	75	74	74	73	72	90
116	Glencore Owned	4.4	3.1	2.8	71	76	74	74	74	72	71	90
117	Glencore Owned	4.6	2.8	2.8	71	76	74	74	74	71	71	90
120	Glencore Owned - Vacant	3.9	1.2	1.3	71	77	73	74	74	70	70	90
121	Glencore Owned - Vacant	3.0	0.6	0.5	73	77	73	73	74	70	70	90
122	Private - Subject to Acquisition Rights	3.2	0.6	0.6	73	77	73	73	74	70	70	90
123	Glencore Owned - Vacant	3.3	0.7	0.7	72	77	73	73	74	70	70	90
124	Glencore Owned	2.3	0.5	0.4	73	77	73	73	74	70	70	90
125	Glencore Owned	2.0	0.4	0.3	73	77	73	73	74	71	70	90
126	Glencore Owned	1.6	0.4	0.3	73	77	73	73	74	71	70	90
129	Glencore Owned	0.4	0.2	0.1	78	82	74	74	78	70	70	90
130	Glencore Owned	0.4	0.2	0.1	78	82	74	74	78	70	70	90
131	Glencore Owned - Vacant	6.7	2.8	1.7	73	77	71	70	76	71	70	90
132	Glencore Owned - Vacant	6.0	2.3	1.4	73	76	71	70	76	71	70	90
133	Private - Subject to Acquisition Rights	2.5	1.3	0.8	70	71	70	69	71	69	69	90
143	Private - Subject to Acquisition Rights	0.2	0.1	0.1	73	78	75	75	73	71	70	90
145	Private - Subject to Acquisition Rights	0.1	0.0	0.0	73	120	119	119	75	75	74	90
146	Other Mine Owned	0.1	0.1	0.0	72	77	76	76	73	72	72	90
147	Private - Subject to Acquisition Rights	0.1	0.1	0.0	73	80	80	79	74	74	73	90
148	Other Mine Owned	0.1	0.1	0.0	73	80	79	79	73	73	72	90
149	Community Infrastructure	0.2	0.1	0.0	73	79	78	78	72	72	71	90
150	Private - Subject to Acquisition Rights	0.2	0.1	0.1	73	78	77	77	72	71	71	90
151	Other Mine Owned	0.2	0.1	0.1	73	78	77	77	72	71	71	90
152	Private - Subject to Acquisition Rights	0.2	0.1	0.1	73	78	77	76	73	71	71	90
154	Private - Subject to Acquisition Rights	0.2	0.1	0.1	73	78	76	76	73	71	71	90
155	Private - Subject to Acquisition Rights	0.2	0.1	0.1	73	78	75	75	73	71	71	90
156	Private - Subject to Acquisition Rights	0.3	0.1	0.1	74	78	75	75	74	71	70	90
157	Glencore Owned - Vacant	1.0	0.3	0.2	75	78	74	73	75	71	71	90
158	Other Mine Owned - Vacant	0.1	0.0	0.0	73	485	485	485	74	74	74	90
159	Other Mine Owned - Vacant	0.1	0.1	0.0	72	81	81	80	73	73	73	90
160	Other Mine Owned - Vacant	0.1	0.0	0.0	73	218	218	218	74	74	73	90
161	Glencore Owned - Vacant	24.8	4.6	2.8	76	95	73	71	95	73	71	90
163	Other Mine Owned	0.9	0.3	0.3	70	73	71	71	70	69	69	90
164	Private - Subject to Acquisition Rights	0.8	0.3	0.2	70	73	71	71	70	69	69	90
165	Other Mine Owned	0.7	0.2	0.2	70	73	71	71	70	69	69	90
166	Other Mine Owned - Vacant	0.3	0.1	0.1	76	81	78	78	74	71	71	90

ID	Status	Proposed Modification			Cumulative All Sources				Cumulative (no SEOC or RCN)			Criteria
		Year 2	Year 8	Year 15	2014	Year 2	Year 8	Year 15	Year 2	Year 8	Year 15	
178	Private	0.2	0.1	0.1	68	68	68	68	68	68	68	90
210	Private	0.1	0.1	0.0	68	68	68	68	68	68	68	90
211	Private	0.2	0.1	0.1	68	68	68	68	68	68	68	90
212	Private	0.2	0.1	0.1	68	68	68	68	68	68	68	90
213	Private	0.2	0.1	0.1	68	68	68	68	68	68	68	90
259	Private	1.4	1.1	0.6	69	70	69	69	70	69	69	90
280	Private	1.3	0.8	0.6	70	73	72	71	71	69	69	90
281	Private	1.4	0.9	0.7	70	73	72	72	71	69	69	90
282	Private	1.2	0.5	0.5	70	73	72	72	71	69	69	90
289	Private	0.9	0.5	0.4	69	71	71	70	70	69	69	90
290	Private	1.0	0.5	0.4	70	72	71	71	70	69	69	90
291	Private	1.0	0.4	0.4	70	73	71	71	70	69	69	90
293	Private	0.6	0.2	0.2	70	72	71	71	70	69	69	90
294	Private	0.7	0.2	0.2	70	72	71	71	70	69	69	90
295	Private	0.5	0.2	0.1	70	72	71	71	70	69	69	90
296	Private	0.4	0.1	0.1	70	72	71	71	70	69	69	90
299	Private	0.2	0.1	0.1	70	72	72	71	70	69	69	90
300	Private	0.2	0.1	0.1	70	72	72	71	70	69	69	90
302	Private	0.2	0.1	0.0	70	72	72	71	70	69	69	90
303	Private	0.2	0.1	0.1	69	71	70	70	69	69	69	90
305	Private	0.2	0.1	0.0	69	71	71	70	70	69	69	90
306	Private	0.1	0.0	0.0	70	71	71	71	70	69	69	90
307	Private	0.1	0.0	0.0	70	71	71	71	70	69	69	90
308	Private	0.1	0.0	0.0	70	72	71	71	70	69	69	90
309	Private	0.2	0.1	0.0	70	72	71	71	70	69	69	90
310	Private	0.1	0.1	0.0	70	72	71	71	70	69	69	90
311	Private	0.1	0.0	0.0	70	72	71	71	70	69	69	90
312	Private	0.1	0.0	0.0	70	72	71	71	70	69	69	90
314	Private	0.1	0.0	0.0	70	72	71	71	70	70	70	90
315	Private	0.1	0.0	0.0	70	72	72	71	70	70	70	90
316	Private	0.1	0.0	0.0	70	72	72	71	70	70	70	90
317	Private	0.1	0.0	0.0	70	72	71	71	70	70	70	90
318	Private	0.1	0.0	0.0	70	72	71	71	70	70	69	90
319	Private	0.1	0.0	0.0	70	72	71	71	70	69	69	90
320	Private	0.2	0.1	0.0	70	72	71	71	70	69	69	90
321	Private	0.1	0.0	0.0	70	72	71	71	70	70	69	90
322	Private	0.1	0.0	0.0	70	72	72	71	70	70	69	90
323	Private	0.1	0.0	0.0	70	72	72	72	70	70	70	90
324	Private	0.1	0.0	0.0	70	73	72	72	70	70	70	90
325	Private	0.1	0.0	0.0	70	73	72	72	71	70	70	90
326	Private	0.1	0.0	0.0	70	73	72	72	71	70	70	90
327	Private	0.1	0.0	0.0	70	73	72	72	71	70	70	90
328	Private	0.1	0.0	0.0	70	73	72	72	71	70	70	90
329	Private	0.1	0.0	0.0	71	73	72	72	71	71	70	90
330	Private	0.1	0.0	0.0	71	73	72	72	71	70	70	90
337	Private	0.1	0.0	0.0	68	68	68	68	68	68	68	90
342	Private Infrastructure	0.4	0.1	0.1	75	78	73	72	76	71	70	90
344	Other Mine Owned	0.7	0.2	0.2	70	73	71	71	70	69	69	90
351	Other Mine Owned	0.2	0.1	0.1	73	78	76	76	73	71	71	90
352	Other Mine Owned - Vacant	0.1	0.1	0.0	72	81	80	80	73	72	72	90
353	Other Mine Owned	0.1	0.1	0.0	73	81	80	80	74	73	73	90
356	Glencore Owned - Vacant	1.1	0.3	0.2	80	82	71	70	81	69	69	90
357	Glencore Owned - Vacant	3.6	0.7	0.5	78	80	70	70	79	69	69	90
358	Glencore Owned - Vacant	3.0	0.8	0.6	80	82	70	70	81	69	69	90
359	Glencore Owned - Vacant	0.3	0.1	0.1	75	77	73	73	75	71	71	90
360	Glencore Owned - Vacant	4.1	1.7	1.8	71	77	73	74	74	70	70	90
361	Glencore Owned - Vacant	5.5	5.3	4.5	71	76	75	74	75	74	73	90
363	Glencore Owned	4.2	2.1	2.2	71	77	74	74	74	71	71	90
364	Other Mine Owned	0.1	0.1	0.0	72	88	88	88	73	73	73	90
365	Other Mine Owned - Vacant	0.1	0.1	0.0	72	80	80	79	73	72	72	90
366	Other Mine Owned - Vacant	0.1	0.1	0.0	72	81	81	80	73	72	72	90
367	Other Mine Owned	0.1	0.1	0.0	72	80	80	80	73	72	72	90
368	Other Mine Owned - Vacant	0.2	0.1	0.0	72	80	79	79	73	72	72	90
369	Other Mine Owned - Vacant	0.2	0.1	0.0	72	79	78	78	73	72	72	90
370	Other Mine Owned	0.1	0.1	0.0	72	79	79	78	73	72	72	90
371	Other Mine Owned	0.2	0.1	0.1	73	78	78	77	73	72	72	90
372	Other Mine Owned	0.2	0.1	0.1	73	78	77	77	73	72	71	90
373	Other Mine Owned - Vacant	0.2	0.1	0.1	73	79	78	77	73	72	71	90
374	Other Mine Owned	0.2	0.1	0.1	73	78	77	77	73	72	71	90
375	Other Mine Owned	0.2	0.1	0.1	73	78	77	77	73	72	71	90
376	Other Mine Owned	0.2	0.1	0.1	73	78	77	77	72	71	71	90
377	Other Mine Owned	0.2	0.1	0.1	73	78	77	76	72	71	71	90
378	Other Mine Owned	0.2	0.1	0.1	73	78	77	76	72	71	71	90
379	Other Mine Owned	0.2	0.1	0.1	73	78	77	77	72	71	71	90

ID	Status	Proposed Modification			Cumulative All Sources				Cumulative (no SEOC or RCN)			Criteria
		Year 2	Year 8	Year 15	2014	Year 2	Year 8	Year 15	Year 2	Year 8	Year 15	
380	Other Mine Owned	0.2	0.1	0.1	73	78	77	77	72	71	71	90
381	Other Mine Owned	0.2	0.1	0.1	73	78	76	76	73	71	71	90
382	Other Mine Owned	0.2	0.1	0.1	73	78	76	76	73	71	71	90
383	Other Mine Owned	0.2	0.1	0.1	73	78	76	76	73	71	71	90
384	Other Mine Owned	0.2	0.1	0.1	73	78	76	76	73	71	71	90
385	Other Mine Owned	0.2	0.1	0.1	73	78	76	76	73	71	71	90
386	Other Mine Owned	0.2	0.1	0.1	73	78	76	76	73	71	71	90
387	Other Mine Owned	0.2	0.1	0.1	73	78	76	76	73	71	71	90
388	Other Mine Owned	0.2	0.1	0.1	73	78	77	77	72	71	71	90
389	Other Mine Owned - Vacant	0.2	0.1	0.1	73	78	76	76	73	71	71	90
390	Other Mine Owned	0.2	0.1	0.1	73	78	76	76	73	71	71	90
391	Other Mine Owned	0.2	0.1	0.1	74	78	75	75	73	71	70	90
392	Other Mine Owned - Vacant	0.2	0.1	0.1	73	78	75	75	73	71	71	90
394	Other Mine Owned	0.2	0.1	0.1	72	78	78	77	73	72	72	90
395	Other Mine Owned	0.2	0.1	0.1	72	78	77	77	73	72	72	90
396	Other Mine Owned	0.2	0.1	0.1	72	78	77	77	73	72	72	90
397	Other Mine Owned	0.2	0.1	0.1	72	78	77	77	73	72	72	90
398	Other Mine Owned	0.2	0.1	0.1	72	78	77	77	73	72	72	90
399	Other Mine Owned	0.2	0.1	0.1	72	78	77	77	73	72	72	90
400	Other Mine Owned	0.2	0.1	0.1	73	78	77	77	73	72	72	90
401	Other Mine Owned	0.2	0.1	0.1	72	78	77	77	73	72	72	90
402	Other Mine Owned	0.2	0.1	0.0	72	78	77	77	73	72	72	90
403	Other Mine Owned	0.2	0.1	0.1	72	78	77	77	73	72	72	90
404	Other Mine Owned - Vacant	0.1	0.0	0.0	76	86	85	85	78	78	77	90
405	Other Mine Owned - Vacant	0.1	0.1	0.0	75	83	82	82	75	74	74	90
406	Other Mine Owned - Vacant	0.1	0.1	0.0	73	88	88	88	74	73	73	90
407	Other Mine Owned - Vacant	0.2	0.1	0.1	73	78	76	76	73	71	71	90
408	Other Mine Owned	0.2	0.1	0.1	73	78	77	77	72	71	71	90
409	Glencore Owned - Vacant	0.4	0.1	0.1	75	77	73	73	75	71	71	90
410	Glencore Owned - Vacant	4.6	2.8	1.6	72	73	71	70	73	71	70	90
411	Glencore Owned - Vacant	5.4	3.3	1.8	72	74	72	70	74	71	70	90
412	Community Infrastructure	2.7	1.4	0.8	70	72	70	69	72	70	69	90
007a	Private	3.8	3.3	2.5	71	75	73	73	73	72	71	90
007b	Private	3.7	3.2	2.4	71	75	73	73	73	72	71	90
007c	Private	3.8	3.4	2.4	71	74	73	72	73	72	71	90
015a	Private	2.9	2.7	1.5	70	72	71	70	71	71	70	90
015b	Private	2.9	2.7	1.6	70	72	71	70	71	71	70	90
044a	Private	0.3	0.2	0.1	68	68	68	68	68	68	68	90
044b	Private	0.3	0.2	0.1	68	68	68	68	68	68	68	90
056a	Private	0.2	0.1	0.1	68	68	68	68	68	68	68	90
056b	Private	0.2	0.1	0.1	68	68	68	68	68	68	68	90
063a	Community Infrastructure	0.5	0.3	0.2	68	69	68	68	69	68	68	90
069a	Private	0.7	0.5	0.3	69	69	69	68	69	69	68	90
102a	Private	2.0	1.6	1.1	70	72	72	71	71	70	69	90
102b	Private	1.9	1.5	1.0	70	73	72	71	71	70	69	90
127a	Private - Subject to Acquisition Rights	0.2	0.1	0.1	72	79	77	77	73	71	71	90
127b	Private - Subject to Acquisition Rights	0.3	0.1	0.1	74	81	76	76	75	70	70	90
127c	Private - Subject to Acquisition Rights	0.3	0.1	0.1	76	81	74	74	77	70	70	90
127d	Private - Subject to Acquisition Rights	0.4	0.1	0.1	76	81	75	75	77	70	70	90
144a	Private - Subject to Acquisition Rights	0.1	0.0	0.0	74	84	84	83	75	75	74	90
144b	Private - Subject to Acquisition Rights	0.0	0.0	0.0	72	74	73	72	73	73	72	90
144c	Private - Subject to Acquisition Rights	0.0	0.0	0.0	72	74	73	72	73	73	72	90
162a	Glencore Owned - Vacant	3.1	2.4	1.3	71	72	71	70	72	71	69	90
162b	Private	0.5	0.4	0.2	69	69	68	68	69	68	68	90
17a	Private	2.5	2.2	1.2	70	71	70	69	71	70	69	90
17b	Private	2.7	2.3	1.3	70	71	71	70	71	70	69	90
292a	Private	0.9	0.4	0.3	70	72	71	71	70	69	69	90
292b	Private	0.9	0.4	0.3	70	72	71	71	70	69	69	90
297a	Private	0.3	0.1	0.1	70	72	72	71	70	69	69	90
297b	Private	0.3	0.1	0.1	70	72	72	71	70	69	69	90
297c	Private	0.3	0.1	0.1	70	72	72	71	70	69	69	90
297d	Private	0.4	0.1	0.1	70	72	71	71	70	69	69	90
349a	Private	0.2	0.1	0.0	69	71	71	71	70	69	69	90
349b	Private	0.2	0.1	0.0	69	71	71	71	70	69	69	90
-												
Annual average dust deposition (g/m2/month)												
1	Other Mine Owned - Vacant	0.4	0.3	0.2	2.3	3.4	3.2	3.1	2.5	2.3	2.3	4
2	Community Infrastructure	0.4	0.2	0.2	2.3	3.2	2.9	2.9	2.6	2.3	2.3	4
3	Other Mine Owned	0.4	0.3	0.3	2.3	3.0	2.8	2.7	2.6	2.3	2.3	4
4	Private	0.5	0.4	0.4	2.4	2.9	2.7	2.6	2.7	2.5	2.4	4
5	Private - Subject to Acquisition Rights	0.4	0.3	0.3	2.4	2.9	2.7	2.6	2.6	2.4	2.3	4
6	Community Infrastructure	0.5	0.4	0.3	2.4	2.8	2.6	2.6	2.6	2.4	2.3	4
10	Private	0.7	0.7	0.5	2.5	2.8	2.8	2.6	2.8	2.7	2.5	4
11	Private	0.7	0.7	0.5	2.5	2.8	2.8	2.5	2.8	2.7	2.5	4

ID	Status	Proposed Modification			Cumulative All Sources				Cumulative (no SEOC or RCN)			Criteria
		Year 2	Year 8	Year 15	2014	Year 2	Year 8	Year 15	Year 2	Year 8	Year 15	
12	Private	0.7	0.8	0.5	2.5	2.9	2.8	2.6	2.8	2.8	2.5	4
13	Private	0.6	0.6	0.3	2.4	2.7	2.6	2.4	2.7	2.6	2.3	4
14	Private	0.5	0.4	0.3	2.4	2.6	2.5	2.3	2.6	2.5	2.3	4
19	Private	0.8	0.9	0.5	2.5	2.9	2.9	2.6	2.9	2.9	2.6	4
21	Private - Subject to Acquisition Rights	0.8	0.9	0.6	2.5	3.0	3.0	2.7	2.9	2.9	2.6	4
22	Private - Subject to Acquisition Rights	0.8	0.9	0.6	2.5	3.0	2.9	2.6	2.9	2.9	2.6	4
23	Private - Subject to Acquisition Rights	0.9	1.0	0.6	2.5	3.0	3.0	2.7	3.0	3.0	2.7	4
24	Glencore Owned	0.9	1.0	0.7	2.6	3.1	3.1	2.8	3.0	3.1	2.7	4
25	Glencore Owned	1.0	1.1	0.7	2.6	3.1	3.2	2.8	3.1	3.1	2.7	4
26	Glencore Owned	1.0	1.1	0.7	2.6	3.1	3.2	2.7	3.1	3.1	2.7	4
27	Glencore Owned	1.0	1.1	0.8	2.6	3.1	3.2	2.9	3.1	3.1	2.8	4
28	Glencore Owned	1.1	1.2	0.8	2.6	3.2	3.3	2.9	3.2	3.3	2.8	4
29	Glencore Owned	1.0	1.2	0.9	2.6	3.2	3.3	3.0	3.2	3.3	2.9	4
30	Glencore Owned	1.3	1.9	1.5	2.7	3.5	4.0	3.6	3.5	3.9	3.5	4
31	Glencore Owned	1.5	2.2	1.6	2.8	3.7	4.3	3.7	3.6	4.2	3.6	4
32	Glencore Owned	1.3	1.4	0.8	2.8	3.4	3.5	2.8	3.4	3.4	2.8	4
33	Glencore Owned	1.0	1.0	0.6	2.7	3.1	3.1	2.6	3.1	3.1	2.6	4
34	Glencore Owned	0.9	0.8	0.4	2.7	3.0	2.9	2.5	3.0	2.9	2.5	4
35	Glencore Owned - Vacant	0.9	0.8	0.4	2.6	3.0	2.8	2.4	2.9	2.8	2.4	4
36	Glencore Owned	1.1	1.0	0.5	2.7	3.2	3.1	2.6	3.1	3.0	2.6	4
37	Glencore Owned - Vacant	1.4	1.4	0.8	3.0	3.5	3.5	2.8	3.5	3.4	2.8	4
38	Glencore Owned	2.0	2.4	1.4	3.1	4.1	4.4	3.4	4.1	4.4	3.4	4
39	Glencore Owned	1.7	2.0	1.1	3.0	3.8	4.0	3.2	3.8	4.0	3.1	4
40	Glencore Owned	0.3	0.2	0.1	2.2	2.3	2.2	2.1	2.3	2.2	2.1	4
41	Private	0.0	0.0	0.0	2.1	2.1	2.0	2.0	2.1	2.0	2.0	4
42	Private	0.1	0.0	0.0	2.1	2.1	2.0	2.0	2.1	2.0	2.0	4
43	Private	0.0	0.0	0.0	2.0	2.1	2.0	2.0	2.1	2.0	2.0	4
45	Private	0.0	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	4
46	Private	0.0	0.0	0.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	4
47	Private	0.0	0.0	0.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	4
48	Private	0.0	0.0	0.0	2.0	2.1	2.0	2.0	2.1	2.0	2.0	4
49	Private	0.0	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	4
50	Private	0.0	0.0	0.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	4
51	Private	0.0	0.0	0.0	2.0	2.1	2.0	2.0	2.1	2.0	2.0	4
52	Private	0.0	0.0	0.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	4
53	Private	0.0	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	4
54	Private	0.0	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	4
55	Private	0.0	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	4
57	Private	0.0	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	4
58	Private	0.0	0.0	0.0	2.0	2.1	2.0	2.0	2.1	2.0	2.0	4
59	Private	0.1	0.0	0.0	2.1	2.1	2.0	2.0	2.1	2.0	2.0	4
60	Private	0.0	0.0	0.0	2.1	2.1	2.0	2.0	2.1	2.0	2.0	4
61	Private	0.0	0.0	0.0	2.1	2.1	2.0	2.0	2.1	2.0	2.0	4
62	Private	0.1	0.0	0.0	2.1	2.1	2.0	2.0	2.1	2.0	2.0	4
73	Private	0.1	0.1	0.1	2.1	2.2	2.1	2.1	2.2	2.1	2.1	4
74	Private	0.3	0.2	0.1	2.2	2.3	2.2	2.1	2.3	2.2	2.1	4
83	Private	0.3	0.3	0.2	2.2	2.4	2.3	2.2	2.4	2.3	2.2	4
85	Private	0.3	0.2	0.1	2.2	2.3	2.3	2.2	2.3	2.3	2.2	4
86	Private	0.3	0.3	0.2	2.2	2.4	2.3	2.2	2.4	2.3	2.2	4
87	Private	0.3	0.3	0.2	2.2	2.4	2.3	2.2	2.4	2.3	2.2	4
88	Private	0.4	0.3	0.2	2.3	2.5	2.4	2.2	2.4	2.4	2.2	4
89	Private	0.4	0.3	0.2	2.3	2.5	2.4	2.3	2.5	2.4	2.2	4
90	Other Mine Owned	0.4	0.4	0.2	2.3	2.5	2.4	2.3	2.5	2.4	2.3	4
91	Private	0.4	0.4	0.3	2.3	2.6	2.5	2.3	2.5	2.4	2.3	4
92	Private	0.5	0.4	0.3	2.4	2.6	2.5	2.4	2.6	2.5	2.3	4
93	Private	0.6	0.6	0.4	2.4	2.7	2.6	2.4	2.7	2.6	2.4	4
94	Private	0.5	0.4	0.3	2.3	2.6	2.5	2.3	2.6	2.5	2.3	4
95	Private	0.4	0.4	0.2	2.3	2.5	2.4	2.3	2.5	2.4	2.3	4
96	Private	0.3	0.2	0.2	2.2	2.4	2.3	2.2	2.4	2.3	2.2	4
97	Private	0.3	0.3	0.2	2.3	2.4	2.3	2.2	2.4	2.3	2.2	4
98	Private	0.3	0.3	0.2	2.3	2.4	2.3	2.2	2.4	2.3	2.2	4
99	Private	0.3	0.3	0.2	2.3	2.5	2.4	2.3	2.5	2.3	2.2	4
100	Private	0.3	0.3	0.2	2.3	2.5	2.4	2.3	2.5	2.3	2.2	4
101	Private	0.3	0.2	0.2	2.3	2.5	2.4	2.3	2.4	2.3	2.2	4
104	Other Mine Owned	0.3	0.2	0.2	2.3	2.6	2.5	2.4	2.4	2.3	2.2	4
105	Private - Subject to Acquisition Rights	0.4	0.2	0.2	2.4	3.0	2.6	2.6	2.6	2.2	2.3	4
107	Private Infrastructure	0.2	0.0	0.0	2.7	3.2	2.8	2.8	2.8	2.4	2.4	4
108	Glencore Owned	0.1	0.0	0.0	2.7	3.1	2.7	2.6	2.7	2.3	2.3	4
109	Glencore Owned	0.1	0.0	0.0	2.7	3.0	2.6	2.6	2.7	2.3	2.3	4
110	Other Mine Owned - Vacant	0.0	0.0	0.0	2.6	3.3	2.9	2.9	2.7	2.3	2.3	4
111	Private - Subject to Acquisition Rights	0.0	0.0	0.0	2.6	3.8	3.4	3.4	2.6	2.2	2.2	4
112	Private	0.7	0.7	0.5	2.5	2.9	2.8	2.7	2.8	2.7	2.6	4
114	Private - Subject to Acquisition Rights	0.6	0.5	0.4	2.4	3.0	2.7	2.7	2.8	2.5	2.5	4
115	Private - Subject to Acquisition Rights	0.6	0.5	0.5	2.4	3.0	2.7	2.7	2.8	2.5	2.5	4

ID	Status	Proposed Modification			Cumulative All Sources				Cumulative (no SEOC or RCN)			Criteria
		Year 2	Year 8	Year 15	2014	Year 2	Year 8	Year 15	Year 2	Year 8	Year 15	
116	Glencore Owned	0.5	0.3	0.4	2.4	2.9	2.6	2.6	2.7	2.4	2.4	4
117	Glencore Owned	0.5	0.3	0.3	2.4	3.0	2.6	2.6	2.7	2.3	2.4	4
120	Glencore Owned - Vacant	0.4	0.1	0.1	2.4	3.1	2.6	2.6	2.7	2.2	2.2	4
121	Glencore Owned - Vacant	0.3	0.0	0.0	2.6	3.0	2.5	2.5	2.7	2.2	2.2	4
122	Private - Subject to Acquisition Rights	0.3	0.0	0.0	2.6	3.0	2.5	2.5	2.7	2.2	2.2	4
123	Glencore Owned - Vacant	0.3	0.1	0.1	2.5	3.1	2.6	2.6	2.7	2.2	2.2	4
124	Glencore Owned	0.2	0.0	0.0	2.6	3.0	2.5	2.5	2.7	2.2	2.2	4
125	Glencore Owned	0.2	0.0	0.0	2.6	3.0	2.5	2.5	2.7	2.3	2.2	4
126	Glencore Owned	0.1	0.0	0.0	2.6	3.0	2.6	2.6	2.7	2.3	2.2	4
129	Glencore Owned	0.0	0.0	0.0	3.3	3.8	2.7	2.6	3.3	2.2	2.2	4
130	Glencore Owned	0.0	0.0	0.0	3.3	3.8	2.7	2.7	3.3	2.3	2.2	4
131	Glencore Owned - Vacant	0.8	0.3	0.2	2.5	2.9	2.4	2.2	2.9	2.4	2.2	4
132	Glencore Owned - Vacant	0.7	0.3	0.2	2.5	2.9	2.3	2.2	2.9	2.3	2.2	4
133	Private - Subject to Acquisition Rights	0.3	0.2	0.1	2.3	2.4	2.2	2.1	2.4	2.2	2.1	4
143	Private - Subject to Acquisition Rights	0.0	0.0	0.0	2.6	3.2	2.9	2.9	2.6	2.3	2.3	4
145	Private - Subject to Acquisition Rights	0.0	0.0	0.0	2.8	6.7	6.7	6.6	3.0	3.0	2.9	4
146	Other Mine Owned	0.0	0.0	0.0	2.5	3.1	3.1	3.0	2.6	2.6	2.5	4
147	Private - Subject to Acquisition Rights	0.0	0.0	0.0	2.7	3.4	3.3	3.3	2.8	2.8	2.7	4
148	Other Mine Owned	0.0	0.0	0.0	2.6	3.4	3.3	3.3	2.7	2.6	2.5	4
149	Community Infrastructure	0.0	0.0	0.0	2.6	3.3	3.2	3.1	2.6	2.5	2.5	4
150	Private - Subject to Acquisition Rights	0.0	0.0	0.0	2.6	3.2	3.1	3.1	2.6	2.5	2.4	4
151	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.1	3.0	2.5	2.4	2.4	4
152	Private - Subject to Acquisition Rights	0.0	0.0	0.0	2.6	3.2	3.0	3.0	2.6	2.4	2.4	4
154	Private - Subject to Acquisition Rights	0.0	0.0	0.0	2.6	3.2	3.0	2.9	2.6	2.4	2.4	4
155	Private - Subject to Acquisition Rights	0.0	0.0	0.0	2.6	3.2	2.9	2.9	2.6	2.4	2.3	4
156	Private - Subject to Acquisition Rights	0.0	0.0	0.0	2.7	3.2	2.9	2.8	2.7	2.3	2.3	4
157	Glencore Owned - Vacant	0.1	0.0	0.0	2.8	3.1	2.6	2.6	2.9	2.3	2.3	4
158	Other Mine Owned - Vacant	0.0	0.0	0.0	2.7	44.2	44.2	44.1	2.9	2.9	2.8	4
159	Other Mine Owned - Vacant	0.0	0.0	0.0	2.6	3.4	3.4	3.3	2.7	2.7	2.7	4
160	Other Mine Owned - Vacant	0.0	0.0	0.0	2.7	14.8	14.8	14.8	2.8	2.8	2.8	4
161	Glencore Owned - Vacant	2.5	0.6	0.3	2.8	4.7	2.6	2.4	4.7	2.6	2.3	4
163	Other Mine Owned	0.1	0.0	0.0	2.3	2.6	2.4	2.4	2.3	2.1	2.1	4
164	Private - Subject to Acquisition Rights	0.1	0.0	0.0	2.3	2.6	2.4	2.4	2.3	2.1	2.1	4
165	Other Mine Owned	0.1	0.0	0.0	2.3	2.6	2.4	2.4	2.3	2.1	2.1	4
166	Other Mine Owned - Vacant	0.0	0.0	0.0	2.8	3.4	3.1	3.1	2.6	2.4	2.3	4
178	Private	0.0	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	4
210	Private	0.0	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	4
211	Private	0.0	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	4
212	Private	0.0	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	4
213	Private	0.0	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	4
259	Private	0.2	0.2	0.1	2.2	2.3	2.2	2.1	2.3	2.2	2.1	4
280	Private	0.2	0.1	0.1	2.3	2.7	2.5	2.5	2.4	2.2	2.1	4
281	Private	0.2	0.1	0.1	2.3	2.7	2.5	2.5	2.4	2.2	2.2	4
282	Private	0.1	0.1	0.1	2.3	2.7	2.5	2.5	2.4	2.2	2.1	4
289	Private	0.1	0.1	0.1	2.2	2.5	2.3	2.3	2.3	2.1	2.1	4
290	Private	0.1	0.1	0.1	2.2	2.6	2.4	2.4	2.3	2.1	2.1	4
291	Private	0.1	0.0	0.0	2.3	2.6	2.4	2.4	2.3	2.1	2.1	4
293	Private	0.1	0.0	0.0	2.3	2.6	2.4	2.4	2.3	2.1	2.1	4
294	Private	0.1	0.0	0.0	2.2	2.5	2.4	2.3	2.3	2.1	2.1	4
295	Private	0.1	0.0	0.0	2.3	2.6	2.4	2.4	2.3	2.1	2.1	4
296	Private	0.1	0.0	0.0	2.2	2.6	2.4	2.4	2.3	2.1	2.1	4
299	Private	0.0	0.0	0.0	2.3	2.6	2.5	2.5	2.3	2.2	2.2	4
300	Private	0.0	0.0	0.0	2.3	2.6	2.5	2.5	2.3	2.2	2.2	4
302	Private	0.0	0.0	0.0	2.3	2.6	2.5	2.5	2.3	2.2	2.2	4
303	Private	0.0	0.0	0.0	2.2	2.4	2.3	2.3	2.2	2.1	2.1	4
305	Private	0.0	0.0	0.0	2.2	2.5	2.4	2.4	2.2	2.1	2.1	4
306	Private	0.0	0.0	0.0	2.2	2.5	2.4	2.4	2.3	2.2	2.1	4
307	Private	0.0	0.0	0.0	2.2	2.5	2.4	2.4	2.3	2.2	2.2	4
308	Private	0.0	0.0	0.0	2.2	2.5	2.4	2.4	2.3	2.2	2.2	4
309	Private	0.0	0.0	0.0	2.2	2.5	2.4	2.4	2.3	2.2	2.2	4
310	Private	0.0	0.0	0.0	2.2	2.5	2.5	2.4	2.3	2.2	2.2	4
311	Private	0.0	0.0	0.0	2.2	2.5	2.4	2.4	2.3	2.2	2.2	4
312	Private	0.0	0.0	0.0	2.2	2.5	2.5	2.4	2.3	2.2	2.2	4
314	Private	0.0	0.0	0.0	2.3	2.6	2.5	2.5	2.3	2.2	2.2	4
315	Private	0.0	0.0	0.0	2.3	2.6	2.5	2.5	2.3	2.2	2.2	4
316	Private	0.0	0.0	0.0	2.3	2.6	2.5	2.5	2.3	2.2	2.2	4
317	Private	0.0	0.0	0.0	2.3	2.6	2.5	2.5	2.3	2.2	2.2	4
318	Private	0.0	0.0	0.0	2.3	2.6	2.5	2.5	2.3	2.2	2.2	4
319	Private	0.0	0.0	0.0	2.3	2.6	2.5	2.5	2.3	2.2	2.2	4
320	Private	0.0	0.0	0.0	2.3	2.6	2.5	2.5	2.3	2.2	2.2	4
321	Private	0.0	0.0	0.0	2.3	2.6	2.5	2.5	2.3	2.2	2.2	4
322	Private	0.0	0.0	0.0	2.3	2.6	2.5	2.5	2.3	2.2	2.2	4
323	Private	0.0	0.0	0.0	2.3	2.6	2.5	2.5	2.3	2.2	2.2	4
324	Private	0.0	0.0	0.0	2.3	2.6	2.5	2.5	2.3	2.2	2.2	4

ID	Status	Proposed Modification			Cumulative All Sources				Cumulative (no SEOC or RCN)			Criteria
		Year 2	Year 8	Year 15	2014	Year 2	Year 8	Year 15	Year 2	Year 8	Year 15	
325	Private	0.0	0.0	0.0	2.3	2.7	2.6	2.5	2.3	2.2	2.2	4
326	Private	0.0	0.0	0.0	2.3	2.7	2.6	2.5	2.4	2.3	2.2	4
327	Private	0.0	0.0	0.0	2.3	2.6	2.6	2.5	2.4	2.3	2.2	4
328	Private	0.0	0.0	0.0	2.3	2.6	2.6	2.5	2.4	2.3	2.2	4
329	Private	0.0	0.0	0.0	2.4	2.7	2.6	2.6	2.4	2.3	2.3	4
330	Private	0.0	0.0	0.0	2.3	2.6	2.6	2.5	2.4	2.3	2.3	4
337	Private	0.0	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	4
342	Private Infrastructure	0.0	0.0	0.0	2.9	3.1	2.5	2.5	2.9	2.3	2.3	4
344	Other Mine Owned	0.1	0.0	0.0	2.3	2.6	2.4	2.4	2.3	2.1	2.1	4
351	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.0	3.0	2.6	2.4	2.4	4
352	Other Mine Owned - Vacant	0.0	0.0	0.0	2.5	3.5	3.4	3.4	2.6	2.5	2.5	4
353	Other Mine Owned	0.0	0.0	0.0	2.6	3.4	3.4	3.3	2.7	2.6	2.6	4
356	Glencore Owned - Vacant	0.1	0.0	0.0	3.4	3.6	2.3	2.2	3.5	2.1	2.1	4
357	Glencore Owned - Vacant	0.3	0.1	0.0	3.1	3.3	2.2	2.2	3.2	2.1	2.1	4
358	Glencore Owned - Vacant	0.3	0.1	0.1	3.3	3.6	2.2	2.2	3.5	2.1	2.1	4
359	Glencore Owned - Vacant	0.0	0.0	0.0	2.8	3.1	2.6	2.5	2.8	2.3	2.3	4
360	Glencore Owned - Vacant	0.5	0.2	0.2	2.4	3.0	2.5	2.6	2.7	2.2	2.3	4
361	Glencore Owned - Vacant	0.7	0.6	0.6	2.4	3.0	2.8	2.8	2.9	2.7	2.6	4
363	Glencore Owned	0.5	0.2	0.2	2.4	3.0	2.6	2.6	2.7	2.3	2.3	4
364	Other Mine Owned	0.0	0.0	0.0	2.6	3.9	3.9	3.9	2.7	2.7	2.7	4
365	Other Mine Owned - Vacant	0.0	0.0	0.0	2.5	3.3	3.3	3.2	2.6	2.6	2.6	4
366	Other Mine Owned - Vacant	0.0	0.0	0.0	2.6	3.4	3.4	3.3	2.7	2.6	2.6	4
367	Other Mine Owned	0.0	0.0	0.0	2.6	3.3	3.3	3.3	2.7	2.6	2.6	4
368	Other Mine Owned - Vacant	0.0	0.0	0.0	2.5	3.3	3.2	3.2	2.6	2.6	2.5	4
369	Other Mine Owned - Vacant	0.0	0.0	0.0	2.6	3.2	3.2	3.1	2.6	2.6	2.5	4
370	Other Mine Owned	0.0	0.0	0.0	2.6	3.3	3.2	3.2	2.7	2.6	2.6	4
371	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.1	3.1	2.6	2.5	2.5	4
372	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.1	3.1	2.6	2.5	2.5	4
373	Other Mine Owned - Vacant	0.0	0.0	0.0	2.6	3.2	3.1	3.1	2.6	2.5	2.5	4
374	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.1	3.1	2.6	2.5	2.5	4
375	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.1	3.1	2.6	2.5	2.4	4
376	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.1	3.0	2.6	2.4	2.4	4
377	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.0	3.0	2.6	2.4	2.4	4
378	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.0	3.0	2.6	2.4	2.4	4
379	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.1	3.1	2.5	2.4	2.4	4
380	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.1	3.0	2.5	2.4	2.4	4
381	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.0	3.0	2.6	2.4	2.4	4
382	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.0	3.0	2.6	2.4	2.4	4
383	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.0	3.0	2.6	2.4	2.4	4
384	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.0	3.0	2.6	2.4	2.4	4
385	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.0	3.0	2.6	2.4	2.3	4
386	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.0	2.9	2.6	2.4	2.3	4
387	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.0	3.0	2.6	2.4	2.4	4
388	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.1	3.0	2.5	2.4	2.4	4
389	Other Mine Owned - Vacant	0.0	0.0	0.0	2.6	3.2	3.0	3.0	2.6	2.4	2.3	4
390	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.0	3.0	2.6	2.4	2.4	4
391	Other Mine Owned	0.0	0.0	0.0	2.7	3.2	2.9	2.9	2.7	2.3	2.3	4
392	Other Mine Owned - Vacant	0.0	0.0	0.0	2.6	3.2	2.9	2.9	2.6	2.4	2.3	4
394	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.1	3.1	2.6	2.5	2.5	4
395	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.1	3.1	2.6	2.5	2.5	4
396	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.1	3.1	2.6	2.5	2.5	4
397	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.1	3.1	2.6	2.5	2.5	4
398	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.1	3.1	2.6	2.5	2.5	4
399	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.1	3.1	2.6	2.5	2.5	4
400	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.1	3.1	2.6	2.5	2.5	4
401	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.1	3.1	2.6	2.5	2.5	4
402	Other Mine Owned	0.0	0.0	0.0	2.6	3.1	3.1	3.0	2.6	2.6	2.5	4
403	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.1	3.0	2.6	2.5	2.5	4
404	Other Mine Owned - Vacant	0.0	0.0	0.0	3.1	4.3	4.3	4.2	3.4	3.4	3.3	4
405	Other Mine Owned - Vacant	0.0	0.0	0.0	2.8	3.7	3.6	3.6	2.9	2.8	2.8	4
406	Other Mine Owned - Vacant	0.0	0.0	0.0	2.6	4.0	4.0	3.9	2.8	2.8	2.7	4
407	Other Mine Owned - Vacant	0.0	0.0	0.0	2.6	3.2	3.0	3.0	2.6	2.4	2.4	4
408	Other Mine Owned	0.0	0.0	0.0	2.6	3.2	3.1	3.0	2.6	2.4	2.4	4
409	Glencore Owned - Vacant	0.0	0.0	0.0	2.8	3.1	2.6	2.5	2.8	2.3	2.3	4
410	Glencore Owned - Vacant	0.6	0.4	0.2	2.5	2.6	2.4	2.2	2.6	2.4	2.2	4
411	Glencore Owned - Vacant	0.7	0.4	0.2	2.6	2.7	2.4	2.3	2.7	2.4	2.2	4
412	Community Infrastructure	0.3	0.2	0.1	2.3	2.4	2.2	2.1	2.4	2.2	2.1	4
007a	Private	0.5	0.4	0.3	2.4	2.8	2.6	2.5	2.6	2.5	2.4	4
007b	Private	0.5	0.4	0.3	2.4	2.8	2.6	2.5	2.6	2.5	2.4	4
007c	Private	0.5	0.5	0.3	2.4	2.7	2.6	2.5	2.6	2.5	2.4	4
015a	Private	0.4	0.4	0.2	2.3	2.5	2.4	2.3	2.5	2.4	2.2	4
015b	Private	0.5	0.4	0.2	2.3	2.5	2.4	2.3	2.5	2.4	2.3	4
044a	Private	0.0	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	4
044b	Private	0.0	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	4

ID	Status	Proposed Modification			Cumulative All Sources				Cumulative (no SEOC or RCN)			Criteria
		Year 2	Year 8	Year 15	2014	Year 2	Year 8	Year 15	Year 2	Year 8	Year 15	
056a	Private	0.0	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	4
056b	Private	0.0	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	4
063a	Community Infrastructure	0.1	0.0	0.0	2.1	2.1	2.0	2.0	2.1	2.0	2.0	4
069a	Private	0.1	0.1	0.0	2.1	2.1	2.1	2.0	2.1	2.1	2.0	4
102a	Private	0.3	0.2	0.2	2.3	2.6	2.4	2.4	2.4	2.3	2.2	4
102b	Private	0.3	0.2	0.1	2.3	2.6	2.5	2.4	2.4	2.3	2.2	4
127a	Private - Subject to Acquisition Rights	0.0	0.0	0.0	2.5	3.3	3.2	3.1	2.6	2.4	2.4	4
127b	Private - Subject to Acquisition Rights	0.0	0.0	0.0	2.8	3.6	3.0	2.9	2.9	2.3	2.2	4
127c	Private - Subject to Acquisition Rights	0.0	0.0	0.0	3.1	3.6	2.8	2.8	3.1	2.3	2.3	4
127d	Private - Subject to Acquisition Rights	0.0	0.0	0.0	3.1	3.6	2.8	2.8	3.1	2.3	2.2	4
144a	Private - Subject to Acquisition Rights	0.0	0.0	0.0	2.8	3.7	3.6	3.6	3.0	3.0	2.9	4
144b	Private - Subject to Acquisition Rights	0.0	0.0	0.0	2.5	2.7	2.7	2.5	2.6	2.6	2.5	4
144c	Private - Subject to Acquisition Rights	0.0	0.0	0.0	2.5	2.7	2.7	2.5	2.6	2.6	2.5	4
162a	Glencore Owned - Vacant	0.4	0.3	0.1	2.4	2.5	2.3	2.2	2.5	2.3	2.1	4
162b	Private	0.1	0.0	0.0	2.1	2.1	2.1	2.0	2.1	2.1	2.0	4
17a	Private	0.4	0.3	0.2	2.3	2.5	2.4	2.2	2.5	2.3	2.2	4
17b	Private	0.4	0.3	0.2	2.3	2.5	2.4	2.2	2.5	2.4	2.2	4
292a	Private	0.1	0.0	0.0	2.2	2.6	2.4	2.4	2.3	2.1	2.1	4
292b	Private	0.1	0.0	0.0	2.2	2.6	2.4	2.4	2.3	2.1	2.1	4
297a	Private	0.0	0.0	0.0	2.3	2.6	2.5	2.5	2.3	2.2	2.1	4
297b	Private	0.0	0.0	0.0	2.3	2.6	2.5	2.5	2.3	2.2	2.1	4
297c	Private	0.0	0.0	0.0	2.3	2.6	2.5	2.5	2.3	2.2	2.1	4
297d	Private	0.0	0.0	0.0	2.2	2.5	2.4	2.4	2.3	2.1	2.1	4
349a	Private	0.0	0.0	0.0	2.2	2.5	2.4	2.4	2.2	2.2	2.1	4
349b	Private	0.0	0.0	0.0	2.2	2.5	2.4	2.4	2.2	2.2	2.1	4

Appendix F. Additional 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 predicting PM₁₀ concentrations for the 2014 calendar year (based on mining and activities rates in 2014) and comparing these results to measurement data.

Figure F1 shows quantile-quantile plots of measured and predicted 24-hour average PM₁₀ concentrations at SX8, SX9 and SX10. These plots show the measured data and predictions 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). The quantile-quantile plots **Figure F1** do however show that the model predictions are well within a factor of two for all percentiles.

Figures F2 to F4 show predicted PM₁₀ concentrations at SX8, SX9 and SX10 by hour of day and by wind speed. Hourly and average concentrations have been plotted. The purpose of this analysis is to check if the model has accurately reproduced the diurnal variation in PM₁₀ concentrations, and weather conditions for maximum concentrations. It can be seen from this figure that the model typically over-estimates PM₁₀ concentrations at night, that is, during stable conditions.

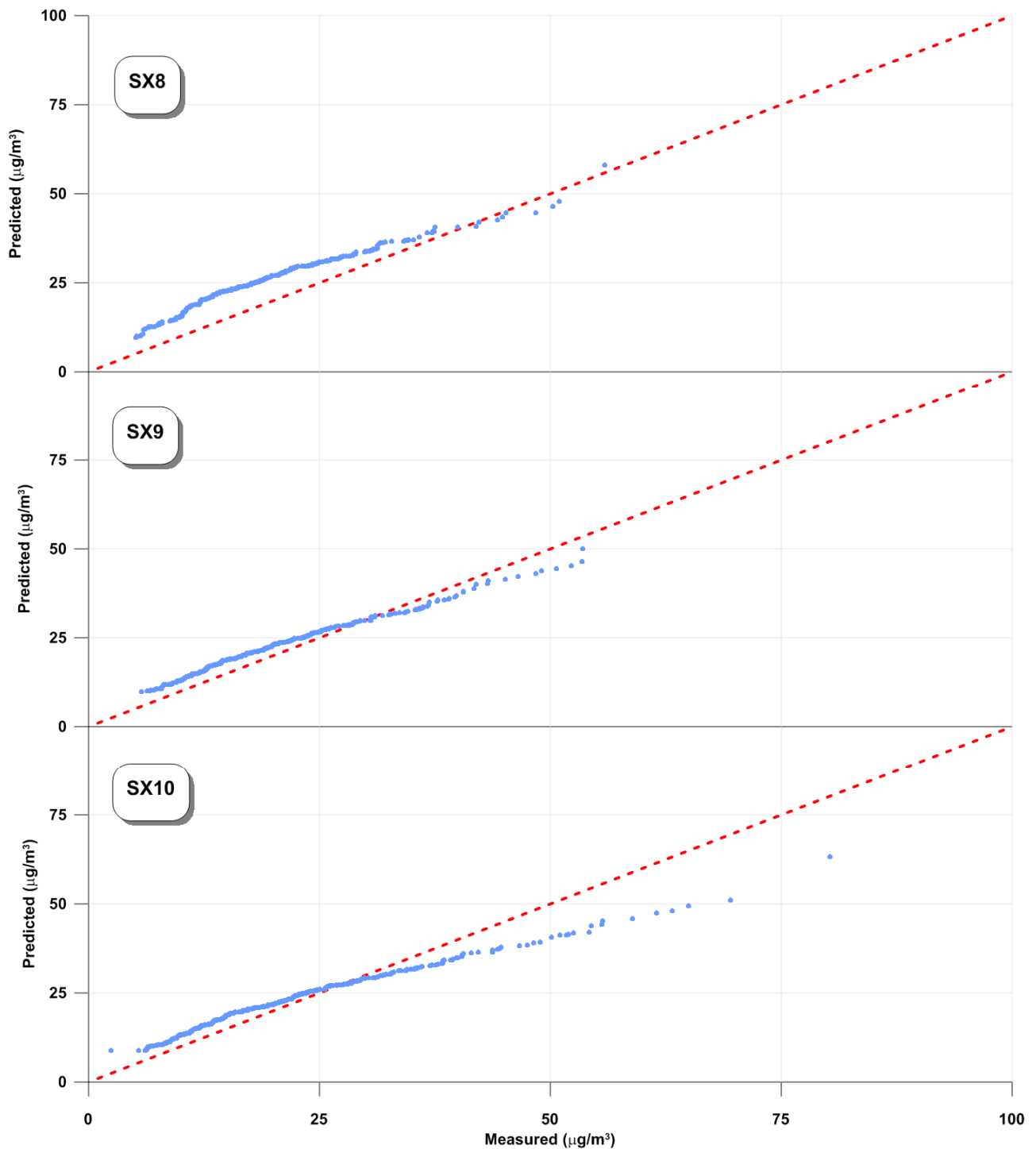


Figure F1 Quantile-quantile plots of measured and predicted 24-hour average PM₁₀ concentrations

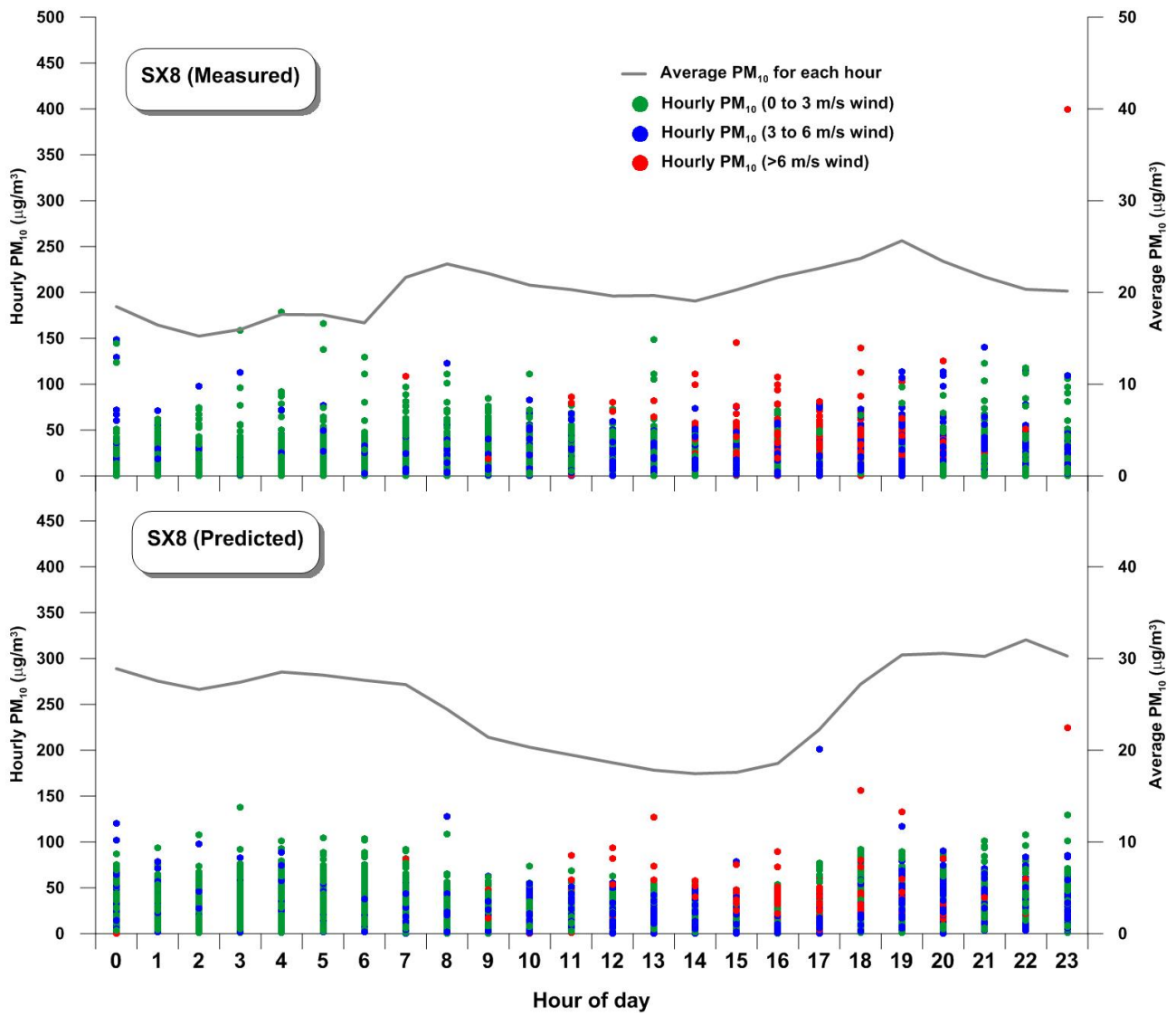
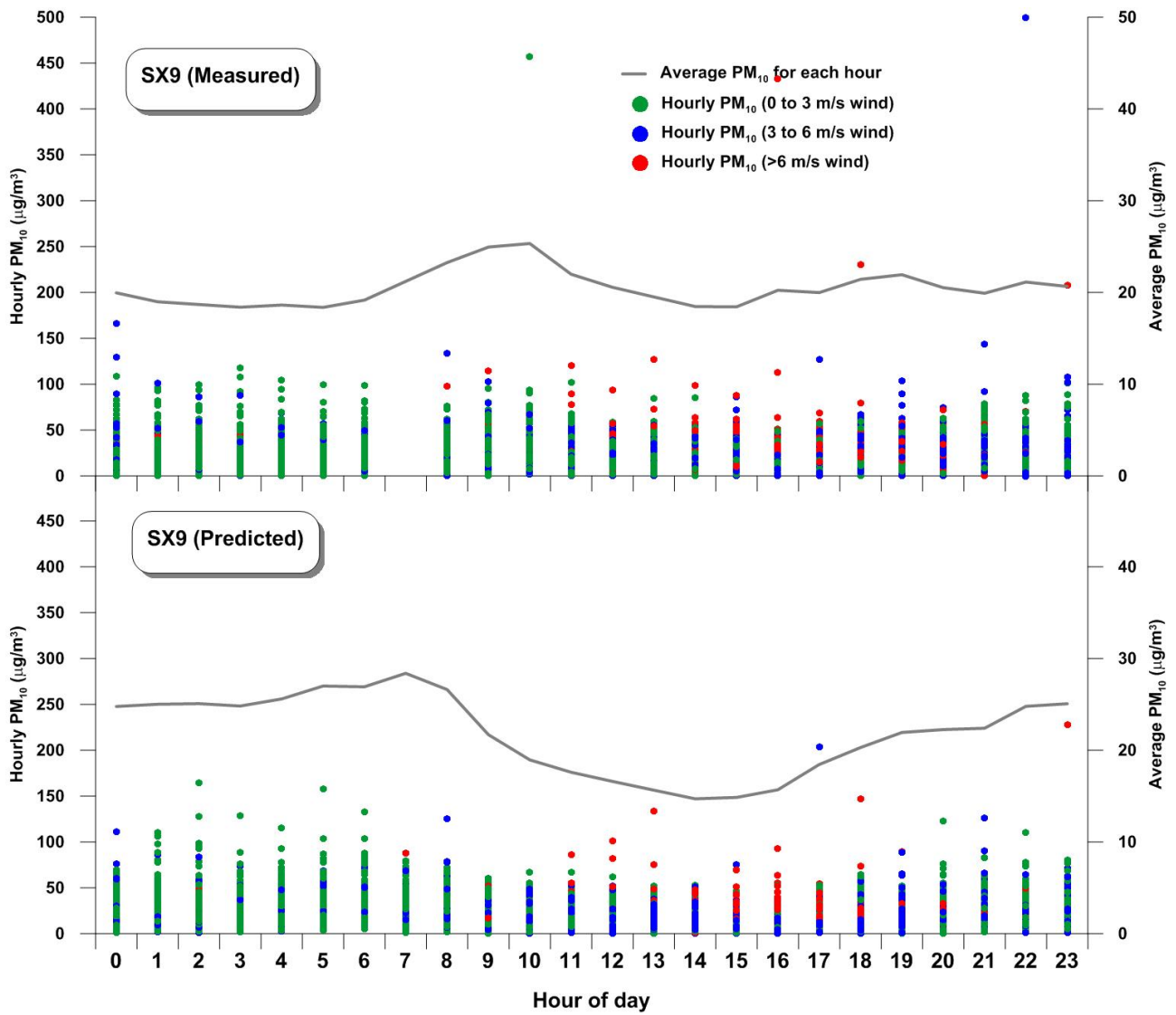


Figure F2 Measured and predicted PM₁₀ concentrations by hour of day and wind speed at SX8

Figure F3 Measured and predicted PM_{10} concentrations by hour of day and wind speed at SX9

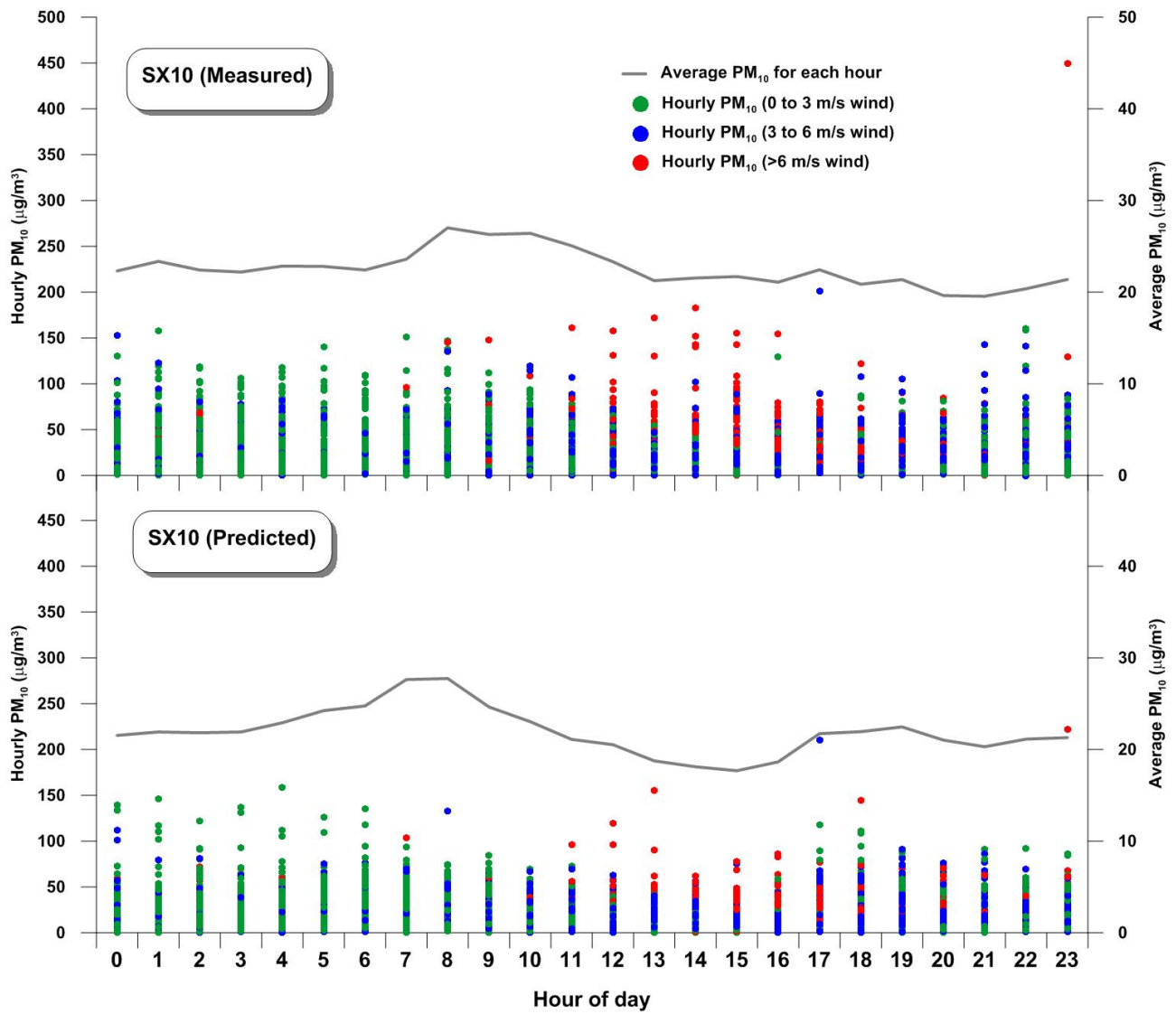


Figure F4 Measured and predicted PM₁₀ concentrations by hour of day and wind speed at SX10

Appendix G. Comparison of Approved Operation and Proposed Modification

This appendix provides a comparison between the predicted impacts of the Approved Operation and the Proposed Modification. There are some complications in making a comparison between the two assessments (that is, the assessment of the Approved Operation and the assessment of this current Proposed Modification). These complications arise because the modelling approaches in the two cases are slightly different. Specifically:

- The modelling for the Approved Operation used meteorological data for 2011/2012 while the modelling for the Proposed Modification used meteorological data from 2014.
- The modelling for the Proposed Modification includes the effects of rainfall and pit-retention while the modelling for the Approved Operation did not.
- The activity lists used in for the assessment of the Proposed Modification have been changed to be consistent with the activity lists for other operations.
- Some emission factors have been changed to use more default approaches.

The modelling results indicate that the amendments to the modelling approach, outlined above, have provided reasonable agreement between the measured and the modelled results (see **Section 8** in the main text). The main benefit of this approach is to avoid the use of model correction factors which were queried (but later addressed) during the review of the air quality impact assessment for the Continued Operations Project. Despite the differences in the modelling approaches for the Approved Operation and Proposed Modification they both show predictions of the impacts of the two mining scenarios and form a useful basis for comparing the air quality effects.

Figure G1 shows the predicted maximum extent of the 50 $\mu\text{g}/\text{m}^3$ composite contour for maximum 24-hour average PM_{10} due to Mount Owen Mine in all years of assessment. This comparison indicates that the maximum extent of the 50 $\mu\text{g}/\text{m}^3$ contour for the Proposed Modification will be, for the most part, within the maximum extent of the 50 $\mu\text{g}/\text{m}^3$ contour that was originally predicted the Approved Operation. There is a reduction in the extent to which the predicted 24-hour contours extend to the northwest for the Proposed Modification compared with the Approved Operation.

Figure G2 shows the predicted maximum extent of the 30 $\mu\text{g}/\text{m}^3$ composite contour for annual average PM_{10} due to Mount Owen Mine in all years of assessment. This contour was chosen as the 25 $\mu\text{g}/\text{m}^3$ was not presented in the air quality assessment for the Continued Operations Project. The comparison shows that the predicted contribution of Mount Owen activities, in relation to private residences not currently subject to acquisition, under the Proposed Modification will be consistent with the predicted contribution for the Approved Operations.

In summary the comparisons in **Figure G1** and **G2** indicate that the Proposed Modification would lead to off-site impacts which are within (24-hour averages) or similar to (annual averages) the approved extent of impacts. There are some variations, depending on the location of interest, but from an air quality modelling perspective the comparisons show that there would not be an overall increase in the maximum area of private land (without current acquisition rights) predicted to be impacted by the Proposed Modification. As can be seen from the predictions in **Figure G1** and **G2** it is the 24-hour averages which has defined the maximum area of impact.

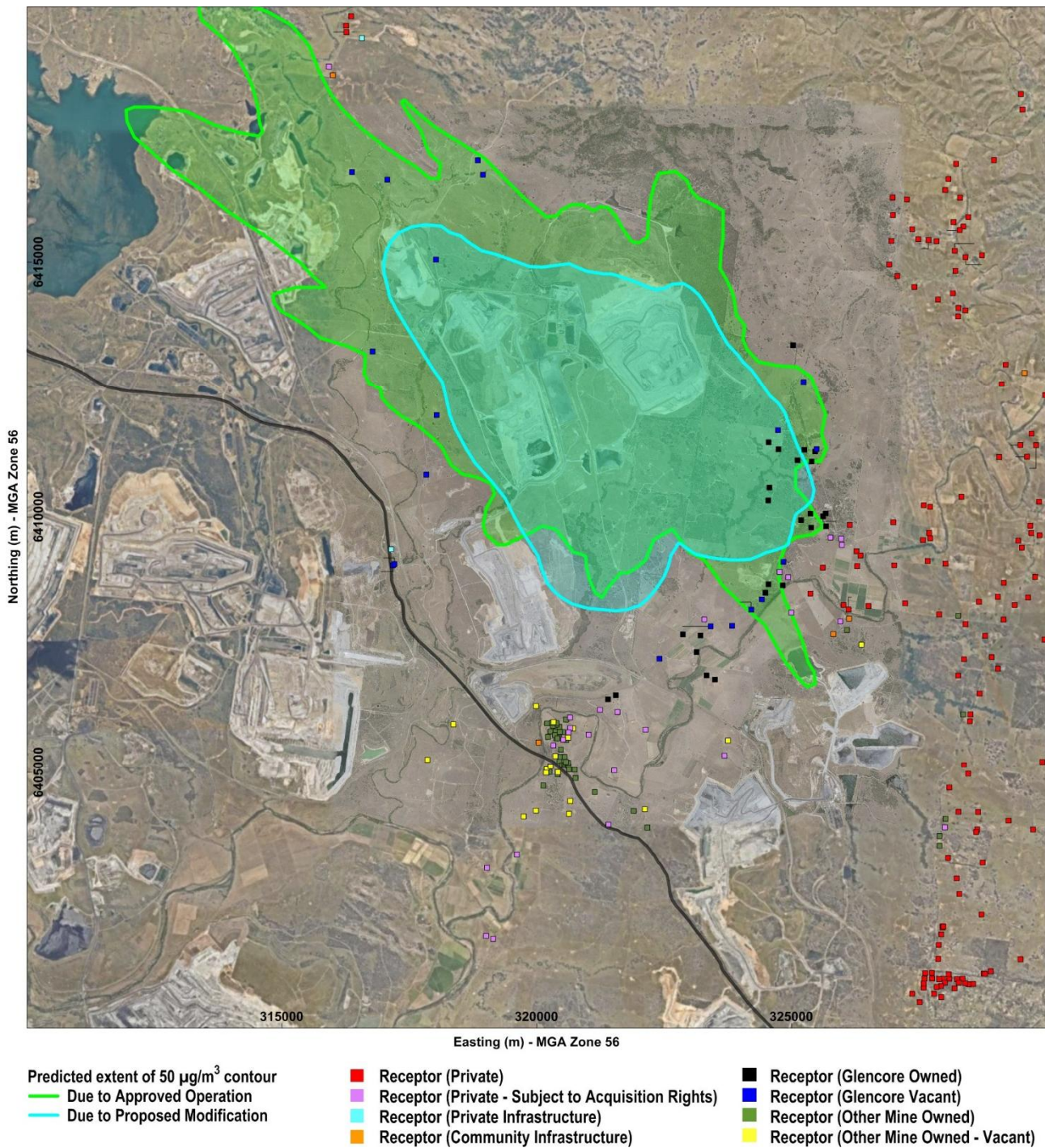


Figure G1 Comparison of Approved Operation and Proposed Modification for maximum 24-hour average PM_{10} contribution

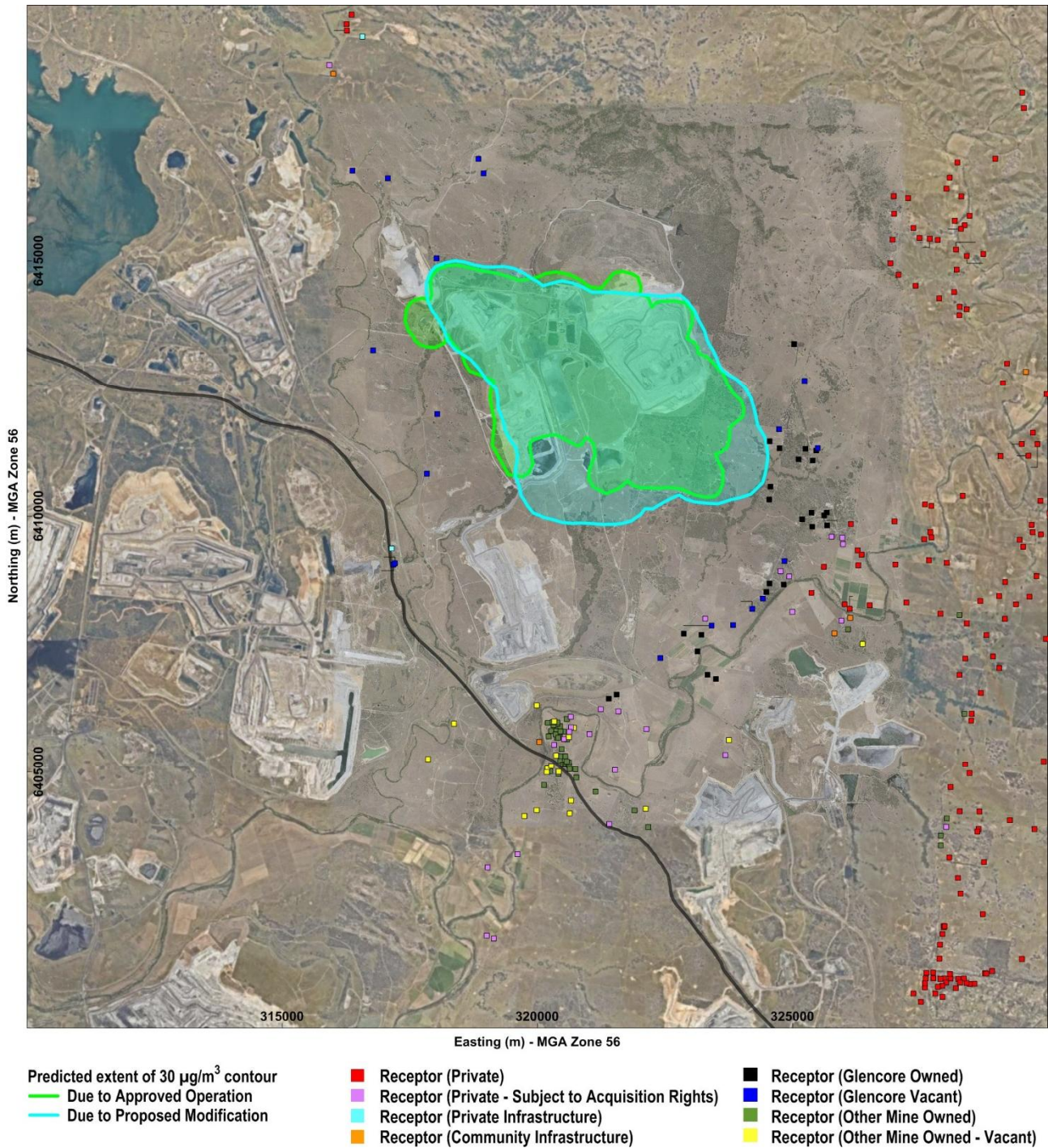


Figure G2 Comparison of Approved Operation and Proposed Modification for annual average PM₁₀ contribution