Air Quality Management Plan

BHO-PLN-ENV-001

September 2022

Contents

List of Tables

List of Figures

Definitions

AEMR	Annual Environmental Management Report
AWS	Automatic Weather Station
AQMP	Air Quality Management Plan
AQMMP	Air Quality Monitoring Management Plan
BHELP	Broken Hill Environmental Lead Program
BHOP	Broken Hill Operations Pty Ltd
BoM	(Australian) Bureau of Meteorology
CML	Consolidated Mining Lease
DDG	Dust Deposition Gauge
DPE	Department of Planning and Environment, NSW
EPA	Environment Protection Authority, NSW
EPL	Environment Protection Licence
HVAS	High Volume Air Sampler
mg	milligram ($g \times 10^{-3}$)
µg	microgram ($g \times 10^{-6}$)
m^3	cubic metre
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NGERS	National Greenhouse and Energy Reporting Scheme
NPI	National Pollutant Inventory
PM	particulate matter
PM_{10}	particulate matter less than 10 µm in aerodynamic diameter
$PM_{2.5}$	particulate matter less than 2.5 µm in aerodynamic diameter
ROM	run of mine
TEOM	Tapered Element Oscillating Microbalance
TSF2	Tailings Storage Facility 2 (Blackwood Pit)
TSF3	Tailings Storage Facility 3 (Kintore Pit)
TSP	total suspended particulate (matter)
USEPA	United States Environmental Protection Agency

1. Introduction

1.1. Purpose

Broken Hill Operations Pty Ltd (BHOP) owns and operates the Rasp Mine, a silver, zinc and lead mine at Broken Hill, NSW. The purpose of this Air Quality Management Plan (AQMP) is to establish the minimum acceptable standards for air quality in relation to the activities at Rasp Mine, and to prevent and/or minimise adverse air quality impacts on the local community.

The AQMP has been written to meet the requirements of the Project Approval 07_0018 as modified. This AQMP includes expert development and review by Dr Paul Boulter (EMM), Scott Fishwick (EMM), Paul Freeman (EMM), and Damon Roddis (Zephyr Environmental), as required by Schedule 3 Condition 11 (a) of the Project Approval. It also addresses other statutory requirements, including the mine's Environment Protection Licence (EPL, number 12559).

This Air Quality Management Plan must be implemented as approved by the Secretary according to Condition 11A of Schedule 3, DO 07_0018.

1.2. Responsibility and Authority

It is the responsibility of all personnel, contractors and visitors at the Rasp Mine to comply with the AQMP. The AQMP applies primarily to all persons who have the potential to generate or influence dust generation at the mine, and the persons who are responsible for managing and monitoring air quality.

Table 1 defines specific responsibilities for the monitoring, review and implementation of the AQMP. The General Manager (or his delegate) shall monitor site activities and conditions to determine compliance with the AQMP, as well as its effectiveness.

Table 1 Responsibilities

Title	Responsibility
General Manager	• Provide the required resources and support to implement the AQMP. • Authorise the implementation of the AQMP. • Participate in annual reviews of the AQMP.
Department Managers	• Provide the resources required to implement the actions from the AQMP and associated procedures. • Allocate responsibilities in their department for the implementation of the AQMP. • Ensure all personnel undertaking works in relation to the AQMP are trained and competent. • Implement air emission abatement and control measures, as required. • Participate in reviews of the AQMP.
Senior Environmental Advisor	• Prepare and maintain the AQMP. • Implement, monitor and review the standards and procedures linked to the AQMP. • Consult with regulatory authorities, as required. • Undertake air quality monitoring, as required. • Provide recommendations for the continual improvement of the AQMP and associated procedures. • Report air quality performance via the company website, the Annual Environmental Management Report (AEMR), and Annual Review (AR).

Title	Responsibility
BHOP Personnel andContractors	• Ensure they have the training and competencies to implement the standards and procedures for air quality management. • Implement the procedures referenced in the AQMP and associated procedures. • Monitor for dust and implement dust mitigation measures for potential dust generating activities performed on site

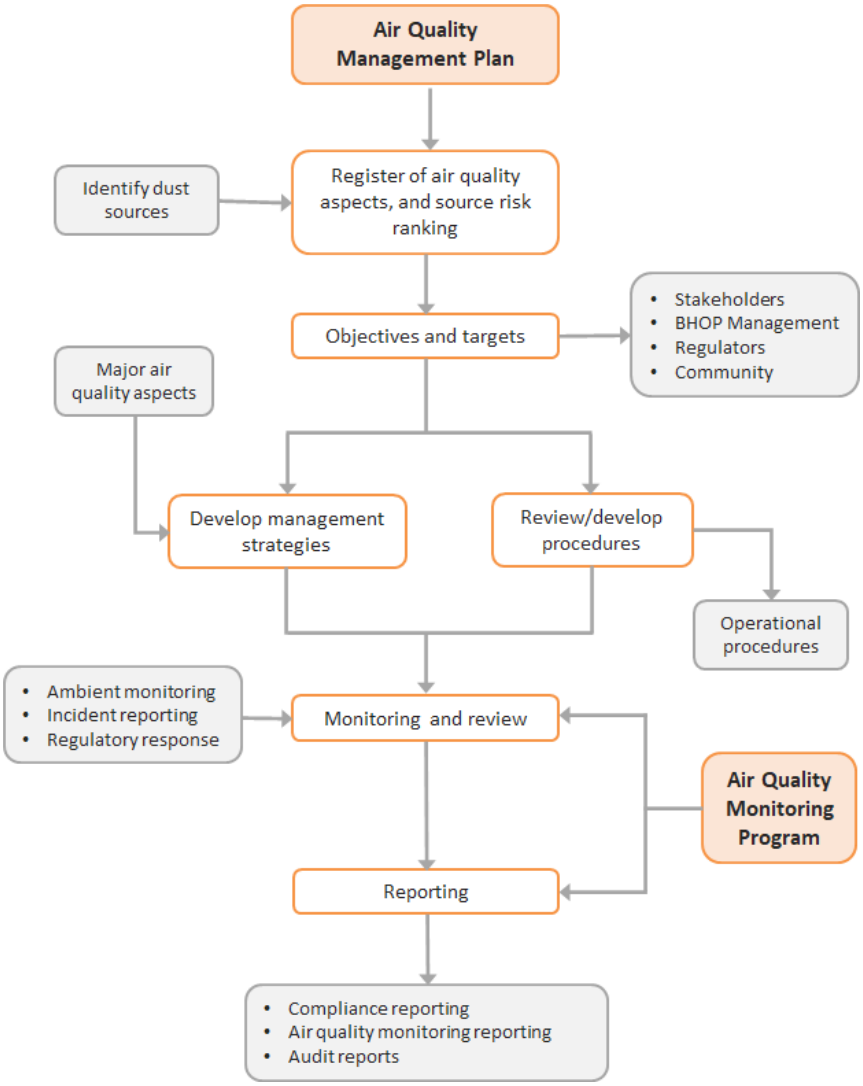
2. Air Quality Management System

The Rasp Mine Air Quality Management System comprises this AQMP, the Air Quality Monitoring Management Plan (AQMMP) Program, the associated site procedures, and the associated reporting requirements.

The AQMP outlines the operational management activities of Rasp Mine with regard to maintaining compliance with the Project Approval and EPL. The AQMMP documents the statutory conditions, standards, locations and reporting requirements for air quality monitoring undertaken by BHOP at the mine and neighbouring properties.

Figure 2-1 provides an overview of the components of the Air Quality Management System.

Figure 2-1 Overview of the Air Quality Management System



3. Requirements

3.1. Project Approval

Development consent was granted to BHOP on 31 January 2011 by the then Minister for the Department of Planning and Infrastructure under the Environmental Planning and Assessment Act 1979 as a Part 3A (Project Approval, 07_0018). The approval has been modified nine times (see **Table 2**):

Table 2 Approved Modifications

Modification	Aspect
MOD1 (16 March 2012)	Relocation of the primary ventilation shaft and installation of the ventilation fans underground.
MOD2 (29 August 2014)	Allow crusher to be operated at any time (24 hours per day 7 days per week).
MOD3 (17 March 2015)	Underground mining extension to include Block 7 and Zinc Lodes.
MOD4 (6 September 2017)	Construction and operation of a Concrete Batching Plant and Embankment Lift for Blackwood TSF2.
MOD5 (2 November 2018)	Warehouse Extension, Cement Silo and Adjustment of Air Quality Monitoring.
MOD 7 (27 July 2019)	Crushing and screening of waste rock in BHP pit
MOD 8 (15 April 2021)	Sub lease arrangement with Perilya Broken Hill Limited
MOD 9 (23 December 2021)	Extension of exploration in the Main Lodes Blocks 13-15 and installation of escape ladder way from stockpile 1 underground to surface.
MOD6 (16 March 2022)	Relocation of mine access portal and use of Kintore Pit as a Tailing Storage facility (TSF3).

The consent conditions that apply to the management of air quality at the Rasp Mine are defined in **Table 3.** These are taken from the consolidated Project Approval for MOD6. The table references the relevant sections of the AQMP that address the conditions of the Project Approval. Appendix G shows the approved project layout.

Table 3 Project Approval MP 07-0018 - Air Quality Conditions

<table>
<tr><th>Condition</th><th>Condition Detail</th><th>Section/ Procedure</th></tr>
<tr><td>Sch3, 1</td><td>Odour
The Proponent shall ensure that no offensive odours are emitted from the site,as defined under the POEO Act.</td><td>Section 3.3, 5</td></tr>
<tr><td>Sch3, 2</td><td>Greenhouse Gas Emissions
The Proponent shall implement all reasonable and feasible measures tominimise the release of greenhouse gas emissions from the site to the satisfaction of the Secretary.</td><td>Section6.15, App E – AQMMP (App B)</td></tr>
<tr><td>Sch3, 3</td><td>Air Quality Criteria
The Proponent shall ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the project do not cause an exceedance of the criteria listed inTables 1, 2 or 3 at any residence on privately-owned land.
Table 1: Long-Term Criteria for Particulate Matter
<table>
<tr><th>Pollutant</th><th>Averaging Period</th><th>[d] Criterion</th></tr>
<tr><td>Total solid particles</td><td>Annual</td><td>[a] 90 µg/m^3</td></tr>
<tr><td>Particulate matter <10 µm (PM_{10})</td><td>Annual</td><td>[a] 25 µg/m^3</td></tr>
<tr><td>Particulate matter <2.5 µm ($PM_{2.5}$)</td><td>Annual</td><td>[a] 8 µg/m^3</td></tr>
</table>
Table 2: Short-Term Criteria for Particulate Matter
<table>
<tr><th>Pollutant</th><th>Averaging Period</th><th>[d] Criterion</th></tr>
<tr><td>Particulate matter <10 µm (PM_{10})</td><td>24-hour</td><td>[a] 50 µg/m^3</td></tr>
<tr><td>Particulate matter <2.5 µm ($PM_{2.5}$)</td><td>Annual</td><td>[a] 25 µg/m^3</td></tr>
</table>
Table 3: Long-Term Criteria for Deposited Dust
<table>
<tr><th>Pollutant</th><th>Averaging Period</th><th>Maximum Project Contribution</th><th>Maximum total Deposited Dust Level</th></tr>
<tr><td>[c] Deposited dust</td><td>Annual</td><td>[b] 2 g/m^2/month</td><td>[a] 4 g/m^2/month</td></tr>
</table>
Notes to Tables 1–3:
[a] Total impact (i.e. incremental increase in concentrations due to the project plus background concentrations due to all other sources);
[b] Incremental impact (i.e. incremental increase in concentrations due to the project onits own);
[c] Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method;
[d] Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents, illegal activities or any other activity agreed by the Secretary in consultation with EPA.;</td><td>Section 6, 10</td></tr>
<tr><td>Sch3, 4</td><td>Air Quality Criteria
The Proponent shall ensure that the project is operated in a manner that does not exceed the criteria listed in Tables 4 and 5.</td><td>Section 10</td></tr>
</table>

<table>
<tr><th>Condition</th><th>Condition Detail</th><th>Section/ Procedure</th></tr>
<tr><td></td><td>

Table 4: Discharge Criteria for Point 1 and Point 6 – Ventilation Shafts

Pollutant	Units of Measure	Concentration Limit
Oxides of nitrogen (as NO_2)	Milligrams per cubic metre	350
Total solid particles	Milligrams per cubic metre	20
[a] Type 1 and type 2 substances	Milligrams per cubic metre	1
Volatile organic compounds (as n-propane)	Milligrams per cubic metre	40

Table 5: Discharge Criteria for Point 2 – Process Enclosure/ Baghouse Stack

Pollutant	Units of Measure	Concentration Limit
Total solid particles	Milligrams per cubic metre	20
[a] Type 1 and type 2 substances	Milligrams per cubic metre	1

Notes to Tables 4–5:

[a] Total of Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, Sn and V; reference conditions for the limits in Tables 4 and 5 are: dry, 273K and 101.3 kPa.

</td><td></td></tr>
<tr><td>Sch3, 5</td><td>

Operating Conditions

The Proponent shall:

(a) Implement best practice dust management, including all reasonable and feasible measures to minimise dust emissions, including point source and fugitive emissions;

(b) minimise any visible off-site dust generated by the project or the site; and

(c) regularly assess real-time air quality monitoring and meteorological forecasting data and relocate, modify and/ or suspend operations to ensure compliance with the relevant conditions of this approval,

to the satisfaction of the Secretary.

</td><td>Sections 4.2, 5, 6, 10 and 11, Table 5</td></tr>
</table>

<table>
<tr><th>Condition</th><th>Condition Detail</th><th>Section/ Procedure</th></tr>
<tr><td>Sch3,6</td><td>Operating Conditions
The Proponent shall seal and maintain the roads listed in Table 6 to the satisfaction of the Secretary. The roads shall be sealed prior to the commencement of ore extraction or their use, unless otherwise agreed by the Secretary.
Table 6: Roads to be Sealed and Maintained
<table>
<tr><th>Road Status</th><th>Road</th><th>Approximate Length (m)</th></tr>
<tr><td rowspan="3">Existing</td><td>Front gate to truck wash</td><td>292</td></tr>
<tr><td>‘Diamond’ intersection to core shed</td><td>360</td></tr>
<tr><td>Front gate road to car park</td><td>132</td></tr>
<tr><td rowspan="6">New</td><td>Truck wash to haul road connection from Kintore Pit</td><td>690</td></tr>
<tr><td>Kintore Pit intersection (truck wash and haul roads) to ROM pad (haul road for ore mine trucks)</td><td>1,186</td></tr>
<tr><td>Altered ROM pad to and through mill</td><td>384</td></tr>
<tr><td>Mill to rail load out (concentrate trucks)</td><td>910</td></tr>
<tr><td>Truck wash road to workshop</td><td>190</td></tr>
<tr><td>Haul road to backfill plant</td><td>400</td></tr>
<tr><td rowspan="2">Modification 6</td><td>Haul road for transportation of harvested tailings from TSF2 to TSF3</td><td>2,283</td></tr>
<tr><td>Ore haul road from the new portal (Modification 6) to the Run of Mine Pad</td><td>325</td></tr>
</table></td><td>Section 6.1</td></tr>
<tr><td>Sch3, 7</td><td>Operating Conditions
Ore crushing shall only be undertaken in a fully-enclosed structure that is designed, operated and maintained to ensure internal negative internal air pressure relative to ambient (external) conditions. The enclosure and associated emissions controls must be designed, constructed, operated and maintained to ensure that visible fugitive emissions from the enclosure are minimised.</td><td>Section 6.10</td></tr>
<tr><td>Sch3, 8</td><td>Operating Conditions
A chemical dust suppressant shall be applied as per the manufacturer’s specification, or more often as required, to all ‘free areas’ identified in the figure in Appendix 4.</td><td>Section 4.1.2, 10
Tables 4, 5, and 6</td></tr>
<tr><td>Sch3, 9</td><td>Operating Conditions
All above-ground conveyors and transfer points prior to the grinding circuit (SAG and ball mills) shall be enclosed.</td><td>Section 6.6</td></tr>
<tr><td>Sch3, 10</td><td>Operating Conditions
Video recording equipment shall be installed to assist in the activemanagement of emissions from the tailings storage facility.</td><td>Section6.5, 11
Table 5</td></tr>
<tr><td>Sch3, 11</td><td>Air Quality Management Plan
The Proponent must prepare an Air Quality Management Plan for the project to the satisfaction of the Secretary. This plan must:</td><td>This document</td></tr>
</table>

Condition	Condition Detail	Section/ Procedure
	(a) be prepared by a suitably qualified and experienced person/s, in consultation with EPA and submitted to the Secretary for approval prior to the commencement of construction on the site;	Section 1.1, Appendix D
	(b) identify all major sources of particulates and other air pollutants that may be emitted from the project, being both point source and diffuse emissions, including identification of the potential for lead contamination to be carried by these particulates;	Section 4.1.2, 4.1.3, Appendix A
	(c) include an air quality monitoring program that: • provides a real-time monitoring system of dust emissions around the perimeter of TSF2 that triggers an automated water spray system prior to adverse meteorological conditions occurring; • is capable of measuring lead concentrations located in the prevailing downwind direction near the perimeter of TSF2. • provides for periodic point source monitoring at Point 1 (Ventilation Shaft) and Point 2 (Process Enclosure/ Baghouse Stack); • provides for continuous ambient monitoring across an ambient air quality and dust monitoring network comprising no fewer than ten monitoring locations (Points 3 to 12) for total suspended particulates, PM_{10}, lead and dust deposition. Monitoring locations shall be informed by the outcomes of the air quality assessments presented in the EA and PPR and identified in consultation with EPA; • provides for continuous meteorological monitoring using ameteorological monitoring station located on the site; • is consistent with the requirements of *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales* (NSW EPA, 2022), or the latest version, the *Protection of the Environment Operations Act 1997* and the *Protection of the Environment (Clean Air) Regulation 2010*; • details trigger response management protocols in combination with continuous particulate matter monitors and a meteorological monitoring station on-site, with clear and specific reactive mitigation measures to be implemented in accordance with the trigger response management protocol; and	Appendix E- (Sections 4.5 and 4.7.) Appendix E (Section 4.1), Section 10 Appendix E (Section 4.6), Section 10 Appendix E (Section 4), Section 10, Table 4 Section 10 Table 7 Appendix E Section 3 Section 11 - TARP
	(d) pro-active and reactive management and response mechanisms for particulates with specific reference to measures to be implemented and actions to be taken to minimise and prevent potential elevated air quality impacts (including ambient air and deposited dust impacts) on surrounding land uses as a consequence of meteorological conditions, upsets within the project, or the mode of operation of the project at any time; (e) procedures to review and refine the reactive management triggers for wind speed and dust concentrations;	Sections 6, 10.1, 10.2, 11 Section 10.1, 6.16
	(f) procedures and processes for monitoring ambient dust and deposited dust impacts;	Section 10, Appendix E (Section 4)
	(g) provision for regular review of dust monitoring data, with comparison of monitoring data with that assumed and predicted in the documents referred to under Condition 2 of Schedule 3;	Section 10.1, 9.1

Condition	Condition Detail	Section/ Procedure
	(h) details of measures to be implemented to address any situation in which monitored dust impacts exceed those assumed and predicted in the documents referred to under Condition 2 of Schedule 3; (i) specific complaints management procedures in the event that dust monitoring indicates elevated off-site impacts; (j) procedures for the minimisation of dust generation on the site and measures to be implemented to ensure compliance with the air quality criteria and operating conditions in this approval; (k) protocols for regular maintenance of plant and equipment to minimise the potential for elevated dust generation, leaks and fugitive emissions; and (l) a contingency plan should an incident, upset or other initiating factor lead to elevated dust impacts, whether above normal operating conditions or above environmental performance goals/ limits.	Section 10.1, 10.2 Section 8 Section 6, 11, 10, 8 Section 6, App E – AQMMP Section 4.1 Section 10.2, 11, 6.16, 11
Sch3, 11A	The Proponent must implement the Air Quality Management Plan as approved by the Secretary.	Section 1.1, 1.2, 12
Sch3, 14	**Update Human Health Risk Assessment** Within one year of the commencement of operation of the project, and every five years thereafter, unless otherwise agreed by the Secretary, the Proponent shall update the human health risk assessment prepared for the project and presented in the EA to the satisfaction of the Secretary. The updated risk assessment shall: (a) be prepared by a suitably-qualified expert whose appointment has been endorsed by the Secretary; (b) take into account monitoring data collected under this approval, and such other information as may be relevant to the assessment; and (c) be prepared in consultation with the EPA and the NSW Health (Western NSW Local Health District).	Section 9.2
Sch3, 14A	**Update Human Health Risk Assessment** The updated Health Risk Assessment must inform the revision of the Air Quality Management Plan and the Lead Management Plan required under this approval, if monitoring data shows that the project is contributing to increased blood lead levels.	Section 4.1.3, 9.2, 10.2
Sch4, 1	**Environmental Management Strategy** The Proponent shall prepare and implement an Environmental Management Strategy for the project to the satisfaction of the Secretary. This strategy must: (a) be submitted to the Secretary for approval by the end of June 2011;	See Environment al Management Strategy

Condition	Condition Detail	Section/ Procedure
	(b) provide the strategic framework for the environmental management of the project; (c) identify the statutory approvals that apply to the project; (d) describe the role, responsibility, authority and accountability of all key personnel involved in the environmental management of the project; (e) describe the procedures that would be implemented to: • keep the local community and relevant agencies informed about the operation and environmental performance of the project; • receive, handle, respond to, and record complaints; • resolve any disputes that may arise during the course of the project; • respond to any non-compliance; and • respond to emergencies; and (f) include: • copies of any strategies, plans and programs approved under the conditions of this approval; and • a clear plan depicting all the monitoring required to be carried out under the conditions of this approval.	
Sch4, 2	**Management Plan Requirements** The Proponent shall ensure that the management plans required under this approval are prepared in accordance with relevant guidelines, and include: (a) detailed baseline data; (b) a description of: • the relevant statutory requirements (including any relevant approval, licence or lease conditions); • any relevant limits or performance measures/criteria; and • the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures;	Section 8, App E-AQMMP, App A – Table A1 Section 7 Section 10 App E – AQMMP Section 2.4
	(c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	Section 6.10
	(d) a program to monitor and report on the: • impacts and environmental performance of the project; and • effectiveness of any management measures (see (c) above);	Section 7, 8, 9
	(e) a contingency plan to manage any unpredicted impacts and their consequences;	Section 10.1, 10.2
	(f) a program to investigate and implement ways to improve the environmental performance of the project over time;	Section 7, 10.1, 10.2
	(g) a protocol for managing and reporting any: incidents; complaints;	Section 7 , 8, 10.1, 10.2

Condition	Condition Detail	Section/ Procedure
	non-compliances with the conditions of this approval and statutory requirements; and exceedances of the impact assessment criteria and/or performancecriteria; and (h) a protocol for periodic review of the plan. *Note: The Secretary may waive some of these requirements if they areunnecessary or unwarranted for particular management plans.*	Section 9.1
Sch4, 3	**Annual Review** By the end of 31 March 2023, and annually thereafter, the Proponent must submit a report reviewing the environmental performance of the project to the satisfaction of the Secretary. This review must: (a) describe the project (including any rehabilitation) that was carried out in the past calendar year, and the project that is proposed to be carried out over the next year; (b) include a comprehensive review of the monitoring results and complaints records of the project over the past year, which includes a comparison of these results against the: • relevant statutory requirements, limits or performance measures/criteria; • monitoring results of previous years; • relevant predictions in the documents referred to in Condition 2 ofSchedule 2; and • requirements of any plan or program required under this approval; (c) identify any non-compliance over the past year, and describe whatactions were (or are being) taken to rectify the non-compliance and avoid reoccurrence; (d) identify any trends in the monitoring data over the life of the project; (e) identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significantdiscrepancies; (f) describe what measure will be implemented over the next year toimprove the environmental performance of the project; and (g) evaluate and report on compliance with the performance measures, criteria and operating conditions of this approval.	Section 7.2, App E – AQMMP Section 5.2
Sch4, 4	**Review of Strategies, Plans and Programs** Within three months of: (a) the submission of an annual review under Condition 3 above; (b) the submission of an incident report under Condition 5 below; (c) the submission of an audit report under Conditions 7 – 8A below; (d) any modification of the conditions of this approval (unless theconditions require otherwise), or (e) a direction of the Secretary under condition 2 of Schedule 2. the Proponent shall review, and if necessary revise, the strategies, plans, and programs required under this approval to the satisfaction of the Secretary. *Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the project.*	Section 9.1

Condition	Condition Detail	Section/ Procedure
Sch4, 5	**Incident Notification, Reporting and Response** The Secretary must be notified in writing via the Major Projects website immediately after the Proponent becomes aware of an incident. The notification must identify the project (including the development application number and the name of the development if it has one) and set out the location and nature of the incident. Subsequent notification requirements must be given, and reports submitted in accordance with the requirements set out in Appendix 5.	Section 7.1
Sch4, 5A	**Non-compliance Notification** The Secretary must be notified in writing via the Major Projects website within seven days after the Proponent becomes aware of any non-compliance. A non-compliance notification must identify the project and the application number for it, set out the condition of approval that the project is non-compliant with, the way in which it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance. *Note: A non-compliance which has been notified as an incident does not need to also be notified as a noncompliance.*	Section7.1
Sch4, 6	**Regular Reporting** The Proponent shall provide regular reporting on the environmental performance of the project on its website, in accordance with the reporting arrangements in any approved plans or programs of the conditions of this approval.	Section 7.2
Sch4, 7	**Independent Environmental Audit** Within one year of the date of physical commencement of development under Modification 6, and every three years after, unless the Secretary directs otherwise, the Proponent must commission and pay the full cost of an Independent Environmental Audit of the project. The audit must: (a) be prepared in accordance with the Independent Audit Post Approval Requirements (NSW Government 2020); and (b) be submitted, to the satisfaction of the Secretary, within two months of undertaking the independent audit site inspection, unless otherwise agreed by the Secretary.	Section 9.2
Sch4, 8	**Independent Environmental Audit** In accordance with the specific requirements of the Independent Audit Post Approval Requirements (NSW Government 2020), the Proponent must: (a) review and respond to each Independent Audit Report prepared under Condition 7 above; (b) submit a response to the Secretary and any other NSW agency that requests it, together with a timetable for the implementation of the recommendations of the Independent Audit Report; (c) implement the recommendations to the satisfaction of the Secretary; and (d) make each Independent Audit Report and response to it publicly available no later than 60 days after submission to the Secretary.	Section 13.2
Sch4, 8A	**Monitoring and Environmental Audits** Any condition of this approval that requires the carrying out of monitoring or an environmental audit, whether directly or by way of a plan, strategy or program, is taken to be a condition requiring monitoring or an environmental audit under Division 9.4 of Part 9 of the EP&A Act. This includes conditions in respect of incident notification, reporting and response, non-compliance notification,	Section 11, Appendix E-AQMMP

Condition	Condition Detail	Section/ Procedure
	compliance report and independent audit. For the purposes of this condition, as set out in the EP&A Act, "monitoring" means monitoring of the project to provide data on compliance with the approval or on the environmental impact of the project, and an "environmental audit" means a periodic or particular documented evaluation of the project to provide information on compliance with the approval or the environmental management or impact of the project.	
Sch4, 9	**Access to Information** From the end of March 2011 until the completion of all rehabilitation required under this approval, the Proponent shall: (a) make copies of the following information and documents (as they are obtained, approved or as otherwise stipulated within the conditions of this approval) publicly available on its website: • the documents referred to in Condition 2 of Schedule 2; • all current statutory approvals for the project; • all approved strategies, plans and programs required under the conditions of this approval; • the proposed staging plans for the project if the construction, operation or decommissioning of the project is to be staged; • regular reporting on the environmental performance of the project in accordance with the reporting requirements in any plans or programs approved under the conditions of this approval; • the monitoring results of the project, reported in accordance with the specifications in any conditions of this approval, or any approved plans or programs; • a summary of the current phase and progress of the project; • contact details to enquire about the project or to make a complaint; • a complaints register, updated on a monthly basis; • the annual reviews of the project; • any independent environmental audit of the project, and the Proponent's response to the recommendations in any audit; and • any other matter required by the Secretary; (b) keep this information up-to-date, to the satisfaction of the Secretary	Section 7
Sch4, 11	**Updating and Staging of Studies, Strategies and Plans** To ensure the studies, strategies and plans for the project are updated on a regular basis and incorporate any required measures to improve the environmental performance of the project, the Proponent may submit revised studies, strategies or plans required for the project under the conditions of approval at any time. With the agreement of the Secretary, the Proponent may also submit any study, strategy or plan required under the conditions of this approval on a staged basis.	Section 9

3.2. Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) is the key piece of environment protection legislation in NSW. With regard to air pollution, the POEO Act

regulates commercial, industrial and domestic activities. The POEO Act also contains provisions concerning air pollution arising from motor vehicles and open burning.

The following regulations support the POEO Act in managing air pollution:

- *Protection of the Environment Operations (Clean Air) Regulation 2021*; and
- *Protection of the Environment Operations (General) Regulation 2021*.

The first of these regulations is the more relevant to operations at the Rasp Mine. The *POEO (Clean Air) Regulation 2010* primarily sets emission limits for major industrial activities scheduled under the POEO Act, as well as regulating emissions of solid particles and smoke from non-scheduled activities. The emission limits specified in Section 4.6 of the Rasp Air Quality Management Plan are consistent with, or more stringent than, the requirementsset out in this Regulation.

3.3. Environment Protection Licence

EPLs are administered by the EPA. Rasp Mine is subject to EPL 12559, pursuant to the Protection of the EnvironmentOperations Act 1997.

The following provides a summary of EPL conditions in relation to air quality:

- undertake monitoring for dust at the listed locations and for the listed parameters, and meet the listed criteria;
- do not cause any offensive odour from the premises;
- prevent dust emission from the premises;
- cover the loads of any ore trucks entering or leaving the premises;
- immediately suppress any visible dust emissions from the TSF by water or chemical suppressant;
- only crush extracted material in the crusher enclosure, operate the enclosure under negative pressure at all times when in operation, and minimise any fugitive emissions;
- include dust management practices in the AQMP that effectively minimise dust emissions; and
- maintain monitoring records for 4 years, and provide to an EPA officer upon request.

In addition to the EPL conditions, the AQMP must be written in consultation with the EPA. Evidence of correspondence with the EPA is provided in Appendix D. The EPA concurs with the NSW Department of Planning and Environment's comments in relation to its review of the AQMPs previously submitted. Table 4 lists the EPA's feedback and the BHOP response.

Table 4 EPA Consultation and Feedback

EPA Feedback	BHOP Control Response
2016	
Tailings Storage Facility 2 (TFS2) Operation An irrigation system is proposed for dust management. This should be installed to ensure controls are in place before any issues arise, and it could be an automatic system that is weather activated (e.g. if the wind speed exceeds a nominated value, sprinklers activate and/or deactivate). Any manual watering systems need activation procedures (trigger points) to avoid methods based on individual interpretation.	A wall lift is proposed for TSF2 which will increase its life to approximately 6 years from July 2016. Current deposition maintains a moist surface across the entire surface of the TSF. An irrigation system will be fitted once the surface of the tails shows evidence of drying which is not expected until deposition stops. During MOD4 discussions it was agreed with the EPA that the irrigation system would be installed during operation of TSF2 and after Embankment construction. Irrigation system is currently being installed (March 2022)
Unloading Ore to ROM stockpile Manual water sprays could be converted to weather-activated and automatic/routine to avoid human error.	Automated sprays have been suggested by the EPA, these will also be investigated at a later date. Dust is managed through the application of water by water carts.
Exposed Areas Chemical dust suppression could be applied overset time periods and subject to set time frame inspections to determine if additional application is required prior to the rostered application.	The current dust suppression chemical Total Ground Control (TGC) has a service life of 18 months. The TGC is currently re-applied every 12 months, well inside the expiry date. Dustbinder is a chemical dust suppressant applied to unsealed roadways as required.
Sealed Roads Street sweeping could be routinely rostered for use at set time periods, with additional inspections to determine if more frequent use is required.	Street sweeping is currently scheduled for 12 hours every week. In periods of heavy loading, such as after heavy rain, extra hours are provided.
ROM Stockpile Wind Erosion Stockpiles should be kept below surrounding bunds removing the “as much as practicable” component.	Removed.
Front end loader Operation/Apron Feeder Hopper at ROM Pad Inspection of the irrigation system could be more frequent, with set timeframes, and the cessation of works procedure could be formalised through guidelines (e.g. if wind speed exceeds a certain nominated value a stop work is activated).	The irrigation system is constantly monitored from the control room on the Citect control system. There is also constant video monitoring of the hopper.
Concentrate Handling Works are undertaken within an enclosed building. However, truck drivers are responsible for manually opening and closing the entry/exit doors - the doors could be automatic.	Concentrate handling shed doors are already automated.
2018	
Meteorological forecasting Meteorological forecasting is proposed to predict meteorological conditions that indicate when an elevated risk of dust emissions may occur. The performance of the proposed forecast system,	The forecast system will be customised for Rasp Mine conditions and will incorporateall model parameters. The system will be reviewed following incidents. Wind direction will be used in conjunction with real-

EPA Feedback	BHOP Control Response
specific to the mine location, has not been demonstrated. If the forecast system is to be effective, it is imperative that the model does not under predict variables that contribute to dust lift-off. The AQMP is unclear on which wind directions will be used as a trigger to inform effective dust management practices.	time monitoring of dust levels to determine dust source.
Reactive management triggers Reactive management triggers for PM_{10} include 1-hour PM_{10} concentration triggers of 80 µg/m^3 and 100 µg/m^3. The trigger concentrations have been selected based on the '*default values adopted at other extractive industry sites*'. To ensure dust is prevented from leaving the TSF2, the trigger values should be re-evaluated. 'Strong' and 'extreme' wind event triggers of 35 km/h and 50 km/h have been nominated in section 1.3 of the AQMP. However, in Section 4 of Appendix B, a strong wind event is defined as wind speeds reaching gusts of 40 km/h (10.9 m/s), as measured 10 m above the surface of the TSF. These inconsistencies should be addressed.	Reactive triggers of one-hour 50 µg/$m^3$and one-hour 100 µg/m^3 have been used in the TARP but may be re-evaluated based on experience. TEOM units currently provide alerts at trigger levels of 15-minute 300 µg/m^3, three-hour 100 µg/m^3 and 24-hour 50 µg/m^3. Level 1 (strong) and Level 2 (extreme) limits of 40 km/h and 50 km/h have been used for consistency. The site weather station currently provides alerts at 35 km/h (awareness trigger), 40 km/h and 50 km/h.
Training The AQMP does not address any training of staff and contractors in effective dust management practices. Internal training and reporting procedures should be incorporated into an AQMP that aim to educate employees around the risks of dust and how to report identified dust issues.	The site general induction was updated will be updated to reflect changes in activities and controls. Specific procedures will also be updated were updated and are regularly reviewed to include training of specific dust control practices for nominated staff.
Action and Response Plans The Actions and Responses identified in the AQMP are limitedto 1) the TSF spray system and 2) the application of fresh tailings. The TSF2 spray system is the principal method of dust suppression for the TSF2. However, it is unclear if the spray system will be effective under windy conditions. The AQMP does not include practical measures to determine the effectiveness of the spray system, at controlling dust emissions,if such conditions arise. Inundating the TSF using an application of fresh tailings is included in the AQMP as an alternative to the spray system. However, the AQMP is not clear as to how quickly this mitigation measure could be applied. The TARPs do not include any references to the video monitoring, or how the feed from the video will be used as an effective management tool. Additional action and response plans should be considered for each of the alert levels identified. The plan should consider changed work practices under certain environmental conditions, such as reduced truck movements along the TSF2	The spray system will be designed to be effective under windy conditions, and will be engaged to wet the TSF surface prior to windy conditions. Inspections required under the TARP will identify deficiencies in the spray system operation. A water cart may be employed if the spray systemfails to wet certain locations. Application to the TSF of fresh tailings will be a preparatory measure based on weather forecasting and inspections identifying the drying of theTSF surface. Dust suppressant has and will be applied to sections of the TSF where fresh tailings or spray coverage cannot be employed, such as when a cell on the TSF is left to dry prior to harvesting.

EPA Feedback	BHOP Control Response
embankment. Additional monitoring and mitigation measures shouldalso be considered such as visual inspections to determine the effectiveness of water spray systems and the use of a water cart if required. The air quality advisor recommend the proponent consider a combination of additional monitoring and mitigation that could be used to; 1. assess the effectiveness of mitigation measures in real time, and 2. respond with an appropriate alternative control in a timely manner.	
Instrument failure It is proposed that in the event of the Location A PM monitor failing and requiring off-site repairs, the unit will be temporarily replaced with the PM monitor from Location B. As the time taken for repairs is unknown, a contingency plan should be in place to ensure effective dust management and control practices are being maintained. It is recommended the proponent considers actions that could be applied, in a timely manner, in the event a dust monitor fails, such as a trained dust watch person conducting more frequent observations and keeping records.	In the event of instrument failure a portable PM_{10} monitor will be available for deployment, as well as for use in investigations of the contribution of external dust sources. Additional inspections, and the use of nominated dust watch staff, will be employed in the time it takes to replace a failed monitor with a spare unit.
2019	
EPA note the EPA's comments on the draft Air Quality Management Plan have been incorporated into the final document.	
There is no proposed timeframe or trigger for the water spray dust suppression system is to be installed on TSF2. We recommend BHOP enters into negotiations with the EPA about an appropriate timeframe or trigger which will see the installation of the proposed TSF2 water spray system at an agreed stage.	BHOP has reviewed the timeframe for installation and testing of the TSF2 spray system, and determined that 31 March 2020 will be the completion date. The tailings level in TSF2 is expected to reach 309 m AHD (the current lip of the pit) around 1 January 2021. EPA were informed in May 2021 of the revision of the spray system design considering proposed changes to operation of TSF2 in MOD6.
2021	
EPA's submission on MOD 6 asked for: • a cap on production to 500,000 tonnes per annum • a Construction Air Quality Management Plan • Proactive and reactive management measures including the use of a comprehensive water sprinkling system, portable ambient air monitoring equipment and weather forecasting to inform operational activities.	• The conditions restrict production to 500,000 tonnes per annum, or up to 750,000 tonnes per annum subject to further air quality assessment undertaken to the satisfaction of the Secretary • BHOP will implement a Construction Environmental Management Plan to manage environmental issues including dust mitigation during the construction stage of MOD 6. • Various mitigation measures have been identified to reduce dust emissions which

EPA Feedback	BHOP Control Response
	include: - the sealing of the new ore haul road; - a reduction in truck movements by the use of larger trucks for tailings haulage (from TSF2 to TSF3); and - the sprinkler system for TSF2 will be optimised to accommodate the change to tailings harvesting operations.
2022	
$PM_{2.5}$ criterion included in MOD6 Project Approval EPA's response to addition of $PM_{2.5}$ monitoring requirement to PA 07_0018 was that the EPA consider the $PM_{2.5}$ criteria to be a modelling criteria and not a regulatory criteria. (Email from EPA, 23 February 2022)	• BHOP have committed to including the $PM_{2.5}$ monitoring equipment in a future variation of the EPL. (Email to EPA, 23 March 2022).
AQMP review and consultation AQMP updated for MOD6 was submitted to EPA for review on 20 May 2022 and Tansley Hill, Operations Officer, responded by email that the EPA had no further comment regarding the AQMP.	• Forward the Draft AQMP to DPE for approval.

4. Air Quality Aspects Register and Source Risk Ranking

The environmental aspects register and risk ranking for potential air quality impacts providesthe basis of the air quality management and monitoring planning for the Rasp Mine.

4.1. Emissions Inventory

A site-specific atmospheric emission inventory was developed as part of the air quality assessment process (ENVIRON, 2010) for the Environment Assessment, July 2010 and Preferred Project Plan, September 2010 (Appendix A).

The site's air emissions inventory contains a record of all significant potential air quality emission sources, as identified during the air quality assessment process. Dispersion modelling results (ENVIRON, 2010) have been referenced to establish the contributions of significant sources to predicted particulate impacts at sensitive receptor sites to inform air quality risk ranking.

Source risk rankings are revised throughout the life of mine where there is a significant change to the emissions inventory.

The assumptions in the emissions estimates for MOD6 are based on those documented within the Environ (2010) air quality assessment report for the Mine, which were repeated in subsequent air quality assessments (see Pacific Environment (2017a)). The emissions estimates for MOD6 are detailed in ERM 2021 and provided in Appendix A.

4.1.1. Boxcut, Kintore Pit TSF3 and Tailings Harvesting

ERM was engaged to complete an AQIA for the Rasp Mine MOD 6 (ERM 2021). The AQIA included:

- a comprehensive analysis of the baseline air quality, including data up to June 2019;
- an assessment of three scenarios;

- Business as Usual (BAU) – this scenario presented a representative operational year of operations under the existing situation and consists of 100% of operations from the Kintore Pit portal;
- MOD6 Construction scenario – this represented the construction of the box cut and the new portal; and
- MOD6 Operational scenario – this represented a reasonable worst-case future year of operations, with progressive rehabilitation and 100% of operations from the new mine portal.

The construction of the new box cut included in the MOD6 construction scenario is expected to take six months. The MOD6 operational scenario was chosen as a representative reasonable worst-case future operational scenario as it comprised the period with the longest travel distances related to the transport and emplacement of waste rock material.

- the estimation of emissions for annual average as well as a 24-hour (reasonable worst-case) peak scenarios; and
- the prediction of off-site air quality impacts using the AERMOD atmospheric dispersion model.

For the MOD6 construction scenario, there was anticipated to be a minor net increase in lead concentrations / deposition rates when considering all sensitive receptors and compared with the MOD4 mine increment. However, all air quality metrics were predicted to be below their respective NSW EPA criteria for the MOD6 construction scenario. The MOD6 construction scenario was expected to be approximately six months in duration and modelling indicated that the associated impacts would reduce upon completion of this phase.

For the MOD6 operational scenario, which incorporated the new portal location and the proposed tailings harvesting activities, there was predicted to be a net reduction in lead concentrations / deposition rates when compared with the Preferred Project Report (PPR) as well as the Business as Usual scenario (BAU). In addition, all air quality metrics were predicted to be below their respective NSW EPA criteria for the MOD6 operational scenario.

As the MOD6 operational scenario was considered to be a reasonable worst-case future year scenario, it was concluded that all future operational years would result in a net reduction in off-site air quality impacts (including lead) when compared with current operations. This was primarily due to the shorter travelling distance for ore transport from the new portal to the ROM pad.

The results for all three scenarios demonstrated compliance with all the NSW EPA impact assessment criteria for all air quality metrics assessed.

Cumulative impacts from the proposed Broken Hill North Mine Recommencement Project were assessed against both short and long-term air quality criteria. The results demonstrated no exceedance of the NSW impact assessment criteria at any of the receptors assessed.

4.1.2. Particulate Matter Emissions Inventory

The emissions estimates for MOD6 are detailed in ERM, 2021. Modelling was completed for three particle size categories; TSP, PM10 and PM2.5. A summary of all the air quality related aspects identified within the Project's air quality assessment is outlined in **Appendix A**. These tables show the emissions estimates for the Construction and Operational phases of the project.

In the 2010 assessment the highest ranked emission source in terms of uncontrolled emissions, was anticipated to be the existing 'free areas'. These areas will not be disturbed by BHOP activities. However, these areas have the potential to generate dust from wind take-up. Figure 4-1outlines the site's 'free areas'. In addition these free areas have a chemical dust suppressant (Total Ground Control) applied annually as per manufacturers specification to minimise and control dust lift off.

Mining-related emission sources may be controlled by a factor of approximately 95% compared with uncontrolled emissions from the site, providing that the proposed management strategies and associated control measures are implemented.

Approximately 75% of annual Project-related particulate emissions have been attributed to the following (controlled) site sources as shown in Figure 4-2 and Figure 4-3:

- unpaved roads, paved roads (TSP);
- ROM stockpile; and
- TSF (PM10 and PM2.5).

Figure 4-1 Site Free Areas

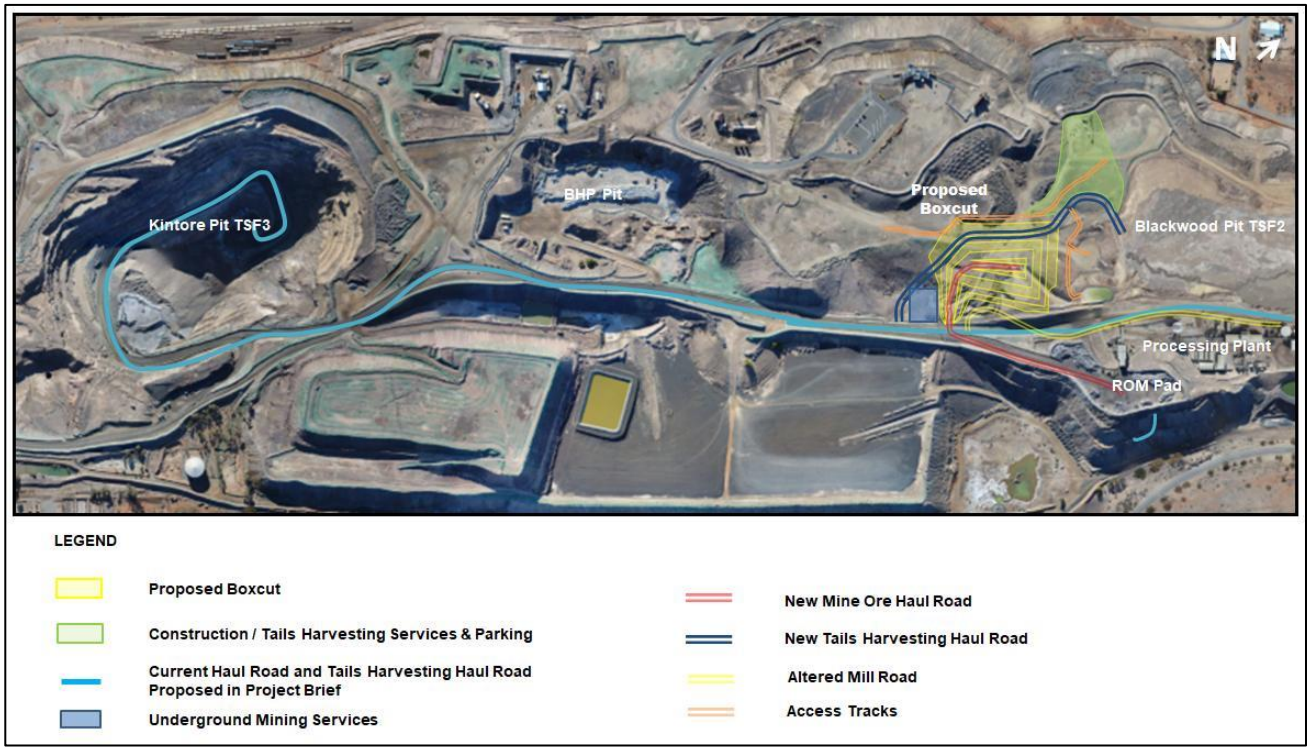


Figure 4-2 Dust-emitting features

Figure 4-3 Unsealed roads treated with dust suppressant

4.1.3. Lead Emissions Inventory

The relative contributions of controlled air quality aspects to the site's lead emissions inventory differs significantly to the particulate emission inventory, and are governed by the lead content of different materials, ascertained through site-specific sampling and analysis.

The Pb emissions modelled for MOD6 are provided in Appendix A and identify the ROM Pad operations and Disturbed Areas (roads and active mining-related areas) as the greatest contributors of Pb emissions.

Estimates adopted for the assessment of potential Pb emissions for non-road sources were based on the percentage lead composition of different material substrates on site, the following were applied:

- Tailings = 0.3% Pb
- Waste rock = 0.5% Pb
- Free Areas = 1.4% Pb
- Active mined areas = 1.9% For the MOD6 construction scenario, there is anticipated to be a net increase in lead concentrations / deposition rates across the sensitive receptors when compared with MOD4.

All air quality metrics are predicted to be below their respective NSW EPA criteria for the MOD6 construction scenario. The MOD6 construction scenario is expected to be approximately six months in duration and modelling predictions indicate that the associated impacts will reduce upon completion of this phase.

For the MOD6 operational scenario, which incorporates the new portal location and the proposed tailings harvesting activities, there is predicted to be a net reduction in lead concentrations / deposition rates when compared with the PPR scenario and the BAU scenario.

All air quality metrics are predicted to be below their respective NSW EPA criteria for the MOD6 operational scenario.

The most dominant lead source contributions are similar to those for particulate matter.

The sources contributing most significantly to off-site dust deposition are:

- unsealed mine areas;
- ROM stockpile wind erosion;
- paved roads;
- unloading ore to ROM stockpile; and,

SLR Consulting Australia Pty Ltd was engaged by BHOP to undertake a Human Health Risk Assessment (HHRA) for MOD6. The HHRA covers the MOD6 construction phase and operational phase of the operation which constitutes an updated HHRA based on the review of monitoring data. The HHRA used air quality modelling results from the air quality assessment completed by ERM for MOD6. SLR consulted BHELP on soil metal concentrations to inform the HHRA.

SLR made the following conclusions:

- Predicted incremental increases in soil Pb potentially arising from approximate 12-month MOD6 construction phase were small and insignificant (i.e. 0.005-0.43% of existing soil Pb).
- MOD6 operations were not expected to change absolute geometric mean blood Pb in children living in Broken Hill.
- Blood Pb concentrations in children living in Broken Hill were not anticipated to be affected by activities associated with MOD6.
- The risk of exceeding health-based toxicity reference values for other metals as a result of MOD6 construction or operations was very low.

Based on the conclusions of the HHRA there are no additional dust management measures required.

4.2. Dust Management Prioritisation

Consistent with the site's objectives and targets, dust controls have been applied to all air quality aspects at the site.

Based on the analysis of the air emission inventory and dispersion modelling outputs, a risk ranking has been developed using a standard risk assessment matrix (provided in **Appendix F**), as shown in Table 5.

Table 5 shows uncontrolled risk rankings for different air quality aspects. The strategies developed in this management plan, as well as the relevant control actions described in operational procedures to mitigate and manage air quality issues, are subsequently provided. Finally, risk rankings are provided with these controls in place.

In addition, Table 5 shows potential emission sources that have been included but were not previously quantified within the air quality assessment due to their periodic (and relatively minor) nature, namely:

- lime silo operations; and,
- grader activities.

The following sources are considered to comprise the greatest air quality risks under normal operations:

- project-related disturbed areas;
- unpaved roads.
- paved roads; and
- ROM stockpile operation and wind erosion.

Additionally, under plant upset conditions, the following sources have the ability to compromise air quality:

- concentrate handling;
- TSF wind erosion;
- transfers at the crushed ore storage bin;
- ventilation exhaust;
- unloading ore to ROM stockpile;
- front end loader operations.
- crusher circuit;
- lime silo operations; and
- grader activities.

Table 5 Air Quality Aspects Risk Register

	Uncontrolled Source Emissions			Controlled Source Emissions			
Aspect	**Consequence**	**Likelihood**	**Risk Classification**	**Current Controls**	**Consequence**	**Likelihood**	**Risk Classification**
Existing Free Areas	Significant	Almost Certain	Extreme 20	Application of Chemical Dust Suppressant Restriction of vehicle or work access to areas Restriction of surface disturbances within area Removal and burial of fine material, capping with inert waste rock (or similar inert material), or additional use of chemical dust suppressants	Moderate	Unlikely	Low 5
Project Related Free Areas	Significant	Almost Certain	Extreme 20	Application of Chemical Dust Suppressant	Moderate	Unlikely	Low 5
Unsealed roads	Significant	Almost Certain	Extreme 20	Application of Chemical Dust Suppressant suitable for use on unsealed roads Restriction of traffic on unsealed roads Speed restrictions (maximum 25km/h)	Moderate	Unlikely	Low 5
Sealed roads	Significant	Almost Certain	Extreme 20	Use of PM10 road sweeper to keep roads clean and limit silt loadings Not overloading haul trucks to avoid spillage of material onto roadways Requirement for the cleaning of vehicles	Moderate	Unlikely	Low 5

				before they exit onto public roads using the site's dedicated wheel wash Provision for storm water drainage to prevent water erosion onto paved roads			
ROM Stockpile Wind Erosion	Major	Almost Certain	Extreme 23	Use of water sprays and static wind breaks	Significant	Unlikely	Medium 9
Concentrate Handling	Major	Almost Certain	Extreme 23	Concentrate loaded to sealed containers within an enclosed structure	Significant	Unlikely	Medium 9
TSF Wind Erosion	Moderate	Almost Certain	High 16	Application of wet tailings, sprinkler system, and chemical dust suppressant (95% control) Use of predictive meteorological forecasting system Live video system (capable of recording) to monitor for dust lift off.	Minor	Unlikely	Low 2
Transfer to/from Crushed Ore Storage Bin	Significant	Almost Certain	Extreme 20	Enclosure of conveyors Crushed ore storage bin is an enclosed structure	Moderate	Unlikely	Low 5
Ventilation Exhaust	Moderate	Likely	Medium 12	Application of water sprays around exhaust activated during firing times Quarterly testing of exhaust emissions	Moderate	Unlikely	Low 5
Unloading ore to ROM stockpile	Major	Almost Certain	Extreme 23	Water sprays, wind breaks and water cart	Moderate	Unlikely	Low 5

Front End Loader operations	Major	Almost Certain	Extreme 23	Water (atomising) sprays on apron feeder hopper Operation of Loader between wind breaks Use of Water cart	Moderate	Unlikely	Low 5
Crusher Circuit	Major	Almost Certain	Extreme 23	Use of a permanent full enclosure under negative pressure vented to a Baghouse Water sprays	Moderate	Unlikely	Low 5
Lime Silo Operations	Moderate	Likely	Medium 12	Silo-specific engineering and operational controls including enclosed structures, transfer process and storage tanks Pressurised process with interlocked sensors in the event of lost pressure or operational issue.	Minor	Unlikely	Low 2
Grader Activities	Significant	Likely	High 17	Grading of damp areas only Limitation of grading to affected areas only.	Moderate	Unlikely	Low 5

5. Air Quality Objectives and Targets

Table 6 provides objectives and targets relevant to the management and mitigation of air quality impacts. These objectives and targets have been developed in line with legal responsibilities, environmental aspects, available technology, operational requirements and stakeholder consultation. The objectives and targets will be reviewed annually as part of the AQMP review.

Table 6 Summary of Proposed Air Quality Management Objectives and Targets

Area	Objective	Target
Legislative Compliance	Satisfy the statutory requirements with respect to air quality documented in Section 3	No odour complaints associated with BHOP operations.
		Particulate matter emissions generated by the project do not cause an exceedance of the criteria listed in (Tables 1, 2 or 3 of Project Approval at any residence on privately-owned land.
		No exceedance of the criteria listed in Tables 4 and 5 of Project Approval and section L2.2 of the EPL.
		Operate ore crushing enclosure to minimise dust emissions from this source.
Project Operations	Ensure that all air quality sources are adequately controlled.	All workers and contractors trained in the relevant procedures and strategies containedin this plan. To implement air quality control measures as outlined in Section 6 and Appendix B.
Stakeholder	Mitigate air quality impacts on neighbouring residents, sensitivereceptors and public roads	No air quality related complaints from the community.
Effective Dust Management	Ensure effective controls are employed to minimise air qualityimpacts on sensitive receptors.	Seal and maintain all roads specified in Table 6of the Project Approval.
		Apply chemical dust suppressant and maintain as per the manufacturer's specification to all 'free areas' identified in Appendix 4 of the Project Approval.
		Enclose all above-ground conveyors and transfer points prior to the grinding circuit (SAG and ball mills).

6. Management Strategies

The air quality management strategies for the potential air emission sources associated with activities at the Rasp Mine are identified below. Where possible, protocols for regular maintenance of plant and equipment have been integrated within operating procedures (**Appendix B**).

Air quality monitoring equipment is serviced and calibrated by site personnel when appropriate, and serviced and repaired by trained technicians on a regular basis as outlined in air quality monitoring procedures and according to manaufacturer or AS/NZ standards. The servicing periods and reminders will be managed under the INX management system. Servicing and calibration of

other site equipment to ensure minimisation of dust levels is managed under the Pronto plant management system. Dust control systems are inspected and serviced under regimes specified in the site maintenance control system, Pronto.

In addition to those air quality controls listed in Appendix B and the TARP in Section 11, specific proactive and reactive controls (as required Schedule 3 Condition 11 (d) of PA 07_0018) that shall be implemented for MOD6 construction and operation include (but are not limited to) the following;

- hosing down excavation areas prior to removal of material with a dedicated water cart and/or water sprays;
- applying water during the placement of any rock fill layers (boxcut / roads) during construction;
- water sprays or water truck used to aid dust suppression on any material stockpiles, and
- the use of chemical suppressants on roadways.
- use of larger haul trucks for the future tailings harvesting operations transferring tailings from TSF2 to TSF3 (50 t trucks to be used);
- use of a water truck and chemical dust suppressant in TSF3 as required;
- sealing of the new Mine Ore Haul Road from the portal to the ROM pad;
- permanent in-pit storage of material excavated from the boxcut in Little Kintore Pit and BHP Pit;
- adaption of the water spray system designed for TSF2 (approved under MOD4) to accommodate the tailings harvesting operations directed by a real-time air quality monitoring system prior to adverse meteorological conditions occurring; and
- capping of the Free Areas.

6.1. Sealed Roads

Consistent with the requirements of Condition 6 of Schedule 3 of the Rasp Mine Project Approval 07_0018, roads under BHOP operational control will be sealed prior to the commencement of ore extraction. The specific roads to be sealed are listed in Condition 6 of Schedule 3, Table 6 and a dust control strategy for all roadways under BHOP operational control has been developed, Procedure – Roadway Dust Management. This procedure includes the following strategies specific to sealed roads:

- all sealed areas intended to carry vehicular traffic are to be kept clean;
- hazard reports are generated by staff when dust emissions from haul roads are visible;
- periodic use of a PM10-certified street sweeper to clean sealed roads to reduce dust below a maximum silt loading;
- minimum frequency of street sweeper use to be determined through road silt load testing during the operation phase;
- paving, stabilisation or vegetation of shoulders of paved roads;
- avoid overloading of haul trucks to avoid spillage of material onto roadways;

- requirement for the cleaning of vehicles before they exit onto public roads using the site's dedicated wheel wash;
- provision for storm water drainage to prevent water erosion onto paved roads; and
- provision for timely cleanup of temporary sources of dust, and rerouting of traffic around spills until they are removed.

6.2. Unsealed Roads

For safety reasons, an 800m section of unpaved haul road will be located from the base to the top of the Kintore Pit. Secondary service roads that receive minimal traffic will also be unsealed.

A dust control strategy for all roadways under BHOP operational control has been developed, Procedure – Roadway Dust Management. This procedure includes the following strategies specific to unsealed roads:

- chemical dust suppressant will be applied as per the manufacturer's specifications (to achieve a minimum dust control efficiency of 80%) to all unsealed roads on the site including the unsealed portion of the haul road;
- where practical static water sprays will be installed in high traffic areas on the haul road and a portion of the service roads. These sprays will be maintained and used as a backup interim measure;
- trafficable areas will be clearly demarcated by guide posts and signs;
- vehicles will be prohibited from driving off of trafficable areas without a job related purpose;
- provision will be made, and responsibility assigned, for timely clean-up of temporary sources of dust on chemically stabilised roads; and
- speed restriction on unpaved haul roads is to be a maximum of 25 km/hour.

6.3. ROM Stockpile Wind Erosion

The ROM stockpile has the potential for dust generation from wind take up. Provision has been made within the Project design for the following engineering controls:

- Static wind breaks will be used to deflect wind to reduce dust entrainment.
- Water sprays will be mounted on the ROM stockpile wind breaks and directed at stockpiles and haul truck dumping areas.

6.4. TSF Wind Erosion

The source of dust from the tailings facilities will primarily be wind-blown dust. A dust control strategy for the Tailings Storage Facility (TSF) been developed, Procedure – Tailings Storage Facility Dust Management covering operational activities.

6.5. TSF2 Operation

Where there is the potential for dust to be generated from the tailings surface, if the tailings dry out and start creating dust, a spray system across the pit will be employed to manage this risk. As an alternative control measure, manual water spraying using a vehicle or mobile equipment may be applied.

The first management level for dust mitigation is the placement of water through the tailings distribution system. This would provide a spread of water over the tailings surface to suppress dust generation. This is the management strategy under current operating conditions.

In addition, meteorological forecasting would be used to predict meteorological conditions for the coming day(s) to determine, at a minimum one day in advance, when an elevated risk of dust emissions may occur (e.g. based on wind speed, direction, rainfall and atmospheric stability).

The predictive meteorological forecasting system provides simple indicators of the following day's dust risk, based on meteorological conditions that are known to have adverse impacts, allowing measures to be put into place in advance. An example of such preparatory measures could include:

- Application of water sprays or dust suppressant; or
- Revising operational activities

The spray system will also be automated through the provision of data from the network of real-time air quality monitors and anemometers around the boundary of TSF2.

The use of video recording equipment specified within Condition 10 of Schedule 3 of DA 07_0018 will be used to assist in the active management of emissions. Following dust alerts from monitors in proximity of the TSF, staff can view video feed to assess dust lift-off from around the TSF. Video feed will also be recorded for later review should there be a complaint regarding dust from the TSF or to review the effectiveness of control measures.

6.6. Transfer To/From Crushed Ore Storage Bin

Material handling of crushed material is potentially a major source of dust in the processing area. Provision has been made within the Project design for the following engineering controls:

- All above ground conveyors and transfer points prior to the grinding circuit (SAG and ball mills) are to be enclosed, (Project Approval, Schedule 3 Condition 9).
- Conveyors will be fitted with dust extraction reporting to insertable dust collectors.
- The crushed ore bin will be fitted with insertable dust collector to filter the air discharged during filling.

6.7. Ventilation Exhaust

The vent exhaust has water sprays installed at the outlet which are automatically triggered prior to and during blasts to maximise suppression of dust exhausted from the underground mine.

6.8. Unloading Ore to ROM Stockpile

The ROM stockpile areas had the potential to generate dust from vehicle movements, depositing ore and wind take-up. A dust control strategy for the ROM stockpile area has been developed, Procedure: – ROM Pad Area Management. This procedure includes the following dust control strategies specific to unloading ore to the ROM stockpile:

- ROM stockpile water sprays can be operated manually when ROM operator can see

visible dust;

- Operators are to visually monitor dust caused by dumping and take appropriate actions to control the level of dust (addition of a dedicated watercart/varying or ceasing operations).
- Operators are to visually monitor dust from the ROM stockpile and additional water will be applied to the stockpile to avoid wind erosion.
- Chemical dust suppressant is to be applied as per manufacturer's specifications to all trafficked areas (FEL and dump trucks) within the ROM stockpile area, Procedure – Roadway Dust Management.

6.9. Front End Loader Operation/Apron Feeder Hopper at the ROM Pad

There is potential for dust to be generated from the dumping of ore onto the apron feeder and into the crusher. Ring nozzle water sprays (atomised sprays) are installed on the apron feeder hopper to the crushing circuit and negative pressure will take this airflow to the crushing circuit bag-house.

Additionally, provision is made for operational dust control measures in the Procedure – ROM Pad Area Management, including:

- Inspection of the ring nozzle water sprays shall be conducted as a minimum once per month to ensure effective operation.
- Loading to the apron feeder is not to be undertaken during adverse weather conditions (high winds).

6.10. Crusher Circuit

Material handling of crushed material is potentially a major source of dust in the processing area.

Provision has been made within the Project design for the following engineering controls:

- The crusher circuit (jaw (primary) crusher) is to be fully enclosed within a permanent structure.
- The enclosed structure over the ROM bin is to extend five meters out, over the front end load feed area. This extension sits flush onto the steel wing walls and is designed to prevent particulate wind entrainment around the top of the ROM bin.
- This crusher circuit enclosure will be kept under negative pressure (approximate airflow into the bag house of 9,700 L/s) and vented via an appropriately sized baghouse with a high (>99%) control efficiency.
- Four dust extraction points report to the bag house - two points in the roof of the crusher circuit enclosure, and two over the conveyor.

Additionally, provision is made for operational dust control measures in the Procedure

– Crusher Circuit Operation, including:

- Consistent with Condition 7 of Schedule 3 of the DA 07_0018, the enclosure and associated emissions controls will be operated and maintained to ensure that visible fugitive emissions from the enclosure are minimised.

- In the event that sustained (>5 minutes) visible dust is observed to be emitted from the crusher circuit enclosure, crushing will be ceased, and the cause established and rectified prior to crushing activities recommencing.
- The integrity of the crusher circuit bag house will be monitored through mill control software (Citect) and stack monitor (as agreed with EPA), and via the point source monitoring detailed within the Air Quality Management Plan.

6.11. Concentrate Handling

Provision has been made within the Project design for the following measures to control dust from the concentrate loading area:

- Concentrate loading will take place in an enclosed building (solid roof and side walls);
- Once the concentrate container has reached capacity a solid lid is placed on the container to maintain moisture content of the product (anticipated to be 9%) and eliminate any dust emissions during transport to the rail load out, and subsequently to port; and
- A concentrate container wash facility will be installed to remove and collect any potential spillage from the concentrate container trucks. Material collected is returned to the process.

6.12. Lime Silo

The operation of the lime silo has been identified as a potential dust source under upset conditions.

The silo contains the following engineering controls:

- Silo management system to include high level alarms, and pressure relief device;
- Continuous high level monitoring systems to be used to monitor stock within the silo;
- When delivery to silo takes place, displaced air will be back-vented to the delivery tanker, to minimise emissions;

6.13. Grading Roads

The periodic grading of unsealed roads has been identified as a potential dust source unless adequately controlled.

Grading of unsealed road sections may generate dust associated with the cutting of the road surface. Empirical equations relating to dust generation from graders refer to the speed of the grader as being a governing factor in determining the level of dust generation from this source (ENVIRON).

To ensure that graders are operated to minimise environmental and community impacts, control measures have been developed, Procedure - Grader Operation, including:

- This procedure includes the following requirements to limit dust generation from grader operations:
- Grading to be avoided in dry conditions;
- Grading to occur only when necessary; and
- If an area needs grading, grade just that area and not the entire haul road. The rest of

the road may be in good condition and this can be reversed by unnecessarily cutting the surface and disturbing the chemical dust suppressant inventory, resulting in dust.

6.14. Vehicle Wash Facilities

All vehicles that have passed the boom gate access point will be required to be washed down prior to leaving site. This is to remove any potential lead contamination that may be on the vehicle. For this purpose a vehicle wash facility has been installed as part of the exploration decline development. It is located on the main exit road prior to the boom gate access point. The main features of this facility are:

- Fully automated wash system;
- Deluge designed to wash wheels and undercarriage of cars and trucks;
- Sediment collection and removal system.
- The capacity of the facility will be in excess of 1000 vehicle movements per day

6.15. Greenhouse Gas Management

The greenhouse gas (Scope 1 and 2) intensity of the Project equates to less than 50 ktCO_2-e/t and the MOD6 operational scenario is not anticipated to have a material impact upon current GHG emissions compared to the status quo.

To minimise energy consumption and greenhouse gas emissions, the following management measures will be undertaken:

- efficiency of all new mobile and fixed equipment will be considered during procurement for both diesel and electric powered equipment;
- within 12 months of commencement of underground mining and annually thereafter, NGER scheme reporting will be conducted to quantify emissions;
- equipment will be maintained to retain high levels of energy efficiency;
- the inventory of emissions developed for the Environmental Assessment will be updated and maintained annually through the NGERS process; and
- annual emission estimations and abatement strategies will be reported annually within the Annual Review.

6.16. Real Time Monitoring for Operational Dust Management

Real-time meteorological and PM10 monitoring is employed at suitable locations representative of sources contributing most significantly to deposition of dust off-site. Monitoring provides site specific investigation and action levels to direct dust management in real-time. Management comprises of notifications to relevant site personnel or the implementation of dust controls (e.g. sprays at the TSF). Currently, PM10 concentrations are monitored using a direct interface connection to the two available TEOM instruments and an alert system triggered by set concentrations over specified periods and available via SMS and email.

Suitable monitoring locations have been identified and are documented in the AQMMP **(Appendix E).**

When short-term PM10 and PM2.5 concentrations are recorded at a given investigation

levels (as specified in Section 11 – Trigger Action Response Plan), appropriate BHOP staff will be notified and liaise with the Area Supervisors to determine appropriate dust mitigation measures including consideration to modifying work methods, relocating work activities elsewhere or ceasing specific activities. Any ameliorative actions shall be recorded.

The use of real-time monitoring for operational dust management is documented within the procedure BHO-PRO-ENV-006 - Real-Time Particulate Monitoring for Operational Dust Management.

An expansion of the management monitoring regime for the control of PM10 from TSF2 includes two additional monitoring locations to be representative of conditions in the vicinity of TSF2 through to its closure. These monitoring locations are intended to inform operational dust management, rather than to demonstrate compliance at / beyond the site boundary.

The following points are noted:

- New Location B will be installed at the beginning of TSF Embankment construction, and is proposed to remain in this location until closure and final capping of the TSF;
- Post Embankment 2 construction, TEOM2 will be reinstated, and the monitor at New Location A will be relocated to inform dust management in the vicinity of subsequent Embankment construction locations; and
- Now that all embankments are completed the PM monitor at new Location A, will be relocated to a location best suited to inform dust management based on current operations, which is Location C.

The location of existing TEOM2 with proposed additional monitoring locations are shown in **Appendix C.**

In the event of the Location A or B PM Monitors failing and requiring off-site repairs or calibration, a spare monitor will be installed in either location on the same day. An additional portable PM10 monitor has been purchased for this purpose.

In the event that a replacement monitor cannot be situated in either of the above-mentioned locations, dust watch personnel will conduct recorded observations on a basis reflecting the conditions of the time.

Wind direction is measured by the site weather station and portable PM10 monitor anemometers. Anemometers will, in association with dust levels measured at all real-time monitors, assist in determining the likely source of dust and help inform the appropriate response to elevated dust levels.

As noted in the AQMMP **(Appendix E),** the need / timing for ongoing dust monitoring to be deployed in the vicinity of TSF3 will be established using a portable anemometer to be located in the vicinity of the TSF surface, periodically moved as the TSF3 surface height increases.

6.17. Meteorological Forecasting to Guide Dust Management

A review of the emissions inventory and atmospheric dispersion modelling conducted for the original Rasp Mine Environmental Assessment indicates that the principal meteorological factor that may lead to adverse impacts beyond the site boundary is the presence of high winds.

Principally, this is likely to increase particulate emissions associated with wind erodible area sources such as the existing 'free areas', the ROM stockpile, TSF2, and, in time, TSF3.

BHOP obtains customised predictive daily meteorological forecasting which is discussed at the prestart meetings prior to commencement of shifts. The Supervisor / Team Leader will consider and organise any additional mitigation measures (e.g. additional chemical dust suppressant / watering to the TSF) required to be put in place in advance of adverse weather conditions. In addition to meteorological forecasting real time PM_{10} and $PM_{2.5}$ concentrations are monitored using a direct interface connection to the available TEOM instruments, portable near-reference PM_{10} monitors and an alert system triggered by set concentrations over specified periods and available via SMS and email. TEOM data is analysed each month for comparison to the allowable annual average (25 $\mu g/m^3$). In a situation where visible dust is reported by site personnel the daily average can be tracked to ensure the PM_{10} daily average concentration is not exceeded (50 $\mu g/m^3$).

Monthly data collected for $PM_{2.5}$ concentrations will be analysed for comparison to the allowable annual average (8 $\mu g/m^3$), the daily average concentration is not to exceed 25 $\mu g/m^3$ and can be tracked as required.

7. Reporting

7.1. Incident Reporting

7.1.1. Operational Incidents

An operational incident related to air quality, includes any deviation from the dust control strategies detailed within the AQMP and are required to be reported in accordance with the Incident Management Procedure. All significant potential incidents are required to be reported to the Health, Safety, Environment and Training Manager, and the Senior Environmental Officer.

7.1.2. Government Agency Incidents

The Secretary must be notified in writing via the Major Projects website immediately after the Proponent becomes aware of an incident. The notification must identify the project (including the development application number and the name of the development if it has one) and set out the location and nature of the incident. Subsequent notification requirements must be given, and reports submitted in accordance with the requirements set out in Appendix 5 of PA 07_0018.

7.1.3. Non-compliance Reporting

For non-compliance events, the Secretary must be notified in writing via the Major Projects website within seven days after the Proponent becomes aware of any non-compliance. A non-compliance notification must identify the project and the application number for it, set out the condition of approval that the project is non-compliant with, the way in which it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance. A non-compliance which has been notified as an incident does not need to also be notified as a noncompliance.

7.2. Regular Reporting

BHOP will submit the following reports:

Monthly Management Report *(distributed to Senior Leadership Team and Board).*

- Summary of incidents, including cause and actions taken (or to be taken) to prevent reoccurrence.

CBH Website

- Summary of monitoring results, updated monthly.
- Summary of community complaints.

Annual Reports for Government Agencies

Air quality monitoring results and compliance with consent and licence conditions will be reported in the Annual Return (EPA) and the Annual Environmental Management Report (RR)/Annual Review (DPE). By the end of 31 March 2023 , and annually thereafter, the Annual Review report reviewing the environmental performance will submitted to the Secretary. This review must:

a) describe the project (including any rehabilitation) that was carried out in the past calendar year, and the project that is proposed to be carried out over the next year;

b) include a comprehensive review of the monitoring results and complaints records of the project over the past year, which includes a comparison of these results against the:

- relevant statutory requirements, limits or performance measures/criteria;
- monitoring results of previous years;
- relevant predictions in the documents referred to in Condition 2 of Schedule 2; and
- requirements of any plan or program required under this approval;

c) identify any non-compliance over the past year, and describe what actions were (or are being) taken to rectify the non-compliance and avoid reoccurrence;

d) identify any trends in the monitoring data over the life of the project;

e) identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies;

f) describe what measure will be implemented over the next year to improve the environmental performance of the project; and

g) evaluate and report on compliance with the performance measures, criteria and operating conditions of this approval.

Additional guidance in relation to air quality monitoring reporting requirements is provided within the Rasp Mine Air Quality Monitoring Program.

8. Air Quality Complaints Management

Any air quality related complaints will be entered into the incident management system, recorded in the complaints register and fully investigated to find root causes and corrective actions implemented where necessary.

Additionally the following measures will be undertaken during complaint and incident investigation:

- instigation of complaints-driven ambient air quality monitoring, as required; and
- review of relevant management practices/operational procedures will be undertaken to systematically identify and implement options to modify site practices, and to ensure effective control of dust-generating activities so as to achieve the air quality objectives stated in this plan.

All complaints will be documented according to the Procedure BHO-PRO-ENV-029 – Environmental Issue Complaints Procedure.

The following additional information shall also be recorded:

- date;
- specific time;
- location of incident;
- wind direction and wind speed;
- frequency of emission; and
- duration of emission.

A Complaints Register, updated monthly, will be provided on the company website. Earlier complaints recorded in the register will be updated as actions are taken.

9. Auditing and Review

9.1. Air Quality Management Plan Review

The AQMP shall be reviewed, and if necessary revised, within three months of:

- the submission of an annual review under Condition 3 of Schedule 4;
- the submission of an incident report under Condition 5 of Schedule 4;
- the submission of an audit report under Condition 7 and 8A of Schedule 4, or
- any modification of the conditions of this approval (unless the conditions require otherwise); or
- A direction of the Secretary under Condition 2 of Schedule 2.

In addition to the above, reviews are to be conducted to assess the effectiveness of the procedures against the objectives of the AQMP. The AQMP will be revised due to:

- monitoring data that shows the project is contributing to increased blood lead levels;
- deficiencies being identified;
- extremes in environmental conditions e.g. prolonged drought conditions;
- improvements in knowledge or technological advancements; or

- a change in the activities or operations associated with the Rasp Mine.

Any amendments to the AQMP will be done in consultation with the EPA as required under the project approval.

Responsibility for the audit and review of the AQMP under any of the above triggers will be the responsibility of the Senior Environmental Advisor.

9.2. Human Health Risk Assessment

As per Condition 14 of Schedule 3 of PA 07_0018, within one year of the commencement of operation of the project, and every five years thereafter, unless otherwise agreed by the Secretary, the Proponent shall update the human health risk assessment prepared for the project and presented in the EA to the satisfaction of the Secretary. The updated risk assessment shall:

- be prepared by a suitably-qualified expert whose appointment has been endorsed by the Secretary;
- take into account monitoring data collected under this approval, and such other information as may be relevant to the assessment; and
- be prepared in consultation with the EPA and the NSW Health (Western NSW Local Health District).

The updated Health Risk Assessment must inform the revision of the Air Quality Management Plan and the Lead Management Plan required under this approval, if monitoring data shows that the project is contributing to increased blood lead levels.

Any condition of this approval that requires the carrying out of monitoring or an environmental audit, whether directly or by way of a plan, strategy or program, is taken to be a condition requiring monitoring or an environmental audit under Division 9.4 of Part 9 of the EP&A Act. This includes conditions in respect of incident notification, reporting and response, non-compliance notification, compliance report and independent audit. For the purposes of this condition, as set out in the EP&A Act, "monitoring" means monitoring of the project to provide data on compliance with the approval or on the environmental impact of the project, and an "environmental audit" means a periodic or particular documented evaluation of the project to provide information on compliance with the approval or the environmental management or impact of the project.

9.3. Independent Environmental Audit

Within one year of the date of physical commencement of development under Modification 6, and every three years after, unless the Secretary directs otherwise, BHOP will undertake an Independent Environmental Audit of the project

as required and compliant with Conditions 7 and 8 of Schedule 4. As per Proponent must commission and pay the full cost of an Independent Environmental Audit of the project. The audit must:

- be prepared in accordance with the Independent Audit Post Approval Requirements (NSW Government 2020); and
- be submitted, to the satisfaction of the Secretary, within two months of undertaking the independent audit site inspection, unless otherwise agreed by the Secretary.

Arranging for the independent audit to be conducted will be the responsibility of the Environmental Advisor.

In accordance with the specific requirements of the Independent Audit Post Approval Requirements (NSW Government 2020), the Proponent must:

- review and respond to each Independent Audit Report prepared under Condition 7 of Schedule 4;
- submit a response to the Secretary and any other NSW agency that requests it, together with a timetable for the implementation of the recommendations of the Independent Audit Report;
- implement the recommendations to the satisfaction of the Secretary; and make each independent Audit Report and response to it publicly available no later than 60 days after submission to the Secretary

10. Air Quality Monitoring

Ambient air quality monitoring is an integral part of the AQMP, in that it is a mechanism by which performance against the following may be evaluated:

- site objectives and targets;
- BHOP policies;
- statutory requirements with respect to air quality documented in **Section 3**; and
- Acceptable air quality impacts on neighbouring residents, sensitive receptors and publicroads.

The data gathered through air quality monitoring will demonstrate the effectiveness of the AQMP, and will be used to evaluate performance against the objective of continual improvement. The Air Quality Monitoring Program is to be included in the AQMP and specifically addresses Schedule 3 Condition 11(c) as follows:

(c) include an air quality monitoring program that:

- *provides a real-time monitoring system of dust emissions around the perimeter of TSF2 that triggers an automated water spray system prior to adverse meteorological conditions occurring;*
- *is capable of measuring lead concentrations located in the prevailing downwind direction near the perimeter of TSF2;*
- *provides for periodic point source monitoring at Point 1 (Ventilation Shaft) and Point 2 (Process Enclosure/ Baghouse Stack);*
- *provides for continuous ambient monitoring across an ambient air quality and dust monitoring network comprising no fewer than ten monitoring locations (Points 3 to 12) for total suspended particulates, PM_{10}, lead and dust deposition. Monitoring locations shall be informed by the outcomes of the air quality assessments presented in the EA and PPR and identified in consultation with EPA;*
- *provides for continuous meteorological monitoring using a meteorological monitoring stationlocated on the site;*

- *is consistent with the requirements of Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (NSW EPA, 2022), or the latest version, the Protection of the Environment Operations Act 1997 and the Protection of the Environment (Clean Air) Regulation 2010;*
- *details trigger response management protocols in combination with continuous particulate matter monitors and a meteorological monitoring station on-site, with clear and specific reactive mitigation measures to be implemented in accordance with the trigger response management protocol.*

The criteria for particulate matter are defined in terms of three metrics: TSP, PM_{10} and $PM_{2.5}$. The Project Approval MP 07_0018 provides long-term impact assessment criteria for these metrics.

Impact assessment criteria for maximum 24-hour average PM_{10} and $PM_{2.5}$ are also specified in the Project Approval.

The Project Approval MP 07_0018 expresses dust deposition criteria in terms of both an acceptable increase in dust deposition over the existing background levels and an absolute maximum value.

Appropriate to the arid, semi-desert climate of Broken Hill, Section 5.1.3 of the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (NSW EPA, 2017) outlines the approach for dealing with elevated background concentrations. This section reads as follows (p.20):

- *"In some locations, existing ambient air pollutant concentrations may exceed the impact assessment criteria from time to time. In such circumstances, a licensee must demonstrate that no additional exceedances of the impact assessment 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." Reference is made to a worked example given in Section 11.2 of NSW EPA (2017).*

Thus, compliance with Condition 3 of Schedule 3 of MP 07_0018, which states that particulate matter emissions generated by the project do not cause an exceedance of the criteria, may be demonstrated through the comparison of concurrent upwind and downwind concentration measurements.

In cases where a downwind station records an exceedance of the short-term PM_{10} and $PM_{2.5}$ criterion, whereas no exceedance was measured at an upwind station, the mine could be seen as being responsible for the exceedance, and therefore in non-compliance, if there is no other source that can be identified. Lead monitoring downwind of TSF2 is provided by High Volume Air Samplers co-located with TEOM2.

It is anticipated that the 'upwind' and 'downwind' approach may be instructive in some instances by referencing observations from the Rasp Mine's TEOM1 and TEOM2, combined with concurrent meteorological data. In the interim period prior to acquisition of monitoring equipment, BHOP will install suitable $PM_{2.5}$ monitoring units at each of the TEOM sites.

In-stack air quality criteria are provided in Condition 4 of Schedule 3 of Project Approval MP 07_0018.

Air quality monitoring will be undertaken in accordance with all relevant Australian Standards,

legislation and EPA approved methods for sampling. Monitoring locations are provided in Table 7 and shown in Figure 10-1.

Meteorological monitoring is conducted using the Rasp Mine Automatic Weather Station (AWS).This monitor records the following parameters, at 15-minute intervals:

- wind speed;
- wind direction;
- wind direction minimum and maximum (range of the wind direction/variation);
- temperature (at 10 m);
- rainfall; and
- sigma theta.

As noted above, a mobile anemometer will be deployed in the vicinity of the surface of TSF3, and will provide alerts / alarms on wind gust speeds close to the TSF surface. The purpose of this is to establish when additional air quality monitoring is required to manage dust lift-off as the height of TSF3 surface increases.

Table 7 Summary of Monitoring Locations

Site Number	Site Description	Easting (MGA54)	Northing (MGA54)
Ventilation Shaft (EPL Point 1)	Main vent rise with monitoring port at ground level.	543616	6463198
Baghouse Stack (EPL Point 2)	Exhaust stack for the Crusher Baghouse.	544532	6463521
DG1 (EPL Point 3)	Dust gauge located within the grounds of the St Johns Centre (across from RSPCA) Potentially impacted by local exposed areas.	542948	6462817
DG2 (EPL Point 4)	Dust gauge located in the grounds of Essential Water property, Honeys Hill /Block 10.	542689	6463036
DG3 (EPL Point 5)	Located at Thompson's Shaft. Potentially impacted by localexposed areas.	545064	6464247
DG4 (EPL Point 6)	Dust gauge located adjacent to uninhabited property ("Number 1 Residence") adjacent to Browne's Shaft.	545195	6464437
DG5 (EPL Point 7)	Dust gauge co-located with TSP-HVAS and PM_{10}-HVAS1 at the CML7 Silver Tank monitoring site. Monitoring locations potentially impacted by haul truck movements and wind erosion of on-site materials including 'free areas'.	543616	6462532
DG6 (EPL Point 8)	Dust gauge located at a representatives receptor location within Department of Health's lead risk zone 1 (Casuarina Ave)	544388	6461192

Site Number	Site Description	Easting (MGA54)	Northing (MGA54)
DG7 (EPL Point 9)	Dust gauge co-located with TEOM2, TSP-HVAS3 and PM_{10}-HVAS2 at the (uninhabited) BHP House monitoring site. Monitoring location selected to evaluate impacts associated with activities in the vicinity of the Rasp Mine processing area (Blackwood Pit).	544792	6464040
TSP-HVAS (EPL Point 10)	TSP High Volume Air Sampler co-located with DDG5 and PM_{10}-HVAS1 at the CML7 Silver Tank monitoring site. Monitoring location potentially impacted by haul truck movements and wind erosion of on-site materials including 'free areas'.	543616	6462532
PM_{10}-HVAS1 (EPL Point 11)	PM_{10} High Volume Air Sampler co-located with TSP-HVAS and PM_{10}-HVAS1 at the CML7 Silver Tank monitoring site. Monitoring location potentially impacted by haul truck movements and wind erosion of on-site materials including 'free areas'.	543616	6462532
PM_{10}-HVAS2 (EPL Point 12)	PM_{10} High Volume Air Sampler co-located with TEOM2 and DDG7 at the Blackwood monitoring site. Monitoring location selected to evaluate impacts associated with activities in the vicinity of the Rasp Mine processing area.	544792	6464040
TSP-HVAS3 (EPL Point 57)	TSP High Volume Air Sampler co-located with TEOM2 and DDG7 at the Blackwood monitoring site. Monitoring location selected to evaluate impacts associated with activities in the vicinity of the Rasp Mine processing area. EPL 12559 varied to specify HVAS at this location will monitor TSP as PM_{10} monitored by TEOM2.	544792	6464040
TEOM1 (PM_{10} and $PM_{2.5}$) (EPL Point 13)	PM_{10} TEOM and $PM_{2.5}$ Monitor (TEOM or BAM) within the perimeter fence of Western Water's water tower facility. Location selected to evaluate impacts associated with management of the TSF.	544460	6462723
TEOM2 (PM_{10} and $PM_{2.5}$) (EPL Point 14)	PM_{10} TEOM and $PM_{2.5}$ Monitor (TEOM or BAM) co-located with TSP-HVAS3 and DDG5 at the (uninhabited) BHP House monitoring site. Monitoring location selected to evaluate impacts of activities in the vicinity of the Rasp Mine processing area.	544792	6464040
PM_{10} – LocationB	Portable near-reference PM10 monitor installed at the western end of TSF2 (Lookout) to monitorPM_{10}. Includes anemometer.	544408	6463608
PM_{10} – LocationA (and C)	Portable near-reference PM10 monitor installed north of TSF2 to monitor dust from embankment construction. Then located as required to monitor dust from later stages of embankment construction. Includes anemometer.	Various	Various
PM_{10} –TSF3	Portable near-reference PM10 monitor installed at the waste surface in TSF3 (Kintore Pit) to monitorPM_{10}. Includes anemometer.	Various	Various
AWS (EPL Point 55)	Weather station situated at the southern edge of Kintore Pit.	543507	6462532

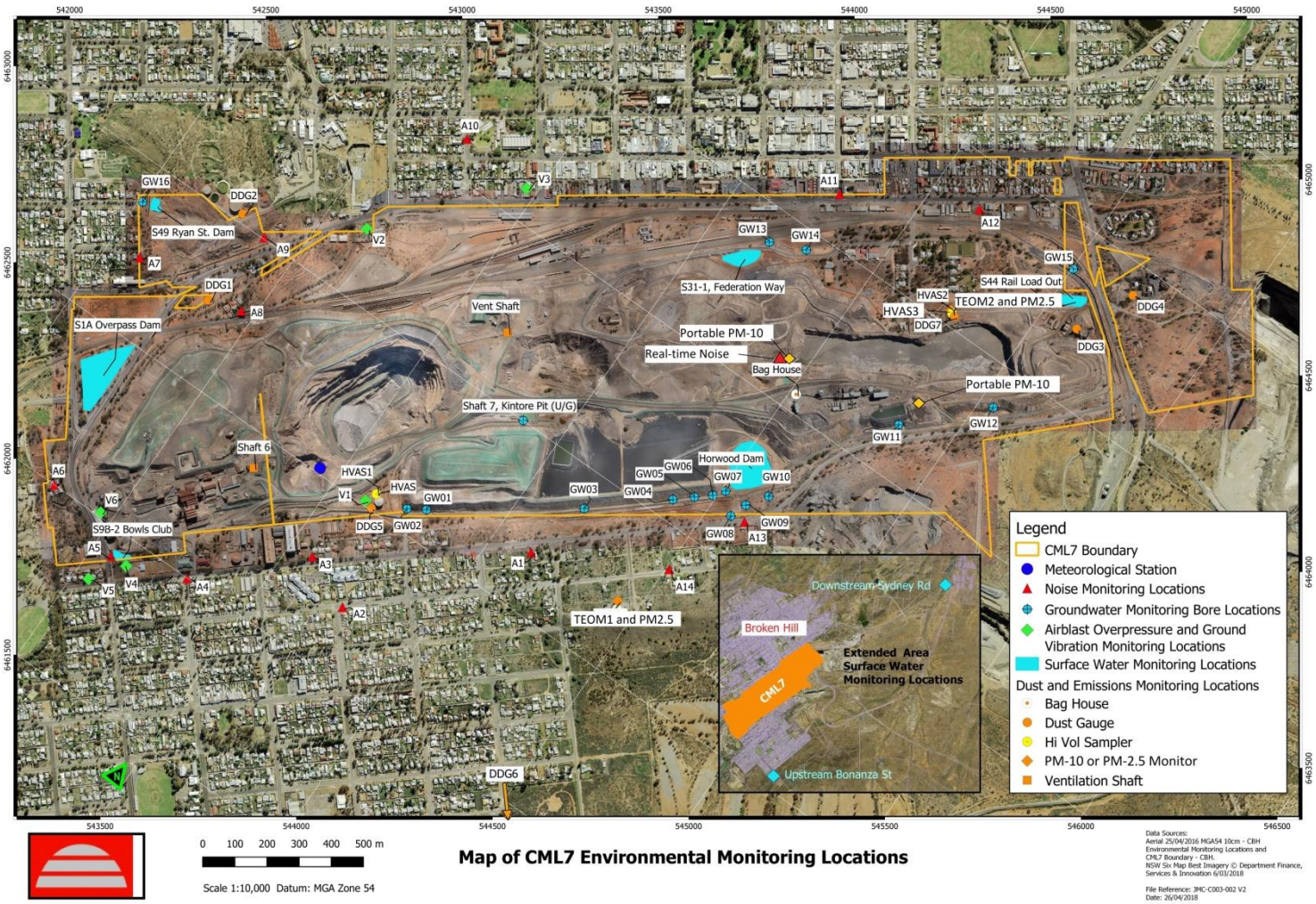


Figure 10-1 CML7 Environmental Monitoring Locations

10.1. Review of Monitoring Data

Environmental staff conducts monthly reviews of air quality monitoring data and will identify and alert management of any increases.

The Senior Environmental Advisor shall keep abreast of the monitoring of Broken Hill community's blood Pb results and where these have increased shall notify management and instigate an investigation. Broken Hill community blood Pb results are provided by the local office of the NSW Department of Health at the quarterly Broken Hill Lead Reference Group meetings.

Contingency measures outlined in Section 10.2 will be implemented following these steps:-

Step 1 There are two triggers for instigating investigations for the implementation of contingency measures:

(1) Dust emissions are higher than predicted. In this case a review of dust monitoring trends indicates an increase in Pb bearing dust over a period of at least 3 months.

(2) Public health monitoring suggests further action is required to reduce blood lead levels in the environment surrounding the site. In this case there has been an increase in the annual blood Pb levels of children as indicated by the NSW Department of Health data.

Step 2 If either of the triggers occurs in Step 1 BHOP will undertake an investigation to determine the source of any increase in Pb dust and any linkage to site operations.

Where it has been determined that the increase in Pb bearing dust or community blood Pb levels can be attributed to Rasp Mine activities, the Senior Environmental Advisor shall complete an incident report in the BHOP INX system and report the matter together with remedial measures to be undertaken to:

- Department of Planning & Environment
- Environment Protection Authority
- Western Area Health Service
- Broken Hill Environmental Lead Program
- Broken Hill City Council
- Department of Resources and Energy

Step 3 Review identified site operations linkages in Step 2 with the contingency measures listed in Sections 7.1 and 7.2 and implement as required.

Step 4 Review proactive controls including trigger levels for dust concentration and wind speeds, including those specified in the TARP. Consultants previously involved in developing dust models may have to be employed to develop new trigger levels.

10.2. Contingency Measures

The Contingency measures outlined below can be implemented in the event that a review of air quality monitoring data or Broken Hill Blood Lead levels suggest dust management needs to be reviewed. Where an incident occurs that results in dust being released off-site and may cause pollution then the Pollution Incident Response Management Plan will be initiated.

Free Areas

The majority of lead bearing dust emission from the site is potentially from the 'free areas' (95%). Currently chemical dust suppressants are applied to minimise dust from these areas. Where dust monitoring results indicate that dust levels have increased, a review of the chemical dust suppressant program will be instigated to investigate if methods of application and / or concentration are effective. The results of this investigation may:

- Increase the area for application of the chemical suppressant.
- Increase the concentration of the chemical suppressant.
- Investigate other newly available chemical suppressants that are more effective.
- Provide capping over sections of the 'free areas' with inert waste rock.

Active Mining Areas

Active mining areas, for example processing plant, crushing and roadways account for 5% of lead bearing dust emissions from the site. BHOP have proposed an extensive range of dust mitigation measures as outlined above, where dust monitoring results indicate that dust levels have increased the following measures may be implemented:

- Sealing of secondary roads.
- Increase application of the chemical suppressant on unsealed roads.
- Increase the concentration of the chemical suppressant on unsealed roads.
- Ceasing of dust generation activities in specific wind conditions, for example from a particular direction and/or at particular wind speeds.
- Installing a dust tracking system to better identify dust generating sources.

11. Trigger Action Response Plans

Aspect	Normal	Trigger 1	Trigger 2	Notifications
Wind Speed	Wind speed as indicatedby site weather stations is below 40 km/h. **Actions:** Continue monitoring conditions and activities for potential dust emissions.	**Trigger:** Wind speed above 40 km/h. **Response:** Regular observations of TSF for dust including use of video equipment. Engage TSF spray system if surface dry.	**Trigger:** Wind speed above 50 km/h. **Response:** Cease construction activities and operations around the TSF. Engage sprays on the TSF. Observe for fugitive dust and monitor effectiveness of sprays.	**Trigger 1**: Notify Processing and Environmental staff. **Trigger 2:** Notify site department supervisors and management.
Monitor Failure	All monitors operating.	**Trigger:** PM_{10} or $PM_{2.5}$ monitor stops working. **Response:** Replace with spare unit. Conduct a dust watch inspection of the TSF. Continue to observe the TSF using video equipment and regular inspections.	**Trigger:** PM_{10} or $PM_{2.5}$ monitor stops working and spare not available**.** **Response:** Source spare unit. Conduct a dust watch inspection of the TSF every two hours or as required based on conditions. Continue to observe the TSF using video equipment and regular inspections.	**Trigger 1**: Notify Processing and Environmental staff. **Trigger 2:** Notify regulators of issue and response.

Aspect	Normal	Trigger 1	Trigger 2	Notifications
Weather Forecasting	Predicted weather conditions three days out are favourable. **Response:** Ensure surface of TSF remains damp.	**Trigger:** Predicted wind speed in coming days is above 40 km/h**.** **Response:** Before the event: Increase water discharge to surface of TSF. Ensure surface has been wetted by the spray system. Record operations.	**Trigger:** Predicted wind speed in coming days is above 50 km/h. **Response:** Before the event: Increase water discharge to surface of TSF. Ensure surface has been wetted by the spray system. Record operations. Plan for construction works to cease.	**Trigger 1**: Notify site personnel. Process Manager to plan resources for extended inspections and spray application. T**rigger 2:** Notify site personnel. Process Manager to plan resources for extended inspections and spray application.
Fugitive Dust	No fugitive dust from TSF observed or measured.	**Trigger:** Observed fugitive dust not leaving vicinity of TSF. **Response:** Engage sprays to wet surface. Record incident. Monitor using video feed.	**Trigger:** Observed fugitive dust leaving vicinity of TSF. **Response:** Engage sprays. Conduct inspection from off-site and up-wind of TSF.	**Trigger 1**: Notify Mill Control Room. **Trigger 2:** Notify Mill Control Room, Processing Manager and Environmental staff. Record incident.

Aspect	Normal	Trigger 1	Trigger 2	Notifications
Measured Dust (determined to be from TSF)	One-hour average PM_{10} concentrations below 50 µg/m^3. One-hour average $PM_{2.5}$ concentrations below 25 µg/m^3. **Response:** Ensure surface of TSF remains damp. Monitor using video feed and standard TSF inspections.	**Trigger:** One-hour average PM_{10} concentrations above 50 µg/m^3 One-hour average $PM_{2.5}$ concentrations above 25 µg/m^3 **Response:** Engage TSF sprays. Monitor dust levels.	**Trigger:** One-hour average PM_{10} concentrations above 100 µg/m^3 One-hour average $PM_{2.5}$ concentrations above 50 µg/m^3 **Response:** Engage TSF sprays. Conduct inspection of TSF for dust emissions. Conduct an off-site observation upwind of the TSF.	**Trigger 1**: Notify Environmental and Process Manager. **Trigger 2:** Notify Environmental and Process Manager. Record incident.

12. Training

Training shall be conducted as required to implement the requirements of the AQMP. The Rasp Mine Training and Competency Management System (INX InTuition) describes trainingrequirements for personnel including record keeping, competency testing and details of training courses. The Environment section of the General Induction will inform staff and contractors of the requirement to report and manage dust emissions.

Specific guidance will be provided for those staff that may be required to perform a dust watch role in the event of dust emissions from the TSF or during monitoring equipment failure as covered in Procedure – Tailings Storage Facility Dust Management.

Department Managers are responsible for ensuring employees and subcontractors (as required) are adequately trained in relevant environmental procedures.

13. Referenced Documents

Legislation

1. National Environmental Protection Council (1998), National Environmental Protection Measure for Ambient Air Quality.

Guidance

2. NSW Environment Protection Authority (2017), Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales.
3. NSW Environment Protection Authority (2022), Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales.
4. Environment Australia National Pollution Inventory (2012), Emission Estimation Technique Manual for Mining Version 3.1.

Australian Standards

5. AS/NZS 3580.1.1:2016 Methods for sampling and analysis of Ambient Air- Guide to Siting Air Monitoring Equipment.
6. AS/NZS 3580.14:2014, Methods for sampling and analysis of ambient air, Part 14: Meteorological monitoring for ambient air quality monitoring applications.
7. AS/NZS 3580.10.1:2016 Methods for sampling and analysis of ambient air: Determination of particulate matter—Deposited matter—Gravimetric method.
8. AS 3580.9.6-2003 Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – PM_{10} high volume sampler with size selective inlet – Gravimetric Method.
9. AS 3580.9.8—2022 Methods for sampling and analysis of ambient air, Method 9.8: Determination of suspended particulate matter — PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser.

Environmental assessments for Rasp Mine

10. ENVIRON 2010 Rasp Mine, Broken Hill Air Quality Assessment, 26 May 2010
11. Environment Assessment Rasp Mine Project 07_0018, July 2010.
12. Preferred Project Report Rasp Mine Project 07_0018, September 2010.
13. Environment Assessment Rasp Mine Project 07_0018 MOD1 Relocation of Ventilation Rise, November 2011.

14. Environment Assessment Rasp Mine Project 07_0018 MOD2 Change to Timing of Crusher Operation, January 2014.
15. Environment Assessment Rasp Mine Project 07_0018 MOD3 Mining Extension, November 2014.
16. Environment Assessment Rasp Mine Project 07_0018 MOD4 Concrete Batching Plant, Blackwood Pit TSF2 Extension.
17. Environment Assessment Rasp Mine Project 07_0018 MOD5 Warehouse Extension, Cement Silo and Adjustment of Air Quality Monitoring.
18. ERM 2021 Rasp Mine, Broken Hill, Modification 6, Air Quality Assessment, 26 May 2021.
19. SLR 2020, Human Health Risk Assessment for Rasp Mine, Modification 6, December 2020.

Appendix A
Particulate Emissions Estimation for Maximum Production Operations

Table A1 - Annual emissions estimates for MOD6 construction scenario (kg/yr)

Activity	Annual Emissions			
	TSP	PM_{10}	$PM_{2.5}$	Pb (TSP)
Ore - hauling ore from Kintore Pit to ROM pad by truck (unsealed roads)	4,220	2,114	211	23
Ore - hauling ore from Kintore Pit to ROM pad by truck (sealed roads)	2,620	503	122	14
Ore - unloading ore at ROM pad	973	460	70	29
Ore - dozers/front end loaders at ROM pad	4,869	883	511	146
Ore - crushed ore storage bin transfer	973	460	70	29
Ore – crushing	68	30	30	2
Ore - Hauling concentrate by trucks within processing plant (unsealed)	2,046	513	51	23
Ore - Hauling concentrate by trucks to rail siding (sealed)	2,047	393	95	23
CBP - truck movement - cement (unsealed roads)	125	31	3	1
CBP - truck movement - cement (sealed roads)	17	3	1	0
CBP - truck movement – aggregate (unsealed roads)	111	28	3	1
CBP - truck movement – aggregate (sealed roads)	61	12	3	0
CBP - truck movement - sand (unsealed roads)	426	107	11	2
CBP - truck movement - sand (sealed roads)	236	45	11	1
CBP - truck movement - shotcrete (unsealed roads)	632	158	16	3
CBP - truck movement - shotcrete (sealed roads)	65	12	3	0
CBP - Loading cement at rail siding	13	6	1	-
CBP -Aggregate transfer	33	16	1	-
CBP - Sand transfer	16	8	0	-
CBP - Cement transfer	3	1	0	-
CBP - Weigh hopper loading	20	10	1	-
CBP - Truck loading	379	101	6	-
CBP - Residual from de-dusted air loading cement and fly-ash	-	53	3	-
CBP - Wind erosion (aggregate stock piles)	131	13	10	2
CBP - Wind erosion (whole CBP)	77	8	6	1
WR - hauling from Kintore Pit to Kintore Pit Waste Tipple (unsealed roads)	602	301	30	3
WR - unloading at Kintore Pit Waste Tipple from Kintore Portal	52	49	7	0

WR - unloading at Kintore Pit Waste Tipple from New Portal	0	0	0	-
WR - dozers/front end loaders at Kintore Pit Waste Tipple	609	221	128	3
WR - hauling from Kintore Pit UG to BHP Pit (unsealed roads)	1,001	251	25	5
WR - hauling from Kintore Pit UG to BHP Pit (sealed roads)	58	11	3	0
WR - unloading at BHP Pit from Kintore Portal	37	18	3	0
WR - unloading at BHP Pit from New Portal	0	0	0	-
WR - front end loaders at BHP Pit	609	221	128	3
WE - ROM Pad stockpile	74	37	6	2
WE - Free areas	705	353	53	10
WE - Disturbed areas	5,763	2,882	432	108
WR - blasting in boxcut area 1	104	54	3	1
WR - blasting in boxcut area 2	43	22	1	0
WR - blasting in boxcut area 3	26	13	1	0
WR - blasting in boxcut area 4	0	0	0	0
WR - loading waste rock from boxcut into trucks	339	160	24	2
WR - hauling waste rock from boxcut to BHP Pit (unsealed)	101	25	3	2
WR - hauling waste rock from boxcut to BHP Pit (sealed)	49	9	2	1
WR - unloading at BHP Pit	8	8	1	0
WR - dozers/front end loaders on overburden at BHP	811	147	85	4
WR - hauling waste rock from boxcut to Little Kintore Pit (unsealed)	8,173	2,047	205	44
WR - hauling waste rock from boxcut to Little Kintore Pit (sealed)	1,709	328	79	9
WR - unloading at Little Kintore Pit	323	153	23	2
WR - front end loaders at Little Kintore Pit	1,217	221	128	6
Laydown area material - loading waste rock from boxcut into trucks	1	1	0	0
Laydown area material - hauling waste rock from laydown area to BHP Pit (unsealed)	9	2	0	0
Laydown area material - hauling waste rock from laydown area to BHP Pit (sealed)	4	1	0	0
Laydown area material - unloading waste rock at BHP Pit	1	1	0	0
Laydown area material - front end loaders at BHP Pit	203	37	21	1
Prog Rehab - loading waste rock from BHP pit into trucks	19	9	1	0
Prog Rehab - hauling waste rock from BHP Pit to Little Kintore Pit (sealed)	118	23	5	2
Prog Rehab - hauling waste rock from BHP Pit to Little Kintore Pit (unsealed)	197	49	5	4

Prog Rehab - unloading waste rock at Little Kintore Pit	19	9	1	0
Prog Rehab - front end loaders at Little Kintore Pit	203	37	21	1
WE - Boxcut Activities	675	338	51	3
TOTAL	**44,027**	**14,006**	**2,714**	**519**

Source: ERM 2021,

Table A2 - Annual emissions estimates for MOD6 operational scenario

Activity	**Annual Emissions**			
	TSP	**PM10**	**PM2.5**	**Pb (TSP)**
Ore - hauling ore from boxcut to ROM pad by truck (sealed roads)	754	145	35	4
Ore - unloading ore at ROM pad	973	460	70	29
Ore - front end loaders at ROM pad	4,869	883	511	146
Ore - crushed ore storage bin transfer	973	460	70	29
Ore - crushing	68	30	30	2
Ore - Hauling concentrate by trucks within processing plant (unsealed)	2,118	530	53	24
Ore - Hauling concentrate by trucks to rail siding (sealed)	2,213	425	103	25
CBP - truck movement - cement (unsealed roads)	125	31	3	1
CBP - truck movement - cement (sealed roads)	17	3	1	0
CBP - truck movement - aggregate (unsealed roads)	111	28	3	1
CBP - truck movement - aggregate (sealed roads)	61	12	3	0
CBP - truck movement - sand (unsealed roads)	426	107	11	2
CBP - truck movement - sand (sealed roads)	236	45	11	1
CBP - truck movement - shotcrete (unsealed roads)	632	158	16	3
CBP - truck movement - shotcrete (sealed roads)	65	12	3	0
CBP - Loading cement at rail siding	13	6	1	-
CBP -Aggregate transfer	33	16	1	-
CBP - Sand transfer	16	8	0	-
CBP - Cement transfer	3	1	0	-
CBP - Weigh hopper loading	20	10	1	-
CBP - Truck loading	379	101	6	-
CBP - Residual from de-dusted air loading cement and fly-ash	-	53	3	-
CBP - Wind erosion (aggregate stock piles)	131	13	10	2
CBP - Wind erosion (whole CBP)	77	8	6	1
WR - hauling from New Portal to	1,769	443	44	9.6

Kintore Pit (unsealed)				
WR - hauling from New Portal to Kintore Pit (sealed)	235	45	11	1.3
WR - unloading at Kintore Pit	49	46	7	0.2
WR - dozers/front end loaders on overburden at Kintore Pit	1,217	221	128	6.1
WR - hauling from New Portal to BHP Pit (unsealed)	290	73	7	5.5
WR - hauling from New Portal to BHP Pit (sealed)	231	44	11	4.3
WR - unloading at BHP Pit	88	41	6	0.4
WR - dozers/front end loaders at BHP Pit	1,217	221	128	6.1
WR - unloading at Mt Hebbard	1,963	492	49	10.6
WR - dozers on overburden at Mt Hebbard	186	36	9	1.0
WE - ROM Pad stockpile	74	37	6	2.2
WE - Free areas	705	353	53	9.9
WE - Disturbed areas	5,763	2,882	432	108.3
Opt A - Grader/Excavator shaving top layer of TSF2	112	53	8	0.3
Opt A - 2 dozers pushing shaved tailings into stockpile	216	35	23	0.7
Opt A - WE from TSF area	214	107	16	0.7
Opt A - WE from tailings stockpile	68	34	5	0.2
Opt A - Excavator loading tailings stockpile to truck	112	53	8	0.3
Opt A - hauling within TSF2 to sealed road (unsealed)	2,710	679	68	8.4
Opt A - hauling outside TSF2 to sealed road (unsealed)	4,321	1,082	108	23.3
Opt A - hauling on sealed portion of road toward Kintore	2,747	527	128	14.8
Opt A - hauling at Kintore pit (unsealed)	10,738	2,689	269	58.0
Opt A - Unloading at Kintore Pit	112	53	8	0.3
TOTAL	**48,269**	**13,487**	**2,476**	**529.7**

Source: ERM 2021

Appendix B
Air Quality Controls within Rasp Mine Operational Procedures

Table B1 Air Quality Controls within Rasp Mine Procedures

Aspect	Procedure/ Engineering Control	Control Action
Existing Free Areas	Procedure – Management of Exposed Areas	Exposed areas have the potential for dust generation by wind take-up. The following strategies control dust generated from these exposed areas: • stabilisation of exposed areas on the mining lease, including existing 'free areas' as defined in Appendix 4 of Project Approval MP 07_0018 and project-related exposed areas; ; • restriction of vehicle or work access to stabilised exposed areas; • restriction of surface disturbances within stabilised exposed area; • identification and remediation of areas where fines or silt has built up (typically after heavy rain); and remediation of any stabilised exposed area disturbed due to works carried out on site including, but not be limited to, removal and burial of fine material, capping with inert waste rock, or additional use of chemical dust suppressants.
Unsealed Roads	Procedure – Roadway Dust Management	This following strategies are specific to reducing emissions from unsealed roads: • chemical dust suppressant will be applied as per the manufacturer's specifications (to achieve a minimum dust controlefficiency of 80%) to all unsealed roads on the site including the unsealed portion of the haul road; • static water sprays are installed in high traffic areas on the haul road and a portion of the service roads. These sprays will be maintained and used as a backup interim measure; • trafficable areas will be clearly demarcated by guideposts and signs; • vehicles will be prohibited from driving off of trafficable areas without a job related purpose; • provision will be made, and responsibility assigned, for timely clean-up of temporary sources of dust on chemically stabilised roads; and • speed restriction on unpaved haul roads is to be a maximum of 25 km/h.
Sealed Roads	Procedure – Roadway Dust Management	The following strategies are specific to reducing emissions from sealed roads: • all sealed areas intended to carry vehicular traffic are to be kept clean; • periodic (daily) checks are to be made by the Environmental Coordinator to ensure that dust suppression activities are sufficient to control dust generated from roads; • periodic use of a PM_{10}-certified street sweeper to clean sealed roads to reduce dust below a maximum silt loading; • minimum frequency of street sweeper use to be determined through road silt load testing during the operation phase; • paving, stabilisation or vegetation of shoulders of paved roads; • avoid overloading of haul trucks to avoid spillage of material ontoroadways; • requirement for the cleaning of vehicles before they exit ontopublic roads using the site's dedicated wheel wash;

		• provision for storm water drainage to prevent water erosion onto paved roads; and • provision for timely clean-up of temporary sources of dust, andrerouting of traffic around spills until they are removed.

Aspect	Procedure/ Engineering Control	Control Action
ROM Stockpile Wind Erosion	Engineering Control	Provision has been made within the Project design for the following engineering controls: • static wind breaks will be used to deflect wind to reduce dust entrainment; and • water sprays will be mounted on the ROM stockpile wind breaksand directed at stockpiles and haul truck dumping areas.
TSF Wind Erosion	Procedure – Tailings Storage Facility Dust Management	Comprehensive construction phase and operation phase dust management specified within this stand-alone procedure. The predictive meteorological forecasting system provides simple indicators of the following day's dust risk, based on meteorological conditions that are known to have adverse impacts, allowing measures to be put into place in advance. An example of such preparatory measures could include: • scheduling additional water cart operations / chemical dust suppressant application; • planning for modifying or relocating certain activities; and/or • scheduling maintenance on equipment. Video feeds will cover activities at both TSF2 and TSF3. The need / timing for ongoing video recording to be deployed in the vicinity of TSF3 will be established using a portable anemometer to be located in the vicinity of the TSF surface, periodically moved as the TSF3 surface height increases.
Transfer to/ from Crushed Ore Storage Bin	Engineering Control	Provision has been made within the Project design for the following engineering controls: • consistent with Condition 9 of Schedule 3 of the Rasp Mine's Project Approval MP 07_0018, all aboveground conveyors and transfer points prior to the grinding circuit (SAG and ballmills) are to be enclosed; • conveyors will be fitted with dust extraction reporting toinsertable dust collectors; and • the crushed ore bin will be fitted with in insertable dust collector to filter the air discharged during filling. This will comprise of a series of fabric filter bags cleaned by reverse air jet.
Ventilation Exhaust	Section 4.6 of the Rasp Mine Air Quality Management Plan	• Post-commissioning stack testing shall be conducted at the ventilation shaft to establish compliance with the criteria set out in Table 2 of the AQMP; and • The vent exhaust has water sprays installed at the outlet which are automatically triggered prior to and during blasts to maximise suppression of dust exhausted from the underground mine.
Unloading oreto ROM stockpile	Procedure – ROM Stockpile Management	This procedure includes the following dust control strategies specific to unloading ore to the ROM stockpile: • Team Leaders and ROM loader operators are to visually monitor dust

		caused by dumping and take appropriate actions to control the level of dust (i.e. activate ROM stockpile water cannons, utilise the services of the dedicated watercart, varying or ceasing operations); and • Team Leaders are to visually monitor dust from the ROM stockpile and additional water will be applied to the stockpile to avoid wind erosion.
	Procedure – Roadway Dust Management	Chemical dust suppressant is to be applied as per manufacturer's specifications to all trafficked areas (FEL and dump trucks) within the ROM stockpile area.
Front EndLoader operation at the ROM Pad	Engineering Control	• ring nozzle water sprays (atomised sprays) will be installed on theapron feeder hopper to the crushing circuit. Negative pressure will take this airflow to the crushing circuit bag-house.
Operations/ Apron Feeder Hopper at the ROM Pad	Procedure – ROM PadArea Management	Provision is made for operational dust control measures in this Procedure, including: • inspection of the ring nozzle water sprays will be conducted as a minimum once per shift to ensure effective operation; • loading to the apron feeder is not to be undertaken duringadverse weather conditions (high winds); and • at all times ore loading must be undertaken so that no visible dust leaves the apron feeder hopper.

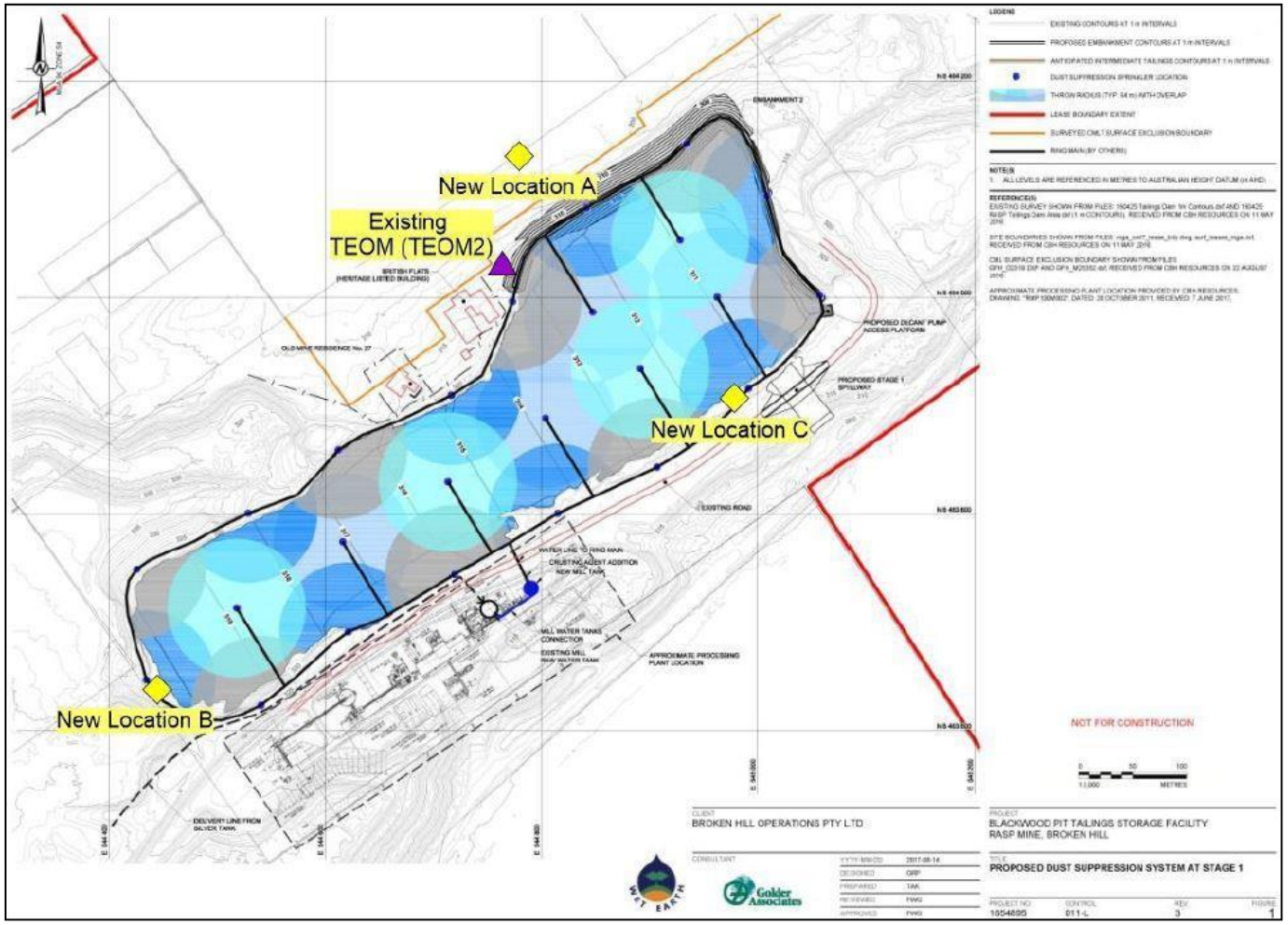
Aspect	**Procedure/ Engineering Control**	**Control Action**
Crusher Circuit	Engineering Control	Provision has been made within the Project design for the following engineering controls: • the crusher circuit (jaw (primary) crusher) is to be fully enclosed within a permanent structure; • the enclosed structure over the ROM bin is to extend five meters out, over the front end load feed area. This extension sits flush onto the steel wing walls and is designed to prevent particulate wind entrainment around the top of the ROM bin; • this crusher circuit enclosure will be kept under negativepressure (approximate airflow into the bag house of 9,700 L/s) and vented via an appropriately sized baghouse with a high (>99%) control efficiency; and • four dust extraction points report to the bag house - two points in the roof of the crusher circuit enclosure, and two over the conveyor.

	Procedure – CrusherCircuit Operation	Provision is made for operational dust control measures in the ROM Pad Management Procedure, including: • consistent with Condition 7 of Schedule 3 of the Rasp Mine Project Approval MP 07_0018, the enclosure and associatedemissions controls will be operated and maintained to ensure that visible fugitive emissions from the enclosure are minimised; • in the event that sustained (>5 minutes) visible dust is observed to be emitted from the crusher circuit enclosure, crushing will be ceased, and the cause established and rectified prior to crushing activities recommencing; and • the integrity of the crusher circuit bag house will be monitored through pressure drop alarms to indicate bag breakthrough, and via the point source monitoring detailed within the Rasp Mine AQMP.
Concentrate Handling	Engineering Control	Provision has been made within the Project design for the following measures to control dust from the concentrate loading area: • concentrate loading will take place in an enclosed building (solid roof and side walls) with automated solid doors at the points of entry and exit points for the concentrate container trucks; • once the concentrate container has reached capacity a lid will automatically be placed on the container to maintain moisture content of the product (anticipated to be 9%) and eliminate any dust emissions during transport to the rail load out, andsubsequently to port; • a concentrate container wash facility will be installed to remove and collect any potential spillage from the concentrate containertrucks. Material collected will be returned to the process.

Aspect	Procedure/ Engineering Control	Control Action
Lime Silo	Engineering Control	The operation of the lime silo has been identified as a potential dust source under upsetconditions. The silo contains the following engineering controls: • silo management system to include high level alarms, arrestment plant and pressure relief device; • continuous high level monitoring systems to be used to monitor stock within the silo and to automatically stop delivery of materialto the silo; • when delivery to silo takes place, displaced air will be vented to suitable arrestment plant (for example cartridge/bag filters) or back-vented to the delivery tanker, to minimise emissions; • arrestment plant fitted to silo will be of sufficient size (and kept clean) to avoid pressurisation during delivery; • silo will be equipped with audible and/ or visual high level alarms,or volume indicators, to warn of overfilling. The correct operationof such alarms will be checked in accordance with manufacturers'instructions; and • silo will be fitted with an automatic system to cut off delivery in the event of pressurisation or overfilling.
	Procedure – Lime Silo	The operation of the lime silo has been identified as a potential dust source under upsetconditions. The silo procedure contains the following controls: • any failure of the silo management system will lead to full investigation of the operation of the plant and equipment; • careful delivery will be conducted by trained personnel to avoid materials being blown into silos at a rate which is likely to resultin pressurisation of the silo; • to minimise fugitive emissions during the charging of silos, transfer lines will be securely connected to the silo delivery inlet point and the tanker discharge point, in that order. Tanker driverswill be informed of the correct procedures to be followed; • silo filling operations will cease if emissions of particulate matter are visible from ducting, pipework, the pressure relief device or dust arrestment plant during silo filling. The cause of the problemwill be rectified prior to further deliveries taking place; • seating of pressure relief devices on silo will be checked at least once a week, or before a delivery takes place, whichever is the longer interval; • no further delivery will take place immediately it appears that thepressure relief device has become unseated during silo filling untilcorrective action has been taken; • the pressure relief device will be examined to check for defects before being re-set and a replacement fitted if necessary, and • deliveries to silos from road vehicles will only be made usingtankers with an on-board (truck mounted) relief valve and filtration system. This means that venting air from the tanker at the end of a delivery will not take place through the silo.

Aspect	Procedure/ Engineering Control	Control Action
Grading Roads	Procedure - Grader Operation	• Grading to be avoided in dry conditions; • Grading to occur only when necessary. • If an area needs grading, grade just that area and not the entire haul road. The rest of the road may be in good condition, and this can be reversed by unnecessarily cutting the surface and disturbing the chemical dust suppressant inventory, resulting in dust.
Vehicle Wash Facilities	Engineering Controls	All vehicles that have passed the boom gate access point will be required to be washed down prior to leaving site. This is to remove any potential lead contamination that may be on the vehicle. For this purpose a vehicle wash facility has been installed as part of the exploration decline development. It is located on the main exit road prior to the boom gate access point. The main features of this facility are: • fully automated wash system; • deluge designed to wash wheels and undercarriage of cars and trucks; and • sediment collection and removal system. The capacity of the facility will be in excess of 1,000 vehicle movements per day.

Appendix C
The Location of TEOM2 with Additional PM10 Monitoring Locations


New Location A
Existing
TEOM (TEOM2)
New Location C
New Location B
EMBANKMENT 2
EXISTING ROAD
PROPOSED DECANT PUMP ACCESS PLATFORM
PROPOSED STAGE 1 SPILLWAY
APPROXIMATE PROCESSING PLANT LOCATION
DELIVERY LINE FROM SILVER TANK
NOT FOR CONSTRUCTION
BROKEN HILL OPERATIONS PTY LTD
BLACKWOOD PIT TAILINGS STORAGE FACILITY
RASP MINE, BROKEN HILL
PROPOSED DUST SUPPRESSION SYSTEM AT STAGE 1
Golder Associates

Appendix D
EPA Consultation and Feedback

Good morning Len, as per our recent discussions all of the management plans submitted (Apart from "Air Quality") have previously be lodged with the EPA as part of Pollution Studies and Reduction Programs attached to the Environment Protection Licence. Hence, the EPA has no further comment in relation to these.

The Air Quality Management Plan & Air Quality Monitoring Program Management Plan have be reviewed.

The EPA advise that given the data information now available BHOP should propose licence limits to the EPA for the Mill Baghouse – Total Solid Particles and Type 1 and Type 2 substances emissions as per project approval requirements.

The EPA support the methods being implemented in the Air Quality Management Plan however advise that the timeframe's for the implementation of these controls needs to be formalised specifically the irrigation system for the tailings facility and the video recording system for dust emissions.

The EPA also advise that air pollution methods could be improved via the introduction of policies and procedures to ensure that controls are implemented more routinely and automated systems installed removing human interpretation and or error.

For example:

•Tailings Storage Facility 2 (TFS2) Operation: An irrigation system is proposed as dust management - This should be installed to ensure controls are in place before any issues arise and could be an automatic system that is weather activated Eg. If wind speed exceeds a certain nominated kilometre per hour sprinklers activate and or deactivate. Any manual watering systems need activation procedures (trigger points) to avoid methods based on individual interpretations;

•Unloading Ore to ROM stockpile: Manual water sprays could converted to weather activated and automatic and routine to avoid human error (Weather activated);

•Exposed Areas: Chemical dust suppression use could be applied over set time periods and subject to set time frame inspections to determine if additional application is required prior to the rostered application;

•Sealed Roads: Street sweeper could be routinely rostered for use at set time periods with additional inspections to determine if more frequent use is required;

•ROM Stockpile Wind Erosion: Stockpiles should be kept below surrounding bunds removing the "as much as practicable" component;

•Frontend loader Operation/Apron Feeder Hopper at ROM Pad: Inspection of the irrigation system could be more frequent with set time frames and the cessation of works procedure could be formalised through guidelines Eg. If wind speed exceeds a certain nominated kilometre per hour a stop work is activated; and

•Concentrate Handling: Works are undertaken within an enclosed building however truck drivers are responsible for manually opening and closing the entry/exit doors - the doors could be automatic.

The EPA concur with the NSW Department of Planning and Environment's comments in relation to their review of the management plans submitted.

Regards,

Tansley Hill
Regional Operations Officer - Griffith Unit
South Branch, NSW Environment Protection Authority
+61 03 50218919 +61 0427437905
tansley.hill@epa.nsw.gov.au www.epa.nsw.gov.au @EPA_NSW
Report pollution and environmental incidents 131 555 (NSW only) or +61 2 99955555

From: Leonard Sharp [mailto:leonardsharp@cbhresources.com.au]
Sent: Thursday, 3 March 2016 11:39 AM
To: EPA RSD Southwest Region Mailbox; Tansley Hill
Cc: Darren Wallett
Subject: FW: Mod 3 - Block & extension supporting documentation

Hello Tansley,

I've just been in contact with Stephen Shoesmith from Planning (details attached) and he has given me feedback on the attached management plans for the project approval. The 2 Air quality plans and the 3 blasting/noise plans relate to conditions 11 and 20 respectively in the project approval. As such planning require these plans to be prepared I consultation with the EPA which is a whole step I missed for these particular plans. Planning have already reviewed the documents, their feedback I s attached. Would you be able to review these documents and provide feedback to ensure they meet the requirements of the EPA in relation to our licence?

The feedback does not have to be exhaustive just establish whether or not the you consider the documents to be adequate and if needed what changes are necessary.

Air Quality Management Plan
11. The Proponent shall prepare and implement a detailed Air Quality Management Plan for the project to the satisfaction of the Secretary. This plan must:
    1. be prepared in consultation with EPA and submitted to the Secretary for approval prior to the commencement ofconstruction on the site;
    2. identify all major sources of particulates and other air pollutants that may be emitted from the project, being bothpoint source and diffuse emissions, including identification of the potential for lead contamination to be carried by these particulates;
3. include an air quality monitoring program that:
    1. provides for periodic point source monitoring at Point 1 (Ventilation Shaft) and Point 2 (Process Enclosure/Baghouse Stack);
    2. provides for continuous ambient monitoring across an ambient air quality and dust monitoring network comprisingno fewer than ten monitoring locations (Points 3 to 12) for total suspended particulates, PM_{10}, lead and dust

deposition. Monitoring locations shall be informed by the outcomes of the air quality assessments presented in the EA and PPR and identified in consultation with EPA; and

3. provides for continuous meteorological monitoring using a meteorological monitoring station located on the site;

4. is consistent with the requirements of *Approved Methods for the Sampling and Analysis of Air Pollutants in NewSouth Wales* (DECC, 2007), the *Protection of the Environment Operations Act 1997* and the *Protection of the Environment (Clean Air) Regulation 2010*.

5. pro-active and reactive management and response mechanisms for particulates with specific reference to measures to be implemented and actions to be taken to minimise and prevent potential elevated air quality impacts(including ambient air and deposited dust impacts) on surrounding land uses as a consequence of meteorological conditions, upsets within the project, or the mode of operation of the project at any time;

6. procedures and processes for monitoring ambient dust and deposited dust impacts;

7. provision for regular review of dust monitoring data, with comparison of monitoring data with that assumed andpredicted in the documents referred to under Condition 2 of Schedule 2;

8. details of measures to be implemented to address any situation in which monitored dust impacts exceed thoseassumed and predicted in the documents referred to under Condition 2 of Schedule 2;

9. specific complaints management procedures in the event that dust monitoring indicates elevated off-siteimpacts;

10. procedures for the minimisation of dust generation on the site;

11. protocols for regular maintenance of plant and equipment to minimise the potential for elevated dust generation,leaks and fugitive emissions; and

12. a contingency plan should an incident, upset or other initiating factor lead to elevated dust impacts, whetherabove normal operating conditions or above environmental performance goals/ limits.

Noise and Blast Management Plan

1. The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of theSecretary. This plan must:

1. be prepared in consultation with EPA, and submitted to the Secretary for approval by the end of June 2011;
2. describe the noise mitigation measures that would be implemented to ensure compliance with the relevant conditions of this approval, including a real-time noise management system that employs both reactive and proactive mitigation measures;
3. include a noise monitoring program that:

4. uses a combination of real-time and supplementary attended monitoring to evaluate the performance of theproject; and

5. includes a protocol for determining exceedances of the relevant conditions of this approval;
6. describe the blast management measures that would be implemented to ensure compliance with the blast criteria and operating conditions of this approval; and
7. include a blast monitoring program that: • evaluates the performance of the project, including compliance with the applicable criteria;
8. uses a combination of roving blast monitors (at least 1) and fixed blast monitors (at least 6); and
9. includes a protocol for determining and responding to exceedances of the relevant conditions of this approval.

Stephen Shoesmith
Senior Planning Officer, Resource Assessments
NSW Department of Planning & Environment
23-33 Bridge Street, Sydney NSW 2001
GPO Box 39, Sydney NSW 2001
(02) 9228 6164
www.planning.nsw.gov.au

Regards, Len

Leonard Sharp
Environment / Community Liaison Officer.
Broken Hill Operations Pty Ltd
CBH Resources – Rasp Mine

T: 08 8088 9126 | **M**: 0414 347 125 | **F**: 08 8088 2932
130 Eyre Street| PO Box 5073 | BROKEN HILL NSW 2880
leonardsharp@cbhresources.com.au

EPA response 14 November 2018

From: Heath Thatcher <Heath.Thatcher@epa.nsw.gov.au>
Sent: Wednesday, November 14, 2018 3:13 PM
To: Damon Roddis <Damon.Roddis@erm.com>
Cc: Darren Wallett <Darren.Wallett@epa.nsw.gov.au>
Subject: BHOP Rasp TSF AQ Monitoring Plan

Damon,

Thank you for providing the Technical Advice Air (TAA) have reviewed the Air Quality Monitoring Plan (AQMP) and agree it reflects most of the points discussed in August.

An air quality management plant (AQMP) is a tool for the Licensee to use as a framework to ensure operational management is appropriately implemented and provides an indication that regulatory obligations are being fulfilled – including the requirement to prevent and minimise emissions. As such, the EPA does not routinely approve management plans.

TAA have conducted a high level review the AQMP and have provided the following comments.

Summary of Review

The AQMP includes both proactive and reactive measures to inform the management of particle emissions from the premises. The plan includes elements and measures commonly contained in management plans for mining activities such as;

1. automatic forecasts of weather conditions up to three days ahead - provided via Dust Management Software.
2. identified high risk conditions
3. monitoring network comprising of real time particle monitors, wind speed/ direction and video.
4. tiered Trigger Action Response Plan (TARP) levels
5. incidents/complaints procedure
6. roles and responsibilities have been identified

There is scope for ongoing evaluation and improvement of the air quality management system at the premises. The adequacy of the air quality management plan and its implementation should be regularly reviewed, assessed for effectiveness and updated as required.

TAA recommends that ERM consider the comments provided in the attachment, in the finalisation, implementation and ongoing review of the management plan.

Heath Thatcher
Technical Policy Advisor – Technical Advice Air
Reform and Compliance Branch, NSW Environment Protection Authority
+61 2 9995 5676
heath.thatcher@epa.nsw.gov.au www.epa.nsw.gov.au @EPA_NSW
Report pollution and environmental incidents 131 555 (NSW only) or +61 2 9995 5555

TAA Detailed Review and Comments - ERM AQMP for the RASP TSF2 (November 2018)

Meteorological forecasting

Meteorological forecasting is proposed to predict meteorological conditions that indicate when an elevated risk of dust emissions may occur. The performance of the proposed forecast system, specific to the mine location, has not been demonstrated. If the forecast system is to be effective, it is imperative that the model does not under predict variables that contribute to dust lift-off.

The AQMP is unclear of wind direction will be used as a trigger to inform effective dust management practices.

Reactive management triggers

Reactive management triggers for PM_{10} include 1-hour PM_{10} concentration triggers of 80 µg/m^3 and 100 µg/m^3. The selected trigger concentrations have been selected based on the '*default values adopted at other extractive industry sites*'. To ensure dust is prevented from leaving the TSF2, the trigger values should be re-evaluated.

'Strong' and 'extreme' wind event triggers of **35** km/h and 50 km/h have been nominated in section 1.3 of the AQMP. However, in Section 4 of Appendix B, a Strong Wind Event is defined as wind speeds reaching gusts of 40 km/h (10.9 m/s), as measured 10m above the surface of the TSF. These inconsistencies should be addressed.

Training

The AQMP does not address any training of staff and contractors in effective dust management practices. Internal training and reporting procedures should be incorporated into an AQMP that aim to educate employees around the risks of dust and how to report identified dust issues.

Action and Response Plans

The Actions and Responses identified in the AQMP are limited to 1) The TSF spray system and 2) The application of fresh tailings.

The TSF 2 spray system is the principal method of dust suppression for the TSF 2. However, it is unclear if the spray system will be effective under windy conditions. The AQMP does not include practical measures to determine the effectiveness of the spray system, at controlling dust emissions, if such conditions arise.

Inundating the TSF using an application of fresh tailings is included in the AQMP as alternative to the spray system. However, the AQMP is not clear as to how quickly this mitigation measure could be applied.

The TARPs do not include any references to the video monitoring, or how the feed from the video will be used at an effective management tool.

Additional action and response plans should be considered for each of the alert levels identified. The plan should consider changed work practices under certain environmental conditions such as reduced truck movements along the TSF2 embankment. Additional monitoring and mitigation measures should also be considered such as visual inspections to determine the effectiveness of water spray systems and the use of a water cart if required.

TAA recommend the proponent consider a combination of additional monitoring and mitigation that could be used to;

1. assess the effectiveness of mitigation measures in real time, and
2. respond with an appropriate alternative control in a timely manner.

Instrument failure

It is proposed that in the event of the Location A PM monitor failing and requiring off-site repairs, the unit will be temporarily replaced with the PM monitor from Location B.

As the time taken for repairs is unknown, a contingency plan should be in place to ensure effective dust management and control practices are being maintained.

It is recommended the proponent consider actions that could be applied, in a timely manner, in the event a dust monitor fails such as a trained dust watch person conducting more frequent observations and keeping records.

EPA Response 12 March 2019

From: Jason Price <Jason.Price@epa.nsw.gov.au>
Sent: Tuesday, March 12, 2019 311:25 AM
To: Devon Roberts
Cc: Darren Wallett; Gwen Wilson
Subject: RE: Rasp Mine Management Plans for review

G'day Devon – the EPA has reviewed the Rasp mine's;

1. 2019 Air Quality Management Plan and Waste Management Plan, and
2. 2018 Environmental Strategy and Site Water Management Plan.

The following comments are provided for information.

3. We note the EPA's comments on the draft Air Quality Management Plan have been incorporated into the final document, and
4. There is no proposed timeframe or trigger for the water spray dust suppression system is tobe installed on TSF2. We recommend BHOP enter into negotiations with the EPA about an appropriate timeframe or trigger which will see the installation of the proposed TSF2 water spray system at an agreed stage.

Regards

Jason Price

Regional Operations Officer
Riverina Far West Region
South & West Branch, NSW Environment Protection Authority
☎ (02) 6969 0700 Mobile ☎ 0428 460 247

jason.price@epa.nsw.gov.au www.epa.nsw.gov.au @EPA_NSW

Report pollution and environmental incidents 131 555 (NSW only) or 02 9995 5555

EPA Responses 2022

Rasp Mine AQMP for Comment – 1 June 2022

From: Tansley Hill <Tansley.Hill@epa.nsw.gov.au>
Sent: Wednesday, 1 June 2022 11:57 AM
To: Devon Roberts
Subject: RE: Rasp Mine AQMP for comment

Good afternoon Devon, thank you for forwarding the above plan for our records.

The EPA encourages the development of such plans to ensure that proponents have determined how they will meet their statutory obligations and environmental objectives.

However, we do not approve or endorse these documents as our role is to set environmental objectives for environmental management, not to be involved in developing strategies such as this plan to achieve those objectives.

Hence, we have no further comment regarding the AQMP.

Regards,
Tansley Hill
Operations Officer
Regulatory Operations
NSW Environment Protection Authority
D 03 50218919 | M 0427437905

Please send all correspondance to info@epa.nsw.gov.au for recording and appropriate delegation.

Please report pollution and environmental incidents via 131 555 or +61 2 9995 5555.

www.epa.nsw.gov.au @NSW_EPA

From: Devon Roberts <devonroberts@cbhresources.com.au>
Sent: Friday, 20 May 2022 2:54 PM
To: EPA West Operations Regional Mailbox <EPA.Westopsregional@epa.nsw.gov.au>
Cc: Jason Price <Jason.Price@epa.nsw.gov.au>
Subject: Rasp Mine AQMP for comment

Hi Jason

The AQMP for Rasp Mine updated for MOD6 is attached for your review and comment.

The EPA were consulted for the MOD6 application and their concerns have been addressed in the AQMP but if you can review the document and comment that would be great.

Thanks.

Devon Roberts

Senior Environmental Advisor
CBH Resources - Rasp Mine
Broken Hill Operations Pty Ltd
PO Box 5073
Broken Hill NSW 2880
Ph: 08 8088 9126
Mob: 0490 251 185
E: devonroberts@cbhresources.com.au

Rasp Mine MOD6 Draft Conditions – 23 February 2022

From: Jason Price [mailto:Jason.Price@epa.nsw.gov.au]
Sent: Wednesday, 23 February 2022 4:12 PM
To: Joel Sulicich
Subject: RE: Rasp mine MOD6 Draft Conditions

G'day Joel – some advice from our technical people below.

Note that we didn't put this criteria requirement in, I'm assuming DPE Planning have added it in, even though I've pointed out to them several times that the EPA's guideline establishing the criteria specifically says it should not be used as a regulatory criteria, just a modelling criteria (because air quality backgrounds are so variable).

So I'd suggest you also put this question to DPE, see what answer you get.

The EPA gives precedence to ambient air monitoring methods published by Standards Australia as an Australian Standard (AS) or joint Australian/New Zealand Standard (AS/NZS). Where an Australian Standard is not available for an analyte, or it is not practicable to use an AS method, appropriate alternative method(s) may be used. Monitoring methods other than an Australian Standard should only be used if:

i. the method can be demonstrated to be fit for purpose; and
ii. calibration and validation studies show that the measurement range, accuracy and precision of the method are appropriate for the intended purpose and reporting

requirements.

The EPA recommends monitoring methods be selected in accordance with the following hierarchy:

1. method published by Standards Australia designated as an Australian standard or joint Australian/New Zealand standard
2. method that has been demonstrated via AS/NZS 3580.9.17 to have equivalence to an AS or AS/NZS
3. method published by the International Organisation for Standardisation
4. method designated as a reference method in a comparable jurisdiction, such as the USA, United Kingdom or Germany
5. method designated as an equivalent reference method in a comparable jurisdiction
6. method published in a comparable jurisdiction
7. non-reference/non-accredited method.

A list of Australian Standard methods is included below.

Standard number1	Standard title
AS/NZS 3580.9.7 (R2020)	Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – Dichotomous sampler (PM10, coarse PM and PM2.5) – Gravimetric method
AS 3580.9.10	Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – PM2.5 low volume sampler – Gravimetric method
AS/NZS 3580.9.12	Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – PM2.5 beta attenuation monitors
AS/NZS 3580.9.13	Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – PM2.5 continuous direct mass method using a tapered element oscillating microbalance monitor
AS/NZS 3580.9.14	Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – PM2.5 high volume sampler with size selective inlet – Gravimetric method

Appendix E
Air Quality Monitoring Program

Broken Hill Operations Pty Ltd

Rasp Mine

Air Quality Monitoring Program

March 2022

This page has been left blank intentionally.

Table of Contents

Glossary of Terms

AEMR	Annual Environmental Management Report
AMMAAP	Approved Methods for the Modelling and Assessment of Air Pollutants inNSW
AWS	Automatic Weather Station
BoM	(Australian) Bureau of Meteorology
CML	Consolidated Mining Licence
EPA	(NSW) Environment Protection Authority
dust deposition	Dust particles that settle out from the air, measured in grams per square meter per unit time (e.g. g/m^2/year)
EMS	Environmental Management System
HVAS	High Volume Air Sampler
mg	milligram ($g \times 10^{-3}$)
µg	microgram ($g \times 10^{-6}$)
µm	micrometre (metre x 10^{-6})
m^3	Cubic metre
ML	Mining Licence
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
NPI	National Pollutant Inventory
PM	particulate matter
PM_{10}	particulate matter less than 10 µm in aerodynamic diameter
$PM_{2.5}$	particulate matter less than 2.5 µm in aerodynamic diameter
ROM	run of mine
TEOM	Tapered Element Oscillating Microbalance
TSP	Total Suspended Particulate (Matter)
USEPA	United States Environmental Protection Agency

1 Introduction

This monitoring program was developed to provide an overview of air quality monitoring undertaken by the BHOP Rasp Mine. This program documents the statutory conditions, standards, locations and reporting requirements for air quality monitoring undertaken by BHOP across its mining operations and neighbouring properties.

- Ambient air quality monitoring is an integral part of the BHOP Rasp Mine Air Quality Management Plan, in that it is a mechanism by which performance against the following may be evaluated:
- Site Objectives and Targets;
- BHOP Policies;
- Statutory requirements with respect to air quality; and
- Acceptable air quality impacts on neighbouring residents, sensitive receptors and public roads.

Data gathered through air quality monitoring demonstrates the effectiveness of the Air Quality Monitoring Plan and evaluates performance against continual improvement objectives.

Additionally, this document addresses the requirements of Condition 11(c) of Schedule 3 of Project Approval MP 07_0018 requires that the site's Air Quality Management Plan must:

(c) include an air quality monitoring program that:

- *provides a real-time monitoring system of dust emissions around the perimeter of TSF2 that triggers an automated water spray system prior to adverse meteorological conditions occurring;*
- *is capable of measuring lead concentrations located in the prevailing down wind direction near the perimeter of TSF2;*
- *provides for periodic point source monitoring at Point 1 (Ventilation Exhaust – Primary Vent) and Point 2 (Process Enclosure/ Baghouse Stack);*
- *provides for continuous ambient monitoring across an ambient air quality and dust monitoring network comprising no fewer than ten monitoring locations (Points 3 to 12) fortotal suspended particulates, PM_{10}, lead and dust deposition. Monitoring locations shall be informed by the outcomes of the air quality assessments presented in the EA and PPR and identified in consultation with EPA; and*
- *provides for continuous meteorological monitoring using a meteorological monitoringstation located on the site;*
- is consistent with the requirements of Approved Methods for the Sampling and Analysis ofAir Pollutants in New South Wales (*NSW EPA, 2022*), the Protection of the Environment Operations Act 1997 and the Protection of the Environment (Clean Air) Regulation 2010.

details trigger response management protocols in combination with continuous particulate matter monitors and a meteorological monitoring station on-site, with clear and specific reactive mitigation measures to be implemented in accordance with the trigger response management protocol;

2 Statutory Requirements

2.1 Legislation

The Rasp Mine Air Quality Monitoring Program has been developed with reference to:

- The Protection of the Environment Operations Act 1997 (POEO Act) administered by the Environment Protection Authority (EPA); and
- Environmental Planning and Assessment Act 1979 (EP&A Act) administered by the Departmentof Planning and Environment.

2.2 Licences And Approvals

2.2.1 Environmental Protection Licence

Environmental Protection Licences (EPLs) are administered by the EPA. BHOP holds EPL 12559, which covers operations at the Rasp Mine prior to Project Approval.

2.2.2 Project Approval

Project Approval MP 07_0018 requires periodic point source monitoring at the site's Ventilation Shaft and the crushing circuit baghouse stack, as well as continuous ambient monitoring across an ambient air quality and dust monitoring network comprising no fewer than ten monitoring locations for total suspended particulates (TSP), particulate matter less than 10 microns in aerodynamic diameter (PM_{10}) and less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$), lead and dust deposition. Continuous meteorological monitoring using an on-site meteorological monitoring station is also required.

2.3 Ambient Air Quality Criteria

Project Approval MP 07_0018 specifies two classes of air quality impact assessment criteria relevant to mining operations. These classes relate to dust deposition and particulate concentration levels. Dust deposition levels refer to the quantity of dust particles that settle out from the air as measured in grams per square metre per month (g/m^2/month) at a particular location. Particulate concentration refers to airborne dust and is measured in micrograms per cubic metre of air ($\mu g/m^3$).

Condition 3 of Schedule 3 of Project Approval MP 07_0018 states:

The Proponent shall ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the project do not cause an exceedance of the criteria listed in Tables 1, 2 or 3 at any residence on privately-owned land.

"Tables 1 to 3" referred to above are summarised in **Table 1**, **Table 2** and **Table 3** below.

2.3.1 Long-Term Impact Assessment Criteria for Particulate Matter

The criteria for particulate matter concentrations are defined in terms of three metrics: TSP, PM_{10} and $PM_{2.5}$.

- TSP relates to particles of all size able to remain suspended in the atmosphere; typically particulatematter with aerodynamic diameters of up to 30 micrometres (µm).

- PM_{10} refers to particulate matter with an aerodynamic diameter less than 10 µm. Thus, PM_{10} is a sub-component of TSP.
- $PM_{2.5}$ refers to particulate matter with an aerodynamic diameter less than 2.5 µm. Thus, $PM_{2.5}$ is a sub-component of both TSP and PM_{10}.

The Project Approval MP 07_0018 specifies long-term impact assessment criteria for particulate matter, as summarised in **Table 1**.

Table 1: Long term impact assessment criteria for particulate matter

Pollutant	Averaging period	[d] Criterion
Total suspended particulate(TSP) matter *(note: this is stated as 'total solid particles' in the Project Approval)*	Annual	[a] 90 µg/m^3
Particulate matter <10 µm (PM_{10})	Annual	[a] 25 µg/m^3
Particulate matter <2.5 µm ($PM_{2.5}$)	Annual	[a] 8 µg/m^3

2.3.2 Short-Term Impact Assessment Criterion for Particulate Matter

Impact Assessment Criteria for maximum 24-hour average PM10 and PM2.5 are specified within the Rasp Mine Project Approval (MP 07_0018), as provided in **Table 2**.

Table 2: Short term impact assessment criterion for particulate matter

Pollutant	Averaging period	[d] Criterion
Particulate matter <10 µm (PM_{10})	24 hour	[a] 50 µg/m^3
Particulate matter <2.5 µm ($PM_{2.5}$)	24 hour	[a] 25 µg/m^3

2.3.3 Dust Deposition

The Project Approval MP 07_0018 expresses dust deposition criteria in terms of both an acceptable increase in dust deposition over the existing background levels and an absolute maximum value. These impact assessment criteria are summarised in **Table 3**.

Table 3: Dust Deposition Criteria

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
[c] Deposited dust	Annual	[b] 2 g/m^2/month	[a] 4 g/m^2/month

2.3.4 Interpretation of Ambient Air Quality Criteria

The following notes are provided relating to the Impact Assessment Criteria shown in **Table 1**, **Table**

2 and **Table 3**, as they appear within Condition 3 of Schedule 3 of MP 07_0018:

- [a] Total impact (i.e. incremental increase in concentrations due to the project plus background concentrations due to all other sources).
- [b] Incremental impact (i.e. incremental increase in concentrations due to the project on its own).
- [c] Deposited dust is assessed as insoluble solids as defined by Standards Australia, 2003, AS 3580.10.1- 2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulates - Deposited Matter - Gravimetric Method".
- [d] Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents, illegal activities or any other activity agreed by the Secretary in consultation with EPA.

Particularly relevant given the arid, semi-desert climate of Broken Hill, Section 5.1.3 of the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (EPA, 2017) outlines the approach for dealing with elevated background concentrations. This section reads as follows (p.20):

"In some locations, existing ambient air pollutant concentrations may exceed the impact assessment criteria from time to time. In such circumstances, a licensee must demonstrate that no additional exceedances of the impact assessment 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." Reference is made to a worked example given in Section 11.2 of the Approved Methods (EPA 2017).

Thus, compliance with Condition 3 of Schedule 3 of MP 07_0018, which states that *particulate matter emissions generated by the project do not cause an exceedance of the criteria*, may be demonstrated through the comparison of concurrent upwind and downwind concentration measurements.

In cases where a downwind station records an exceedance of the short-term PM_{10} criterion of 50 µg/m³ (refer **Table 3**), whereas no exceedance was measured at an upwind station, the mine could be seen as being responsible for the exceedance and therefore in non-compliance.

It is anticipated that the "upwind" and "downwind" approach may be instructive in some instances by referencing observations from the Rasp Mine's TEOM1 and TEOM2, combined with concurrent meteorological data (refer **Section 4.5**).

2.4 In-Stack Air Quality Criteria

The EPA specify in-stack performance criteria within the Protection of Environment Operations (Clean Air) Regulation (2010). Standards of concentration specified in this document represent minimum requirements for point source emissions within NSW. They are generally expressed in terms of milligrams per cubic metre of air (µg/m^3), expressed at reference conditions (typically Dry, 273 K, 101.3 kPa).

Condition 4 of Schedule 3 of Project Approval MP 07_0018 states:

The Proponent shall ensure that the project is operated in a manner that does not exceed the criteria listed in Tables 4 and 5.

"Tables 4 to 6" referred to above are summarised in **Tables 4, 5** and **6** below. The following notes are provided relating to the Discharge Criteria shown in the tables, as they appear within Condition 4 of

Schedule 3 of Project Approval MP 07_0018:

- [a] Total of Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, Sn and V;

Reference conditions for the limits in Tables 4, 5 and 6 are: dry, 273K and 101.3 kPa.

Table 4: Discharge Criteria for Point 1 – Ventilation Exhaust (Primary Vent)		
Pollutant	**Units of Measure**	**Concentration Limit**
Oxides of nitrogen (as NO_2)	Milligrams per cubic metre	350
Total solid particles	Milligrams per cubic metre	20
[a] Type 1 and Type 2 substances	Milligrams per cubic metre	1
Volatile organic compounds (as n-propane)	Milligrams per cubic metre	40

Table 5: Discharge Criteria for Point 2 – Process Enclosure / Baghouse Stack		
Pollutant	**Units of Measure**	**Concentration Limit**
Total solid particles	Milligrams per cubic metre	20
[a] Type 1 and Type 2 substances	Milligrams per cubic metre	1

Table 6: Discharge Criteria for Point 6 – Ventilation Exhaust (Shaft 6)		
Pollutant	**Units of Measure**	**Concentration Limit**
Oxides of nitrogen (as NO_2)	Milligrams per cubic metre	350
Total solid particles	Milligrams per cubic metre	20
[a] Type 1 and Type 2 substances	Milligrams per cubic metre	1
Volatile organic compounds (as n-propane)	Milligrams per cubic metre	40

3 Monitoring Standards

Air quality monitoring will be undertaken in accordance with all relevant Australian Standards, legislation and EPA approved methods for sampling. The Australian Standards and EPA approved methods relevant to the Air Quality Monitoring Program are listed below:

- All sampling and analysis will be undertaken in accordance with the POEO (Clean Air) Regulation 2010 and the guidelines specified in the publication of *Approved Methods for the Sampling and Analysis of Air pollutants in New South Wales* (NSW EPA, 2022);
- All dust deposition gauges will be sampled monthly for insoluble solids in accordance with AS/NZS 3580.10.1 (2003) *Methods for sampling and analysis of ambient air – determination of*

particulate matter – deposited matter – gravimetric methods;

- As per AM-19, NSW EPA, 2022, Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales;

- High Volume Air Samplers (HVAS) will measure and analyse TSP in accordance with the guidelines specified in AS/NZS 3580.9.3 (2003) *Methods for the Sampling and Analysis of Ambient Air – Determination of Suspended Particulate Matter – Total Suspended Particulate Matter (TSP) – High Volume Air Sampler Gravimetric Method*;
  - As per AM-15, NSW EPA, 2022, Approved Methods for the Sampling and Analysis of Air Pollutants inNew South Wales;
- High Volume Air Samplers (HVAS) will measure and analyse PM_{10} in accordance with the guidelines specified in AS/NZS 3580.9.6 (2003) *Methods for Sampling and Analysis of Ambient Air*
  - Determination of Suspended Particulate Matter – PM_{10} High Volume Sampler with Size Selective Inlet – Gravimetric Method;
  - As per AM-18, NSW EPA, 2022, Approved Methods for the Sampling and Analysis of Air Pollutants inNew South Wales; and
- Tapered Element Oscillating Microbalances (TEOMs) will measure and analyse continuous PM_{10} in accordance with the guidelines specified in *AS/NZS 3580.9.8 (2008) Methods for sampling and analysis of ambient air -Determination of suspended particulate matter - PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser*;
  - As per AM-22, NSW EPA, 2022, Approved Methods for the Sampling and Analysis of Air Pollutants inNew South Wales.
- Tapered Element Oscillating Microbalances (TEOMs) will measure and analyse continuous PM_{10} and $PM_{2.5}$ in accordance with the guidelines specified in AS/NZS 3580.9.7:2009 Methods for sampling and analysis of ambient air Method 9.7: Determination of suspended particulate matter— Dichotomous sampler (PM_{10}, coarse PM and $PM_{2.5}$)—Gravimetric method
- Tapered Element Oscillating Microbalances (TEOMs) will measure and analyse continuous $PM_{2.5}$ in accordance with the guidelines specified in *AS/NZS 3580.9.13 (2022) Methods for sampling and analysis of ambient air -Determination of suspended particulate matter - $PM_{2.5}$ continuous direct mass method using a tapered element oscillating microbalance monitor*

Finally, the following standards are noted with respect to monitoring of Discharge Limits:

- Monitoring of the Discharge Limits shown in **Table 5** and **Table 6** will be conducted in accordancewith the guidelines specified in *AS4323.1 (1995) Stationary Source Emissions Method 1: Selectionof Sampling Positions* (EPA TM-1);
- individual discharge parameters will be assessed as per:
  - TM-2 (USEPA (2000) Method 2 or 2C or USEPA (1999) Method 2F or 2G or 2H (as appropriate)), TM-11 (USEPA (2000) Method 7 or 7A or 7B or 7C or 7D or USEPA (1990) Method 7E or USEPA (1996) Method 20 or ISO (1993) Method 10396 (as appropriate). NOx analysers may be substituted in Method 7E provided the performance specifications of the method are met. Both NO and NOx must be directly measured), TM-12 (USEPA (2000)

Method29), TM-13 (USEPA (2000) Method 29 (Analysis for tin and vanadium to be done by Inductively Coupled Argon Plasma Emission Spectroscopy (ICAP) as defined in USEPA Method 29) or USEPA (1986) Method 7910 (for vanadium only) or USEPA (1986) Method 7911 (for vanadium only) (as appropriate)), TM-14 (USEPA (2000) Method 29), TM-15 (AS 4323.2 (1995) Stationary source emissions method 2 – determination of total particulate matter – isokinetic manual sampling – gravimetric method), TM-22 (USEPA (2000) Method 4), TM-23 (USEPA (2000)Method 3) and TM-34 (USEPA (2000) Method 18 or USEPA (2000) Method 25 or 25A or 25B or 25C or 25D or 25E (as appropriate)) as specified within NSW EPA, 2022, Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales.

The above standards should be specified when commissioning third-party stack testing to demonstrate compliance against the criteria specified in **Section 2.4**.

4 Monitoring Locations And Protocol

4.1 Monitoring Equipment And Locations

The air quality monitoring network comprises seven dust deposition gauges, four high volume air samplers (of which two monitor for PM10 and Lead (Pb) and two monitor for TSP and Pb), two TEOM or similar monitors monitoring PM10 and PM2.5, and two portable PM10 dust monitors.

Downwind monitoring of Lead at TSF2 is conducted by HVAS2 –PM10, HVAS3-TSP, and Dust Gauge 7.

The location of the monitoring sites are described in Table 7 and shown in Appendix C.

Air quality monitoring equipment is serviced and calibrated by site personnel when appropriate, and serviced and repaired by trained technicians on a regular basis as outlined in air quality monitoring procedures and according to manufacturer or AS/NZ standards. The servicing periods and reminders will be managed under the INX management system.

Table 7: Summary of Monitoring Locations

Site Number	Site Description	Easting (MGA54)	Northing (MGA54)
Ventilation Shaft (EPL Point 1)	Main vent rise with monitoring port at ground level.	543616	6463198
Baghouse Stack (EPL Point 2)	Exhaust stack for the Crusher Baghouse.	544532	6463521
DG1 (EPL Point 3)	Dust gauge located within the grounds of the St Johns Centre (acrossfrom RSPCA) Potentially impacted by local exposed areas.	542948	6462817
DG2 (EPL Point 4)	Dust gauge located in the grounds of Essential Water property, Honeys Hill /Block 10.	542689	6463036
DG3 (EPL Point 5)	Located at Thompson's Shaft. Potentially impacted by local exposed areas.	545064	6464247
DG4 (EPL Point 6)	Dust gauge located adjacent to uninhabited property ("Number 1 Residence") adjacent to Browne's Shaft.	545195	6464437
DG5 (EPL Point 7)	Dust gauge co-located with TSP-HVAS and PM_{10}-HVAS1 at the CML7 Silver Tank monitoring site. Monitoring locations potentially impacted by haul truck movements and wind erosion of on-site materials including 'free areas'.	543616	6462532
DG6 (EPL Point 8)	Dust gauge located at a representatives receptor location within Department of Health's lead risk zone 1 (Casuarina Ave)	544388	6461192
DG7 (EPL Point 9)	Dust gauge co-located with TEOM2, TSP-HVAS3 and PM_{10}-HVAS2 at the (uninhabited) BHP House monitoring site. Monitoring location selected to evaluate impacts associated with activities in the vicinity of the Rasp Mine processing area (Blackwood Pit).	544792	6464040
TSP-HVAS (EPL Point 10)	TSP High Volume Air Sampler co-located with DDG5 and PM_{10}-HVAS1 at the CML7 Silver Tank monitoring site. Monitoring location potentially impacted by haul truck movements and wind erosion of on-site materials including 'free areas'.	543616	6462532
PM_{10}-HVAS1 (EPL Point 11)	PM_{10} High Volume Air Sampler co-located with TSP-HVAS and PM_{10}-HVAS1 at the CML7 Silver Tank monitoring site. Monitoring location potentially impacted by haul truck movements and wind erosion of on-site materials including 'free areas'.	543616	6462532
PM_{10}-HVAS2 (EPL Point 12)	PM_{10} High Volume Air Sampler co-located with TEOM2 and DDG7 at the Blackwood monitoring site. Monitoring location selected to evaluate impacts associated with activities in the vicinity of the Rasp Mine processing area.	544792	6464040
TSP- HVAS3 (EPL Point 57)	TSP High Volume Air Sampler co-located with TEOM2 and DDG7 at the Blackwood monitoring site. Monitoring location selected to evaluate impacts associated with activities in the vicinity of the Rasp Mine processing area. EPL 12559 varied to specify HVAS at this location will monitor TSP as PM_{10} monitored by TEOM2.	544792	6464040
TEOM1	PM_{10} TEOM and $PM_{2.5}$ Monitor (TEOM or BAM) within the perimeter fence of Western Water's water tower facility.	544460	6462723

(PM_{10} and $PM_{2.5}$) (EPL Point 13)	Location selected to evaluate impacts associated with management of the TSF.		
TEOM2 (PM_{10} and $PM_{2.5}$) (EPL Point 14)	PM_{10} TEOM and $PM_{2.5}$ Monitor (TEOM or BAM) co-located with TSP-HVAS3 and DDG5 at the (uninhabited) BHP House monitoring site. Monitoring location selected to evaluate impacts of activities in the vicinity of the Rasp Mine processing area.	544792	6464040
PM_{10} – LocationB	Portable near-reference PM10 monitor installed at the western end of TSF2 (Lookout) to monitorPM_{10}. Includes anemometer.	544408	6463608
PM_{10} – LocationA (and C)	Portable near-reference PM10 monitor installed north of TSF2 to monitor dust from embankment construction. Then located as required to monitor dust from later stages of embankment construction. Includes anemometer.	Various	Various
PM_{10} –TSF3	Portable near-reference PM10 monitor installed at the waste surface in TSF3 (Kintore Pit) to monitorPM_{10}. Includes anemometer.	Various	Various

Generally, monitoring locations have been selected to be representative of areas of higher predicted impacts, as evaluated within the Air Quality Assessment prepared for the Environment Assessment (ENVIRON, 2010).

4.2 Air Quality Monitoring Locations and Network Log

The Rasp Mine air quality and meteorological monitoring program is detailed in Table 8.

A summary description of the location and monitoring requirements for each location is provided within the Air Quality Monitoring Network Log included as Appendix B.

Table 8: Rasp Mine Ambient Air Quality and Meteorological Monitoring Program

Site No.	Parameters Monitored	Units of Measure	Averaging period	Sampling Frequency	EPA Sampling method
DG1 (EPL Point 3)	Insoluble solids, Pb	g/m²/month	monthly, annual	monthly	AM-19
DG2 (EPL Point 4)	insoluble solids, Pb	g/m²/month	monthly, annual	monthly	AM-19
DG3 (EPL Point 5)	insoluble solids, Pb	g/m²/month	monthly, annual	monthly	AM-19
DG4 (EPL Point 6)	insoluble solids, Pb	g/m²/month	monthly, annual	monthly	AM-19
DG5 (EPL Point 7)	insoluble solids, Pb	g/m²/month	monthly, annual	monthly	AM-19
DG6 (EPL Point 8)	insoluble solids, Pb	g/m²/month	monthly, annual	monthly	AM-19
DG7 (EPL Point 9)	insoluble solids, Pb	g/m²/month	monthly, annual	monthly	AM-19

TSP-HVAS (EPL Point 10)	TSP, Pb	µg/m³	annual	24 hours, every 6 days	AM-11, AM-15
PM_{10}-HVAS1 (EPL Point 11)	PM_{10}, Pb	µg/m³	24 hour, annual	24 hours, every 6 days	AM-11, AM-18
PM_{10}-HVAS2 (EPL Point 12)	PM_{10}, Pb	µg/m³	24 hour, annual	24 hours, every 6 days	AM-11, AM-18
TSP- HVAS3 (EPL Point 57)	TSP, Pb	µg/m³	annual	24 hours, every 6 days	AM-11, AM-15
TEOM1 (PM_{10} and $PM_{2.5}$) (EPL Point 13)	PM_{10}, $PM_{2.5}$	µg/m³	24 hour, annual	24 hours, continuous	**AM-22**
TEOM2 (PM_{10} and $PM_{2.5}$) (EPL Point 14)	PM_{10}, $PM_{2.5}$	µg/m³	24 hour, annual	24 hours, continuous	**AM-22**
PM_{10} – LocationB	PM_{10}	µg/m³	NA	Real-time	NA
PM_{10} – LocationA (and C)	PM_{10}	µg/m³	NA	Real-time	NA
PM_{10} –TSF3	PM_{10}	µg/m³	NA	Real-time	NA
AWS (EPL Point 55)	Meteorological Parameters	Temperature (2 m and 10 m), wind speed / direction, rainfall	15-minute	Continuous	AM-2, AM-4

4.3 Meteorological Monitoring

Meteorological monitoring is conducted using the Rasp Mine Automatic Weather Station (AWS). This monitor records the following parameters, at 15-minute intervals:

- Wind speed;
- Wind direction;
- Wind direction min and max (range of the wind direction/variation);
- Temperature (at 1.5 m and 10 m);
- Rainfall; and
- Sigma theta.

4.4 Meteorological Monitoring for Operational Dust Management at TSF3

Meteorological monitoring is to be conducted using a portable sonic anemometer in the vicinity of the surface of TSF3.

The purpose of this monitoring is to ensure that the sheltering effect of Kintore Pit is adequate to mitigate high winds and avoid dust lift-off at TSF3.

Ongoing monitoring of wind speed in the vicinity of the surface of TSF3 will be compared to values recorded at the AWS. When the difference in ambient wind speeds is consistently less than a threshold value, real-time particulate monitoring will be deployed at this location to provide additional alerts / safeguards against periodic dust lift-off at this location.

Specifically, the trigger level at which point the need for additional operational dust management measures will be the following difference (Delta) in wind speed observations:

- For wind speeds recorded at the AWS greater than the awareness trigger (35 km/h; equivalent to 9.7 m/s), 15-minute average, the Delta, as recorded by the mobile anemometer at TSF3 is ≤ 2 m/s

It is thus envisaged that as the height of the TSF3 surface increases, the ability of the Kintore Pit to mitigate high wind speeds will be reduced. Where the difference between the two anemometers is less than 2 m/s (at wind speeds greater than 9.7 m/s) then the ability of the Kintore Pit to provide appropriate dust mitigation shall be reviewed.

The above may be expressed more simply as:

- Dust management measures at TSF3 will be reviewed when wind speeds, as recorded by the mobile anemometer at TSF3 exceed 7.7 m/s, 15-minute average.

The above value has been incorporated within the TARP detailed in Section 11 of the AQMP.

4.5 Real Time Particulate Monitoring for Operational Dust Management

Tapered Element Oscillating Microbalances (TEOMs) will be used as a real-time measure for operational dust management at the site. Dust management will be based on PM_{10} concentrations. $PM_{2.5}$ measurements do not provide suitable information for dust management, as mechanically-generated dust particles are mostly larger than 2.5 µm in diameter. The Rasp Mine TEOM sites will be configured to provide 5-minute interval data to a kiosk computer in the HSE office.

Investigation/action Level: An Interim Investigation Level for PM_{10} concentrations has been set at 100 µg/m^3, expressed as a 1- hour rolling average.

Contributing sources can be identified through the review of corresponding meteorological and air quality data (wind speed, wind direction, diurnal trends, and pollution roses) and a knowledge of current Rasp Mine site activities.

Calm conditions and recirculation events may lead to the Rasp Mine significantly contributing to exceedances of the Investigation Level. For this reason, the wind direction is not built into the Investigation Level criterion. However, the wind speed and direction will also be reported when the alarm is triggered to inform site personnel.

If the Investigation Level continues to be exceeded in the following hour, and Rasp Mine sources have been identified as being significant contributors, appropriate dust mitigation measures (use of chemical / water suppression / varying or ceasing operations) will be applied.

Real time PM_{10} concentrations are monitored using a direct interface connection to the two available

TEOM instruments and an alert system triggered by set concentrations over specified periods and available via SMS and email. TEOM data is analysed each month for comparison to the allowable annual average (25 ug/m^3). In a situation where visible dust is reported by site personnel the daily average can be tracked to ensure the daily average is not exceeded (50 ug/m^3).

Along with the TEOM (or equivalent devices as required) there will be portable PM10 monitoring devices, identified in Tables 7 and 8, located on the TSF2 boundary that will provide real-time data to inform dust management.

The TEOMs will be the primary source of real-time data informing the TSF2 spray system control software to initiate the spray system in the event dust lift-off from the surface of TSF2 is detected. The portable PM10 monitors may also be used to stream real-time data to the spray control system to initiate the spray system in response to dust lift-off.

4.6 Point Source Monitoring

Post-commissioning stack testing shall be conducted at both the ventilation shaft's (Primary Vent and Shaft 6) and crusher circuit baghouse stack to establish compliance with the criteria set out in in **Table 5**, **Table 6 and Table 7.**

If post-commissioning stack testing of the ventilation shaft does not easily satisfy the above criteria (i.e. if the ventilation shaft is not a 'wet' shaft, as is expected) water sprays will be installed and used during blasts to maximise suppression of dust in the underground mine.

Subsequent to post-commissioning stack testing, stack testing at Point 1 (Ventilation Shaft) and Point 2 (Crusher Baghouse) is conducted on a quarterly frequency.

All stack testing shall be conducted by a suitably qualified, NATA-accredited stack testing consultant, and will be conducted consistent with the relevant standards documented in **Section 3**.

4.7 Meteorological Forecasting for Operational Dust Management

A review of the emissions inventory and atmospheric dispersion modelling conducted for the Rasp Mine Environmental Assessment (ENVIRON, 2010) indicates that the principal meteorological factor that may lead to adverse impacts beyond the site boundary relates to the presence of high winds.

Principally, this is likely to increase particulate emissions associated with wind erodible area sources such as the existing 'free areas', the ROM stockpile and TSF1.

Details of wind conditions will be provided at the morning shift meeting and posted on the information board and any additional mitigation measures (e.g. additional chemical dust suppressant /watering to the TSF) will be discussed and put in place in advance of adverse weather conditions.

BHOP have obtained customised predictive daily meteorological forecasting which is provided to relevant Supervisors / Team Leaders to consider and organise any additional mitigation measures (e.g. additional chemical dust suppressant / watering to the TSF) required to be put in place in advance of adverse weather conditions.

The TSF2 spray system will be activated when weather forecasting suggests there will be adverse conditions likely to generate dust lift-off from the TSF2 surface.

5 Reporting

All monitoring records are kept in accordance with the Rasp Mine's EPL conditions:

- In a in a legible form, or in a form that can readily be reduced to a legible form;
- kept for at least 4 years after the monitoring or event to which they relate took place; and
- produced in a legible form to any authorised officer of the EPA who asks to see them.The following records will also be kept in respect of air quality monitoring undertaken:
- the date(s) on which the sample was taken;
- the time(s) at which the sample was collected;
- the point at which the sample was taken; and
- the name of the person who collected the sample.

5.1 Incident Reporting

Condition 5 of Schedule 4 of Project Approval MP 07_0018 states:

The Secretary must be notified in writing via the Major Projects website immediately after the Proponent becomes aware of an incident. The notification must identify the project (including the development application number and the name of the development if it has one) and set out the location and nature of the incident. Subsequent notification requirements must be given, and reports submitted in accordance with the requirements set out in Appendix 5 of PA 07_0018. In terms of air quality monitoring, an 'incident' is defined as any exceedance of the air quality criteria summarised in **Table 2**, **Table 3**, **Table 4**, **Table 5** and **Table 6** of PA 07_0018.

For non-compliance events, the Secretary must be notified in writing via the Major Projects website within seven days after the Proponent becomes aware of any non-compliance. A non-compliance notification must identify the project and the application number for it, set out the condition of approval that the project is non-compliant with, the way in which it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance. A non-compliance which has been notified as an incident does not need to also be notified as a noncompliance.Incident reporting should additionally contain information on diurnal trends and pollution roses (a graphical representation of wind direction plotted against concurrent particulate concentration, similar to a wind rose), as applicable.

5.2 Regular Reporting

Air quality monitoring results will be reported by the Environment Coordinator for:

- Monthly Head of Departments Meeting
- CBH Website
- Annual Return, Annual Review and Annual Environment Management Report

An environment performance review shall be conducted annually and provided to the DPE.

By the end of 31 March 2023, and annually thereafter, the Annual Review report reviewing the environmental performance will submitted to the Secretary. This review must:

h) describe the project (including any rehabilitation) that was carried out in the past calendar

year, and the project that is proposed to be carried out over the next year;

i) include a comprehensive review of the monitoring results and complaints records of the project over the past year, which includes a comparison of these results against the:

- relevant statutory requirements, limits or performance measures/criteria;
- monitoring results of previous years;
- relevant predictions in the documents referred to in Condition 2 of Schedule 2; and
- requirements of any plan or program required under this approval;

j) identify any non-compliance over the past year, and describe what actions were (or are being) taken to rectify the non-compliance and avoid reoccurrence;

k) identify any trends in the monitoring data over the life of the project;

l) identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies;

m) describe what measure will be implemented over the next year to improve the environmental performance of the project; and

n) evaluate and report on compliance with the performance measures, criteria and operating conditions of this approval.

5.3 Monitoring Data Screening, Analysis and Storage

The following procedures are provided with regard to TEOM data, for quality control / quality assurance:

- Validated data reports will be produced by Ecotech and reviewed by BHOP Environmental staff for external event exceptions such as dust storms;

The above rules will be applied by the Senior Environmental Advisor who will generate reports as required.

All data shall be stored in a central database that is regularly backed up. The database will be configured to permit the viewing of data as a continuous data set.

Raw data can then be revisited and re-analysed if any problems arise with the original quality assurance process.

5.4 Non-Routine Operations

Non-routine mine operations which may impact air quality levels (e.g. earthworks), and local and regional incidences (e.g. bush fires, control burns, dust storms, dust events at neighbouring mines) that may affect air quality levels will be noted in monthly reports. The log will assist in data analysis and interpretation.

6 Auditing And Review

6.1 Air Quality Monitoring Program Review

The Air Quality Monitoring Program (as with the AQMP) shall be reviewed, and if necessary revised, within three months of:

- the submission of an annual review under Condition 3 of Schedule 4;
- the submission of an incident report under Condition 5 of Schedule 4;
- the submission of an audit report under Condition 7 and 8A of Schedule 4, or
- any modification of the conditions of this approval (unless the conditions require otherwise); or
- A direction of the Secretary under Condition 2 of Schedule 2.

6.2 Independent Environmental Audit

An independent audit of the project will be conducted every three years with the first review to be undertaken within one year of the date of physical development under MOD6 commencing.

Arrangement for the independent audit to be conducted will be the responsibility of the Senior Environmental Advisor.

7 Accountability

The relevant Rasp Mine personnel accountabilities for the implementation of this Air Quality Monitoring Program are provided in **Table 9**.

Table 9: Accountabilities for the Air Quality Monitoring Program	
Position	**Responsibility**
Mine Manager	• Provide adequate resources to assist the implementation of theMonitoring Program.
Department Managers	• Provide adequate resources to assist the implementation of theMonitoring Program. • Allocate responsibilities to implement all actions within the MonitoringProgram. • Support actions to mitigate or cease dust generation activities asdetermined from an Investigation Level or Action Level. • Provide training and maintain competencies to enable theimplementation of the Monitoring Program.
Environmental Coordinator	• Provide and maintain the Monitoring Program; • Assist in the identification of causes of PM_{10} and $PM_{2.5}$ Investigation Level being exceeded upon SMS notification; • Assist in identifying appropriate dust mitigation actions are conductedupon SMS notification that PM_{10} and $PM_{2.5}$ Action Level has been exceeded; • Undertake a review of air quality monitoring results on a monthly basis; • Provide monitoring results for the Heads of Department Meetings, CBH website, to the AEMR and to the DPE; and • Report any exceedances for which the Rasp Mine is responsible to theDirector-General - DPE and EPA. • Arrange independent audits.
Operators	• Maintain operations so as to minimise the generation of dust. • Identify and take actions to mitigate or cease dust generation activitiesas determined from an Investigation Level or Action Level. • Undertake training as appropriate to maintain air quality relatedcompetencies.

8 Procedures

The Monitoring Program is to be read in conjunction with the following Rasp Mine procedures relevant to air quality monitoring:

- Procedure - Real-Time Particulate Monitoring for Operational Dust Management
- Procedure - TEOM Monitoring
- Procedure - Dust Deposition Gauge Monitoring
- Procedure - TSP and PM_{10} High Volume Air Sampling
- Procedure - Meteorological Monitoring
- Procedure - Meteorological Forecasting to Guide Dust Management

9 References

AS 2800-1985 Ambient air - Determination of particulate lead - High volume sampler gravimetric collection - Flame atomic absorption spectrometric method.

AS 2922-1987 Ambient Air - Guide for the Siting of Sampling Units.

AS 3580.10.1-2003 Methods for Sampling and Analysis of Ambient Air - Determination of Particulates -Deposited Matter - Gravimetric Method.

AS/NZS 3580.9.3:2003 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - Total suspended particulate matter (TSP) - High volume sampler gravimetric method

AS/NZS 3580.9.6-2003 Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – PM_{10} high volume sampler with size selective inlet – Gravimetric Method.

AS 3580.9.8—2022 Methods for sampling and analysis of ambient air, Method 9.8: Determination of suspended particulate matter — PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser.

AS/NZS 3580.9.7:2009 Methods for sampling and analysis of ambient air Method 9.7: Determination of suspended particulate matter— Dichotomous sampler (PM_{10}, coarse PM and $PM_{2.5}$)—Gravimetric method [**To be confirmed**].

AS/NZS 3580.9.13:2022 Methods for sampling and analysis of ambient air Determination of suspended particulate matter — $PM_{2.5}$ continuous direct mass method using a tapered element oscillating microbalance monitor

AS/NZS 3580.9.12:2022 Methods for sampling and analysis of ambient air Method 9.12 Determination of suspended particulate matter — $PM_{2.5}$ beta attenuation monitors

AS 3580.14 Methods for sampling and analysis of ambient air - Meteorological monitoring for ambient air quality monitoring applications

Hourly observations for 2009 from the Bureau of Meteorology Automatic Weather Station at Broken Hill Airport.

National Environmental Protection Council (1998) “National Environmental Protection Measure for Ambient Air Quality”.

National Health and Medical Research Council, 92nd Session, (1981).

AMMAAP (2005) NSW Department of Environment, Climate Change and Water, Approved Methodsfor the Modelling and Assessment of Air Pollutants in New South Wales.

NSW Department of Environment, Climate Change and Water (2007), Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales.

Appendix A

Air Quality Monitoring Network Log

BROKEN HILL OPERATIONS PTY LTD – Air Quality Monitoring Program

This Air Quality Monitoring Network Log outlines specific monitoring details for eachmonitoring site.

Site Number: DG1

Instrument Type	Dust Deposition Gauge	
MGA54 Coordinates	**Easting**	**Northing**
	542948	6462817
Parameters Monitored	Insoluble solids, Lead	
Units of Measure	g/m²/month	
Averaging Period	monthly, annual	
Sampling Frequency	Monthly	
EPA Sampling method	AM-19, % Pb	
Location Classification	On-site	
Commissioning Date	March 2007	
Reporting Frequency	Monthly	
Auditing Frequency	Annual	
Station Description	Located adjacent to the RSPCA and St Johns Training Centres. Potentially impacted by local exposed areas. Located on CML7, off BHOP surface area.	
Monitoring Objective	Compliance, EP Licence 12259. Long-term temporal trend analysis.	

Site Number: DG2

Instrument Type	Dust Deposition Gauge	
MGA54 Coordinates	**Easting**	**Northing**
	542689	6463036
Parameters Monitored	Insoluble solids, lead	
Units of Measure	g/m²/month	
Averaging Period	monthly, annual	
Sampling Frequency	monthly	
EPA Sampling method	AM-19, % Pb	
Location Classification	Residential	
Commissioning Date	March 2007	
Reporting Frequency	Monthly	
Auditing Frequency	Annual	

Station Description	Located at Honeys Hill, Block 10. Located on CML7, BHOP surface area.
Monitoring Objective	Compliance, EP Licence 12259. Long-term temporal trend analysis.

Site Number: DG3

Instrument Type	Dust Deposition Gauge	
MGA54 Coordinates	**Easting**	**Northing**
	545064	6464247
Parameters Monitored	Insoluble solids,Lead	
Units of Measure	g/m²/month	
Averaging Period	monthly, annual	
Sampling Frequency	monthly	
EPA Sampling method	AM-19, % Pb	
Location Classification	On-site	
Commissioning Date	March 2007	
Reporting Frequency	Monthly	
Auditing Frequency	Annual	
Station Description	Located at Thompson's Shaft. Potentially impacted by local exposed areas. Located on CML7, BHOP surface area.	
Monitoring Objective	Compliance, EP Licence 12259. Long-term temporal trend analysis.	

Site Number: DG4

Instrument Type	Dust Deposition Gauge	
MGA54 Coordinates	**Easting**	**Northing**
	545195	6464437
Parameters Monitored	Insoluble solids, lead	
Units of Measure	g/m²/month	
Averaging Period	monthly, annual	
Sampling Frequency	monthly	
EPA Sampling method	AM-19, % Pb	
Location Classification	Residential	
Commissioning Date	March 2007	
Reporting Frequency	Monthly	
Auditing Frequency	Annual	

Station Description	Located adjacent to “Number 1 Residence” adjacent to Browne’s Shaft. Located onCML7, BHOP surface area. Dust gauge was relocated by <10 m in June 2010 to remove potential impacts from adjacent vegetation.
Monitoring Objective	Compliance, EP Licence 12259. Long-term temporal trend analysis.

Site Number: DG5

Instrument Type	Dust Deposition Gauge	
MGA54 Coordinates	**Easting**	**Northing**
	543616	6462532
Parameters Monitored	Insoluble solids, lead	
Units of Measure	g/m²/month	
Averaging Period	monthly, annual	
Sampling Frequency	monthly	
EPA Sampling method	AM-19, % Pb	
Location Classification	On-site	
Commissioning Date	December 2009	
Reporting Frequency	Monthly	
Auditing Frequency	Annual	

Station Description	Co-located with TSP-HVS1 and PM_{10}-HVS2 at the CML7 Silver Tank monitoring site. Monitoring location potentially impacted by haul truck movements and wind erosion ofon-site materials including 'free areas'. Located on CML7, BHOP surface area.
Monitoring Objective	Long-term temporal trend analysis.

Site Number: DG7

InstrumentType	Dust Deposition Gauge	
MGA54 Coordinates	**Easting**	**Northing**
	544764	6464009
Parameters Monitored	Insoluble solids, lead	
Units of Measure	g/m²/month	
Averaging Period	monthly, annual	
Sampling Frequency	monthly	
EPA Sampling method	AM-19, % Pb	
Location Classification	Residential	
Commissioning Date	TBA	
Reporting Frequency	Monthly	
Auditing Frequency	Annual	

Station Description	Co-located with TEOM2 and PM_{10}-HVS2 adjacent to BHP House. Located on CML7,BHOP surface area. Monitoring location selected to evaluate impacts associated withactivities in the vicinity of the Rasp Mine processing area.
Monitoring Objective	Compliance, EP Licence 12259.

Site Number: DG6

InstrumentType	Dust Deposition Gauge	
MGA54 Coordinates	**Easting**	**Northing**
	544390	6461187
Parameters Monitored	Insoluble solids, lead	
Units of Measure	g/m²/month	
Averaging Period	monthly, annual	
Sampling Frequency	monthly	
EPA Sampling method	AM-19, % Pb	
Location Classification	Residential	
Commissioning Date	TBA	
Reporting Frequency	Monthly	
Auditing Frequency	Annual	

Station Description	Located at a representative receptor location within Department of Health's Lead RiskZone 1 (western end, southern side of Eyre Street). Located off CML7.
Monitoring Objective	Compliance, EP Licence 12259. Input into future Health Risk Assessment (evaluationof lead deposition within Risk Zone 1 during the operational phase).

Site Number: TSP-HVAS

InstrumentType	High Volume Air Sampler with TSP Sampling Head	
MGA54 Coordinates	**Easting**	**Northing**
	543616	6462532
Parameters Monitored	Total Suspended Particulate, Lead on filter paper	
Units of Measure	µg/m^3	
Averaging Period	24-hours, Annual	
Sampling Frequency	24-hours, 1-day-in-6	
EPA Sampling method	AM-11 (Pb),AM-15 (TSP)	
Location Classification	On-site	
Commissioning Date	May 2007	
Reporting Frequency	Monthly	
Auditing Frequency	Annual	

Station Description	Co-located with DG5 and HVS2 at the CML7 Silver Tank monitoring site. Monitoringlocation potentially impacted by haul truck movements and wind erosion of on-site materials including 'free areas'. Located on CML7, BHOP surface area.
Monitoring Objective	Compliance, EP Licence 12259. Long-term temporal trend analysis. Evaluation of Pbcontent within different Particle Sizes.

Site Number: PM_{10}-HVAS1			
InstrumentType	High Volume Air Sampler with PM_{10} Size Selective Inlet		
MGA54 Coordinates	**Easting**	**Northing**	
	543616	6462532	
Parameters Monitored	PM_{10}, Lead on filter paper		
Units of Measure	$\mu g/m^3$		
Averaging Period	24-hours, Annual		
Sampling Frequency	24-hours, 1-day-in-6		
EPA Sampling method	AM-11 (Pb), AM-18 (PM_{10})		
Location Classification	On-site		
Commissioning Date	May 2010		
Reporting Frequency	Monthly		
Auditing Frequency	Annual		
Station Description	Co-located with HVS1 and DG5 at the CML7 Silver Tank monitoring site. Monitoringlocation potentially impacted by haul truck movements and wind erosion of on-site materials including 'free areas'. Located on CML7, BHOP surface area.		
Monitoring Objective	Long-term temporal trend analysis. Evaluation of Pb content within different ParticleSizes.		

Site Number: PM_{10}-HVAS2

Instrument Type	High Volume Air Sampler with PM_{10} Size Selective Inlet	
MGA54 Coordinates	**Easting**	**Northing**
	544764	6464009
Parameters Monitored	PM_{10}, Lead on filter paper	
Units of Measure	$\mu g/m^3$	
Averaging Period	24-hours, Annual	
Sampling Frequency	24-hours, 1-day-in-6	
EPA Sampling method	AM-11 (Pb), AM-18 (PM_{10})	
Location Classification	Residential	
Commissioning Date	TBA	
Reporting Frequency	Monthly	
Auditing Frequency	Annual	

Station Description	Co-located with TEOM2 and DG6 adjacent to BHP House. Located on CML7, BHOP surface area. Monitoring location selected to evaluate impacts associated with activities in the vicinity of the Rasp Mine processing area.
Monitoring Objective	Compliance, EP Licence. Evaluation of lead content in PM_{10} size fraction.

Site Number: TSP-HVAS3

Instrument Type	High Volume Air Sampler with TSP Size Selective Inlet	
MGA54 Coordinates	**Easting**	**Northing**
	544764	6464009
Parameters Monitored	TSP Lead on filter paper	
Units of Measure	µg/m^3	
Averagingperiod	24-hours, Annual	
Sampling Frequency	24-hours,1-day-in-6	
EPA Sampling method	AM-11 (Pb), AM-18 (PM_{10})	
Location Classification	Residential	
Commissioning Date	October 2018	
Reporting Frequency	Monthly	
Auditing Frequency	Annual	

Station Description	Co-located with TEOM2, HVAS2 and DG7 adjacent to BHP House. Located on CML7,BHOP surface area. Monitoring location selected to evaluate impacts associated with activities in the vicinity of the Rasp Mine processing area.
Monitoring Objective	Compliance, EP Licence ID 57. Evaluation of Lead content in TSP size fraction.

Site Number: TEOM1			
InstrumentType	Tapered Element Oscillating Microbalance (TEOM) with PM_{10} Size Selective Inlet		
MGA54 Coordinates	**Easting**	**Northing**	
	544460	6462723	
Parameters Monitored	PM_{10},		
Units of Measure	$\mu g/m^3$		
Averaging Period	24-hours, Annual		
Sampling Frequency	Continuous		
EPA Sampling method	AM-22		
Location Classification	Commercial		
Commissioning Date	TBA		
Reporting Frequency	Monthly		
Auditing Frequency	Annual		
Station Description	Located within the perimeter fence of Essential Water's water tower facility. Location selected to evaluate impacts associated with management of the TSF. Located off CML7.		
Monitoring Objective	Compliance, EP Licence 12259. Operational Dust Management. Upwind/Downwind Contribution Evaluation.		

Site Number: TEOM2

InstrumentType	Tapered Element Oscillating Microbalance (TEOM) with PM_{10} Size Selective Inlet	
MGA54 Coordinates	**Easting**	**Northing**
	544764	6464009
Parameters Monitored	PM_{10},	
Units of Measure	$\mu g/m^3$	
Averaging Period	24-hours, Annual	
Sampling Frequency	Continuous	
EPA Sampling method	AM-22	
Location Classification	Residential	
Commissioning Date	TBA	
Reporting Frequency	Monthly	
Auditing Frequency	Annual	

Station Description	Co-located with HVS3 and DG7 adjacent BHP House. Located on CML7, BHOPsurface area. Monitoring location selected to evaluate impacts associated with activities in the vicinity of the Rasp Mine processing area.
Monitoring Objective	Compliance, EP Licence 12259. Operational Dust Management. Upwind/Downwind Contribution Evaluation.

<table>
<tr><th colspan="3">Site Number: Site 1 $PM_{2.5}$</th></tr>
<tr><td colspan="2">$PM_{2.5}$</td><td rowspan="11"> 

Final monitoring unit to be determined.</td></tr>
<tr><td>Easting</td><td>Northing</td></tr>
<tr><td>544460</td><td>6462723</td></tr>
<tr><td colspan="2">$PM_{2.5}$,</td></tr>
<tr><td colspan="2">µg/m^3</td></tr>
<tr><td colspan="2">24-hours, Annual</td></tr>
<tr><td colspan="2">Continuous</td></tr>
<tr><td colspan="2">AM-22</td></tr>
<tr><td colspan="2">Commercial</td></tr>
<tr><td colspan="2">TBA</td></tr>
<tr><td colspan="2">Monthly</td></tr>
<tr><td colspan="2">Annual</td></tr>
<tr><td colspan="3">Located within the perimeter fence of Essential Water’s water tower facility. Locationselected to evaluate impacts associated with management of the TSF. Located off CML7.</td></tr>
<tr><td colspan="3">Compliance</td></tr>
</table>

Site Number: Site 2 $PM_{2.5}$

$PM_{2.5}$	 Final monitoring unit to be determined.
Easting	**Northing**
544764	6464009
$PM_{2.5}$,	
µg/m^3	
24-hours, Annual	
Continuous	
AM-22	
Commercial	
TBA	
Monthly	
Annual	
Co-located with HVAS2, HVS3 and DG7 adjacent BHP House. Located on CML7, BHOP surface area. Monitoring location selected to evaluate impacts associated with activities in the vicinity of the Rasp Mine processing area.	
Compliance	

Site Number: AWS

Instrument Type	Automatic Weather Station	
MGA54 Coordinates	**Easting**	**Northing**
	543507	6462532
Parameters Monitored	Meteorological Parameters	
Units of Measure	Temperature (10m), wind speed / direction, rainfall, sigma theta	
Averaging Period	15-Minutes	
Sampling Frequency	Continuous	
EPA Sampling method	AM-2,AM-4	
Location Classification	On-site	
Commissioning Date	May 2007 (upgrade January 2019)	
Reporting Frequency	Monthly	
Auditing Frequency	Annual	

Station Description	On-site meteorological monitoring site located North East of Little Kintore Pit.

Monitoring Objective

Compliance, EP Licence 12259. Site-representative meteorological monitoring.

Parameter	Units of Measure	Frequency	Averaging Period	Sampling Method
Rainfall	Millimetres	Continuous	1 hour	AM-4
Temperate at 10 m	Degrees Celsius	Continuous	15-minute	AM-4
Wind speed at 10 m	Metres per second	Continuous	15-minute	AM-4
Wind direction at 10 m	Degrees	Continuous	15-minute	AM-4
Sigma theta at 10 m	Degrees	Continuous	15-minute	AM-2 and AM-4

Appendix B

Baseline Air Quality Monitoring Data

The assessment of compliance with ambient air quality limits necessitates the characterisation of baseline air quality in the absence of the Rasp Mine operations.

Broken Hill is located in an arid climate, frequently impacted by dust storms. Additionally, there are several existing sources of both particulate matter and heavy metals (e.g. CML7 'free areas'). Air quality monitoring for compliance purposes should take account of the Broken Hill locality and should, where necessary, make reference to the following baseline air quality data.

Air Quality Assessment for the Rasp Mine 2010

(ENVIRON document reference 1150_BHOP Rasp Air_Rev1_26May2010).

B1 Existing Local Sources of Atmospheric Emissions

Industrial and mining activities operating within 5 km of the Project Area which are listed as either National Pollutant Inventory (NPI) reporting activities or EPA licence holders are listed in **Table B1**.

Table B1 – Industrial operations and mines situated within 5 km of the Project Area

Facility Name	Distance from Site	Description
Perilya Broken Hill Operations Pty Ltd – South and North Mines	Operations located adjacentto northeast and southwest site boundaries	Zinc, lead and silver mines
Bemax (Now Tronox) Mineral Separation Plant	4.1 km WSW of southwest boundary	Mineral sand processing plant
E B Mawsons & Sons	Adjacent to south-eastern site boundary	Gravel quarry and concrete batching plant

Extraction operations are currently at the nearby Mawsons Quarry. Perilya Broken Hill Operations Pty Ltd undertakes separate mining operations to the northeast and southwest of the Project Area. The northern operations are in a care and maintenance phase, with emissions from the site expected to be primarily from wind erosion of exposed surfaces. Perilya operations to the southwest comprise underground mining operations with surface processing. Tailings from this operation are currently sent to a storage facility located approximately 5 km to the southwest of the Project Area.

It is noted at this point that due to the scale and nature of the existing surrounding operations, these sources are not considered to be substantial contributors of particulate matter emission to the local air shed.

Rather, due to the arid location of Broken Hill, naturally generated dust storms are a likely significant contributor to elevated ambient particulate matter concentrations events in the region. Review of Bureau of Meteorology (BoM) records for recent years highlighted various occurrences of dust storms along with other days where sustained periods of high winds contributed to the persistence of significant levels of visible dust. Dust storms worthy of being recorded by the BoM due to their severity occurred on 2% of days over the 2007 to 2009 period. This is likely to exclude days on which more minor events resulted in dust episodes.

Wind-blown dust thus represents a key component of suspended particulate concentrations and dust deposition in the area. Other potential sources of atmospheric emissions in the vicinity of the Project include:

- Dust entrainment due to vehicle movements along unsealed and sealed town and rural roadswith high silt loading levels;
- Vehicle exhaust and rail related emissions; and
- Episodic emissions from vegetation fires.

Fugitive dust from long-range transport of fine particles is also expected to contribute to suspended particulate concentration in the study area.

D2 Monitoring Data Available for Baseline Air Quality Characterisation

Monitoring data sets which were made available and used in the characterisation of the existing air quality in the study area are listed in **Table B2**. The locations of the BHOP sampling stations are given in **Figure B1**.

Table B2 - Monitoring data sets used in the baseline air quality characterisation

Data Owner / Data Set	Sampling Sites	Parameters Measured	Monitoring Duration
BHOP HVAS	1 station: on-site adjacent to Dust Deposition Gauge D5	TSP and Lead (one-in-six day cycle)	May 2007 – Jan 2010
BHOP Dust Deposition	6 dust gauge sampling stations: D1 to D5 and Casuarina Ave	Dust deposition and Pb (30 day +/- 2 day cycle)	March 2007 – December 2009
Bemax HVAS	1 station: onsite adjacent to Bemax operations	PM_{10} (one-in-six day cycle)	May 2006 – Jan 2010

HVAS – high volume air samplers

Figure B1: Locations of BHOP monitoring stations

D3 Ambient TSP Concentrations

The 24-hour average TSP concentrations recorded by the BHOP HVAS between January 2008 and December 2009 are presented in Figure D2.

The maximum recorded 24-hour average TSP concentration for the period January 2008 and December 2009 was 415.3 µg/m³. This peak concentration occurred during a recorded dust storm event in March 2009.

Annual average TSP concentrations of 47.8 µg/m³ and 64.9 µg/m³ were recorded for 2008 and 2009 respectively, while the dataset average was 56.4 µg/m³. Ambient concentrations of TSP were therefore within the annual guideline value of 90 µg/m³ for 2008 and 2009, with measured levels comprising about 50% to 70% of the guideline value.

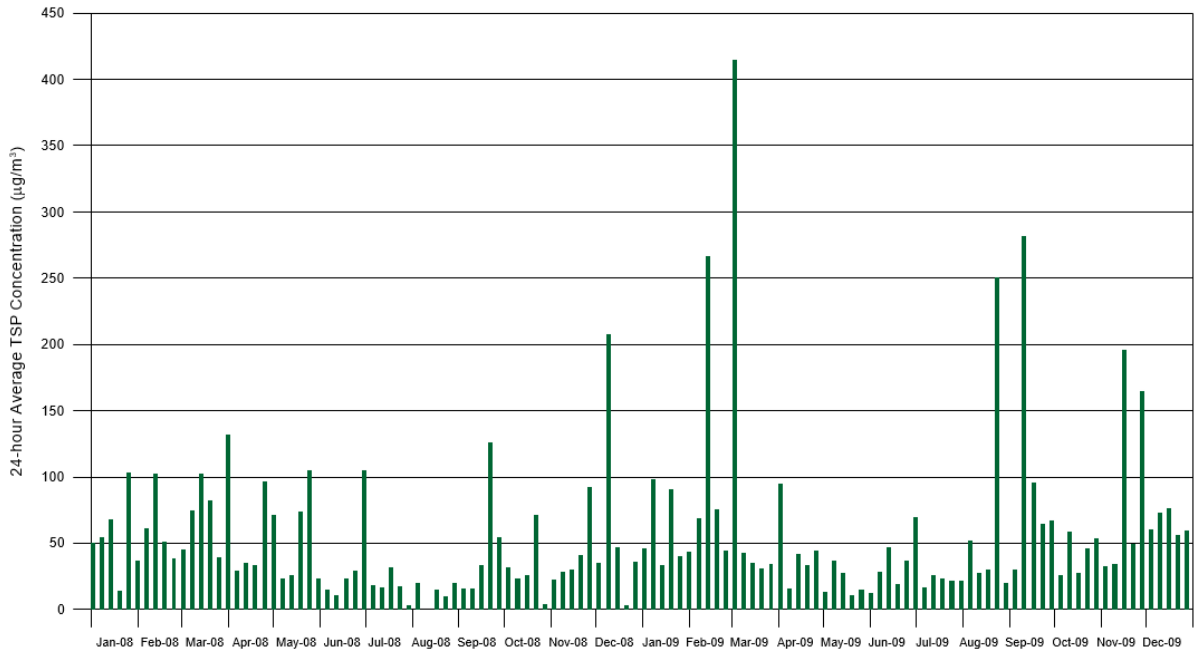


Figure D2: 24-hour average TSP concentrations recorded at BHOP HVAS during January 2008 to December 2009

D4 Measured Ambient PM_{10} Concentrations

PM_{10} concentrations are not measured at the Project Site. Given the importance of providing an estimate of prevailing PM_{10} concentrations for the purposes of assessing cumulative concentrations, reference was made to the PM_{10} monitoring undertaken by Bemax Resources Limited (Bemax). Bemax conducts one-in-six day sampling of PM_{10} concentrations by HVAS at the Broken Hill Mineral Separation Plant situated approximately 4.1 km to the west-southwest of the Project Site.

The 24-hour average PM_{10} concentrations recorded by the Bemax HVAS between January 2008 and December 2009 are presented within **Figure D3**. It is noted that the PM_{10} concentrations are not measured by Bemax on the same days on which TSP concentrations are measured by BHOP.

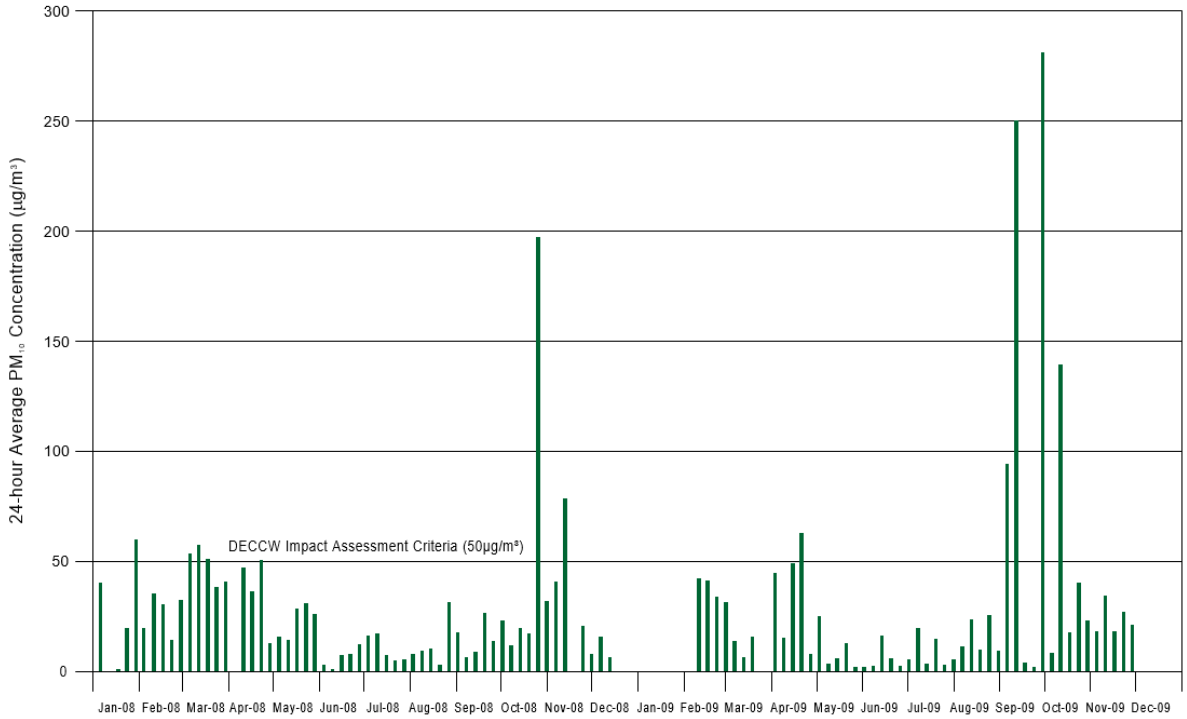


Figure D3: 24-hour Average PM_{10} concentrations recorded by Bemax during January 2008 to December 2009

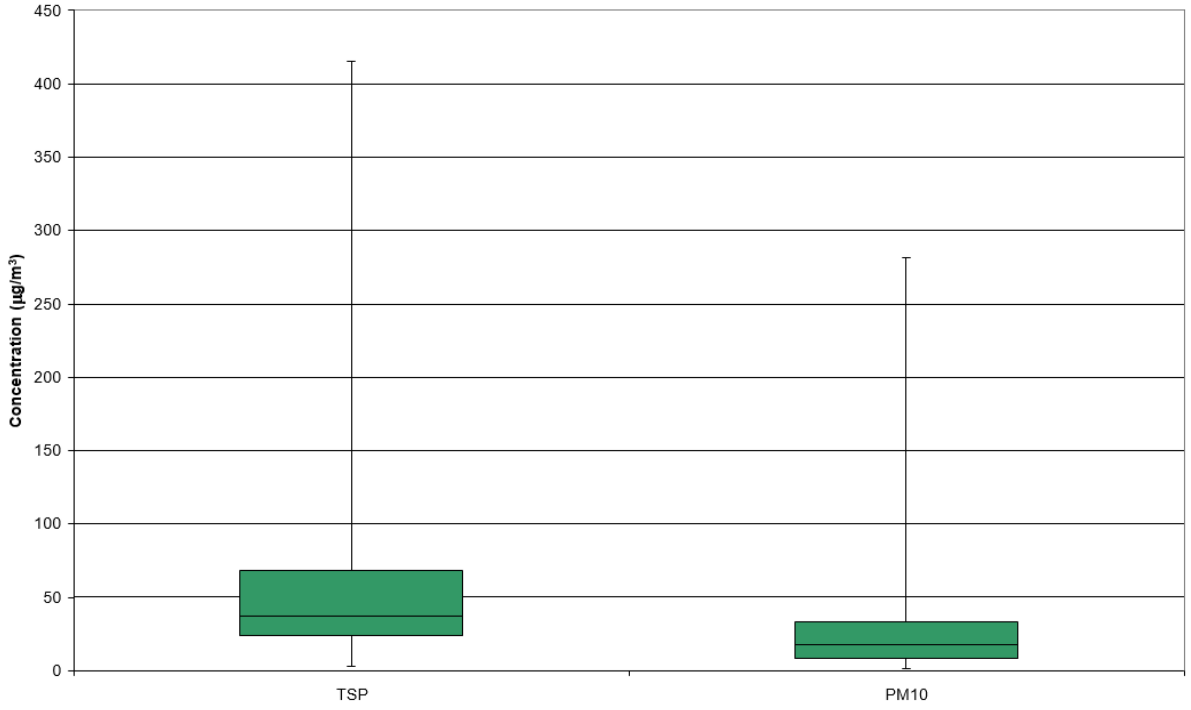
The maximum recorded 24-hour average PM_{10} concentration for the period January 2008 and December 2009 was 281.2 µg/m³, during a period of sustained dust storm activity during late September 2009. The 24-hour impact assessment guideline of 50 µg/m³ was exceeded on 12 separate occasions between January 2008 and December 2009 (11.7% of all data days).

Average PM_{10} concentrations of 26.3 µg/m³ and 32.3 µg/m³ were recorded for 2008 and 2009 respectively, with the period average of 29.1 µg/m³ across the 103 data days comprising about 97% of the impact assessment criterion of 30 µg/m³.

D5 PM_{10} Concentrations as a Fraction of TSP Levels

Despite the BHOP TSP and Bemax PM_{10} monitoring days not being concurrent, a statistical analysis of these data sets provides for an assessment of likely PM_{10}/TSP ratios in the study area. Results from this analysis are presented in **Table D3** and illustrated in **Figure D4**.

Table D3 – TSP and PM_{10} Dataset Statistics – January 2008 to December 2009			
Statistic	**BHOP HVAS TSP Concentration (µg/m³)**	**Bemax HVAS PM_{10} Concentration (µg/m³)**	**PM_{10} to TSP Ratio**
Mean	56.4	29.1	0.52
Standard Deviation	59.4	43.2	0.73
Median	37.1	17.3	0.47
Lower Quartile(25th Percentile)	23.6	7.9	0.34
Upper Quartile(75th Percentile)	68.3	33.2	0.49
Minimum	3.2	0.9	0.28
Maximum	415.3	281.2	0.68



Note: Horizontal lines of boxes indicate 25th percentile, 50th percentile (Median) and 75th percentileconcentrations for the dataset. Whiskers indicate the maxima and minima of the dataset.

Figure D4: Distribution of TSP and PM_{10} concentrations in Broken Hill region – January 2008 to December 2009

The PM_{10}/TSP ratio is thus in the range of about 0.3 to 0.7, and most typically of the order of 0.5. Based on experience gained in the analysis of PM_{10}/TSP ratios for rural and mining areas where mechanically generated dust sources dominate, it is anticipated that peak TSP concentrations will coincide with significantly lower PM_{10}/TSP ratios. Exceptions to this will occur during vegetation fire events, with such events likely to coincide with peak suspended particulate concentrations and significantly higher PM_{10}/TSP ratios.

D6 Projected PM_{10} Concentrations for Project Assessment Purposes

For the purpose of projecting the magnitude of PM_{10} concentrations at the site, the median PM_{10}/TSP ratio of 0.47 was applied to the measured BHOP TSP data set to derive indicative PM_{10} levels.

This projected PM_{10} data set (comprising 121 data days) was combined with the measured Bemax PM_{10} data set (103 data days) to generate a constructed PM_{10} data set covering 224 days during the January 2008 to December 2009 period with all seasons represented.

The constructed PM_{10} data set, illustrated in Figure D5, provides an indication of temporal variations in PM_{10} levels and facilitates a more robust means of assessing cumulative air quality impacts due to the Project.

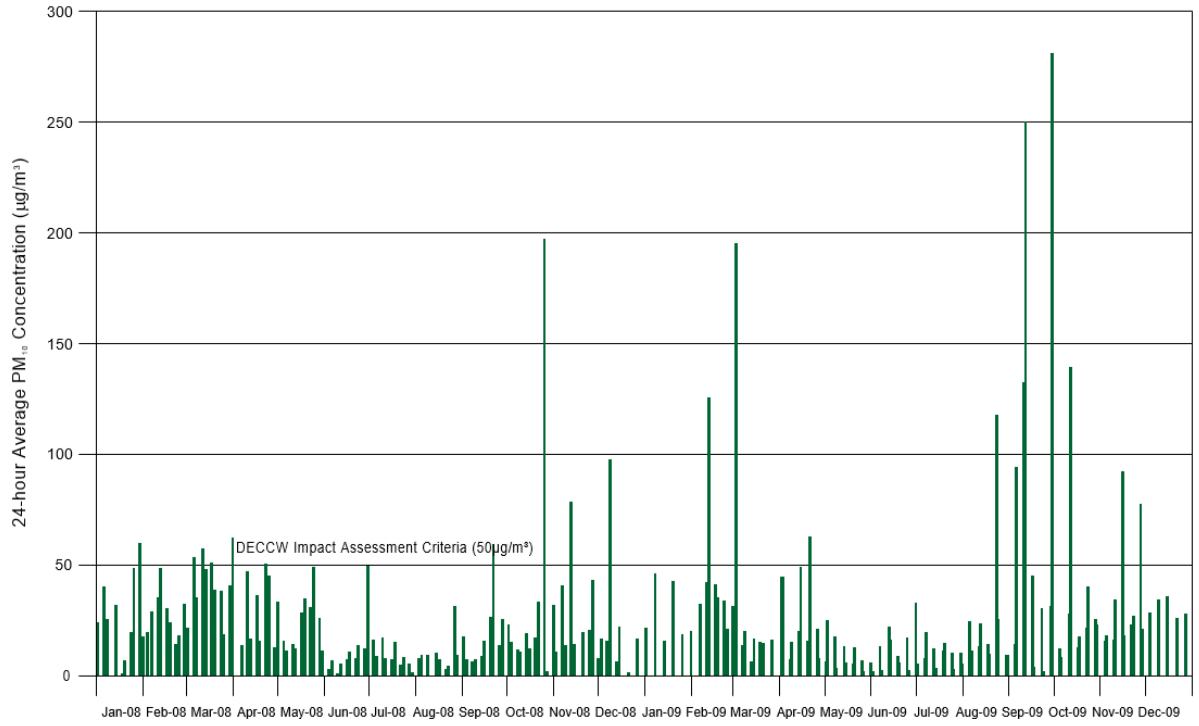


Figure D5: Constructed PM_{10} Concentration Dataset (January 2008 to December 2009) – Bemax PM_{10} and PM_{10} from BHOP HVAS TSP

Based on the constructed PM_{10} data set, daily average PM_{10} concentrations are given as ranging from about 1 µg/m³ to 280 µg/m³, with a period average concentration of 28 µg/m³ and a median value of 17 µg/m³. The EPA daily assessment criterion of 50 µg/m³ is estimated to be exceeded on about 10% of days (Figure D6).

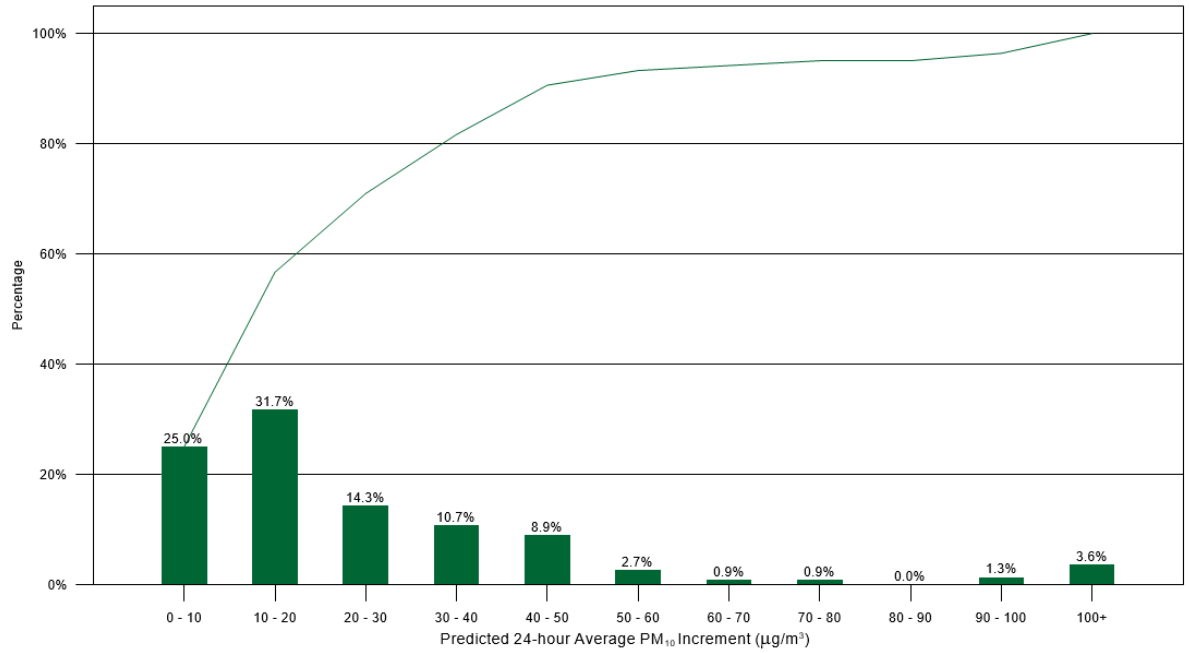


Figure D6: Distribution of Constructed PM_{10} Concentration (data set constructed from Bemax PM_{10} measurements and derived PM_{10} levels from BHOP HVAS TSP measurement) for January 2008 to December 2009

D7 Ambient $PM_{2.5}$ Concentrations

No site-specific $PM_{2.5}$ monitoring data were available for the Broken Hill region for reference.

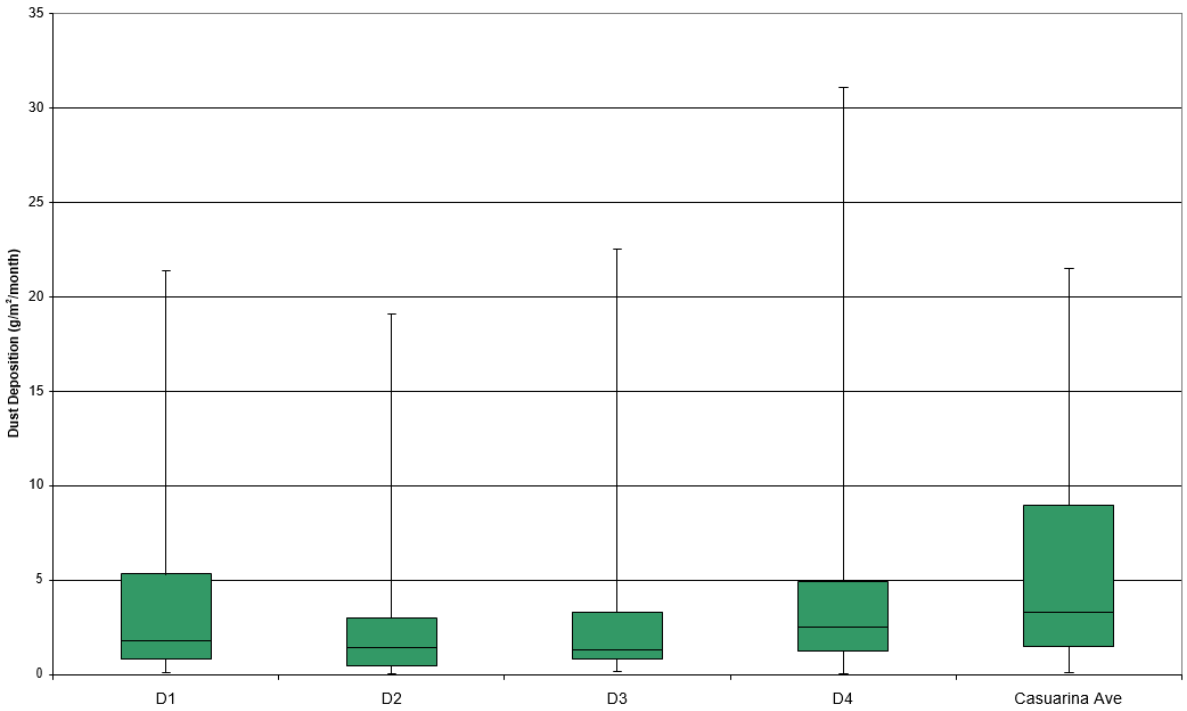
D8 Dust Deposition

Dust deposition is recorded at six separate locations by BHOP nominally on a 30 day +/- 2 day sampling period, as presented in **Figure D1**. All locations, with the exception of D5 which was established in December 2009, have recorded dust deposition rates since March 2007. D1 to D4 are situated at the Project Site, while the Casuarina Avenue sampling site is located to the south of the Project Site and represents a measure of ambient dust deposition away from significant influence of on-site emissions. Statistics for the five long term dust deposition monitoring locations are presented in **Table D4** with the associated box-and-whisker plot presented in **Figure D7**. Annual and period average dust deposition rates are presented in **Table D5**.

Dust deposition rates in the Broken Hill region are determined to be typically high based on the BHOP monitoring data, with annual averages recorded to range from 1.3 to 9.9 g/m^2/month across sites and years (2008, 2009). Of note is that dust deposition rates recorded at the Casuarina Avenue sampling site are typically higher than are measured at the BHOP site. This demonstrates the general dustiness of the Broken Hill region, likely to be due to regional scale wind entrainment.

Table D4 – Dust Deposition Statistics – March 2007 to December 2009					
Statistics	**Dust Deposition (g/m^2/month)**				
	D1	**D2**	**D3**	**D4**	**Casuarina Ave**
Mean	4.0	3.1	4.3	5.7	5.8
Standard Deviation	5.4	4.3	6.5	8.2	6.2
Median	1.8	1.4	1.3	2.5	3.3
Lower Quartile (25th Percentile)	0.8	0.5	0.8	1.2	1.5
Upper Quartile (75th Percentile)	5.3	3.0	3.3	4.9	9.0
Minimum	0.1	0.1	0.2	0.1	0.1
Maximum	21.4	19.1	22.5	31.1	21.5

Note: Result of 60.1 g/m^2/month recorded at D2 in October 2008 excluded as erroneous based oncorresponding samples at other locations.



Note: Horizontal lines of boxes indicate 25th percentile, 50th percentile (Median) and 75th percentileconcentrations for the dataset. Whiskers indicate the maxima and minima of the dataset.

Figure D7: Distribution of BHOP Dust Deposition Levels – March 2007 to December 2009

Table D5 – Dust Deposition – Annual and Period Averages					
Year	Dust Deposition (g/m^2/month)				
	D1	D2	D3	D4	Casuarina Ave
2007	2.1	2.3	2.2	2.3	2.6
2008	3.5	1.3	3.3	4.9	4.5
2009	6.0	5.2	7.0	9.4	9.9
Average	**3.9**	**2.9**	**4.2**	**5.6**	**5.6**

D9 Ambient Lead Concentrations

Ambient concentrations of lead (Pb) are recorded within the Project Area both through the TSP HVAS monitoring and dust deposition sampling and subsequent laboratory analysis. Measurements available for the May 2007 to December 2009 period are summarised in **Table D6** and illustrated as a time series in **Figure D8**.

Annual average suspended lead concentrations (in the TSP fraction) are of the order of 0.2 µg/m³, comprising about 40% of the EPA criterion of 0.5µg/m³. On average, Pb concentrations represent about 0.3% of total TSP concentrations. Typically lower Pb fractions are recorded to coincide with peak TSP concentrations, indicating the likelihood that such peaks are associated with more regional dust events (**Figure D8**).

Table D6 - Pb concentrations from TSP Monitoring – BHOP HVAS				
Period	**Average 24-hour Concentration**		**% Pb of TSP**	**Pb % of EPA Guideline Value**
	TSP (µg/m³)	**Pb (µg/m³)**		
2007 (May-Dec)	67.4	0.21	0.32	43
2008	47.8	0.14	0.30	28
2009	65.0	0.22	0.34	45
Average	59	0.19	0.32	38

Note: EPA Guideline – 0.5 (µg/m³)

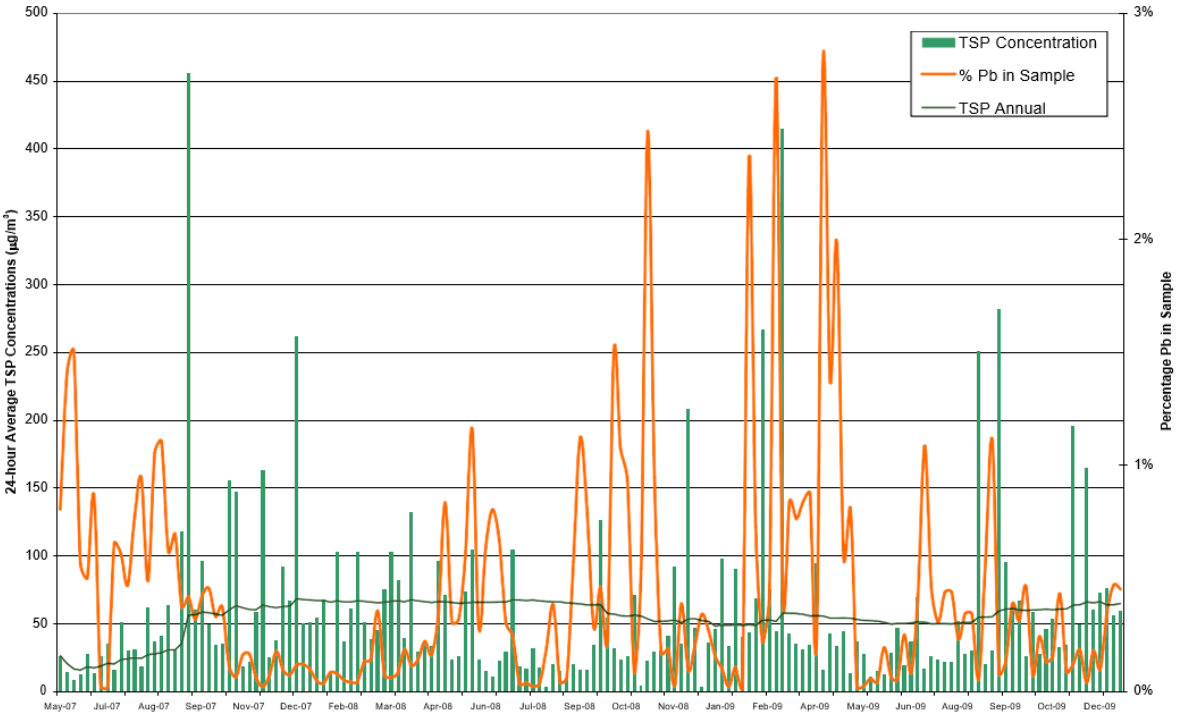


Figure D8: Percentage Lead Concentrations in 24-hour Average TSP Concentrations at BHOP HVAS – May 2007 to December 2009.

Insoluble Pb levels within the total dust deposition monitoring conducted, as reported by BHOP, are provided in **Table D7**. Pb constitutes on average 0.06% to 0.15% of the annual total dust deposition measured, with the lowest Pb content recorded for the Casuarina Avenue sampling location.

It is of note that the Pb content (~0.1%) of on-site deposited dust is lower than the 0.3% Pb content within suspended TSP concentrations.

Table D7 – Dust Deposition and Pb comparison – March 2007 to December 2009

Location	Average Dust Deposition (g/m^2/month)	Average Pb Deposition (g/m^2/month)	Percentage Pb to Dust Deposition (%)
D1	4.0	0.0034	0.09
D2	3.1	0.0045	0.15
D3	4.3	0.0046	0.11
D4	5.7	0.0060	0.11
Casuarina Ave	5.8	0.0036	0.06
Average	**4.6**	**0.0044**	**0.10**

D10 Ambient Levels of Other Metals/Metalloids

Other than lead, metals/metalloids of interest in the current study include: antimony, arsenic, barium, beryllium, cadmium, chromium, copper, manganese, mercury, nickel, silver and zinc.

No measurements are however available for ambient air concentrations or deposition rates of metals other than lead. In order to provide more comprehensive information regarding background levels of metals of interest in the study, BHOP site emissions from exposed free surface areas were estimated and modelled within the Rasp Mine Air Quality Assessment. Baseline levels of other metals/metalloids,as derived through modelling, are presented within the Health Risk Assessment for the Rasp Mine.

Air Quality Assessment for the Rasp Mine 2017

(Rasp Mine-Environment Assessment, Modification 4 Concrete Batching Plant/Blackwood Pit TSF2 Extension)

Dust may be generated during construction of the CBP and TSF2 extension from earthworks, plant construction, rockfill material placement and on-site road traffic.

During operations of the CBP dust may be generated from vehicle traffic and aggregate loading/unloading to storage point, dumping aggregate into hopper, and mixing of materials. Operation of the TSF2 largely involves pumping tailings in slurry form into TSF2 and waste water from the decant pond located with TSF2 to the Processing Plant for reuse. Some drying of tailings may occur as the deposition heads towards decommissioning and the level of tailings rises closer to the surface.

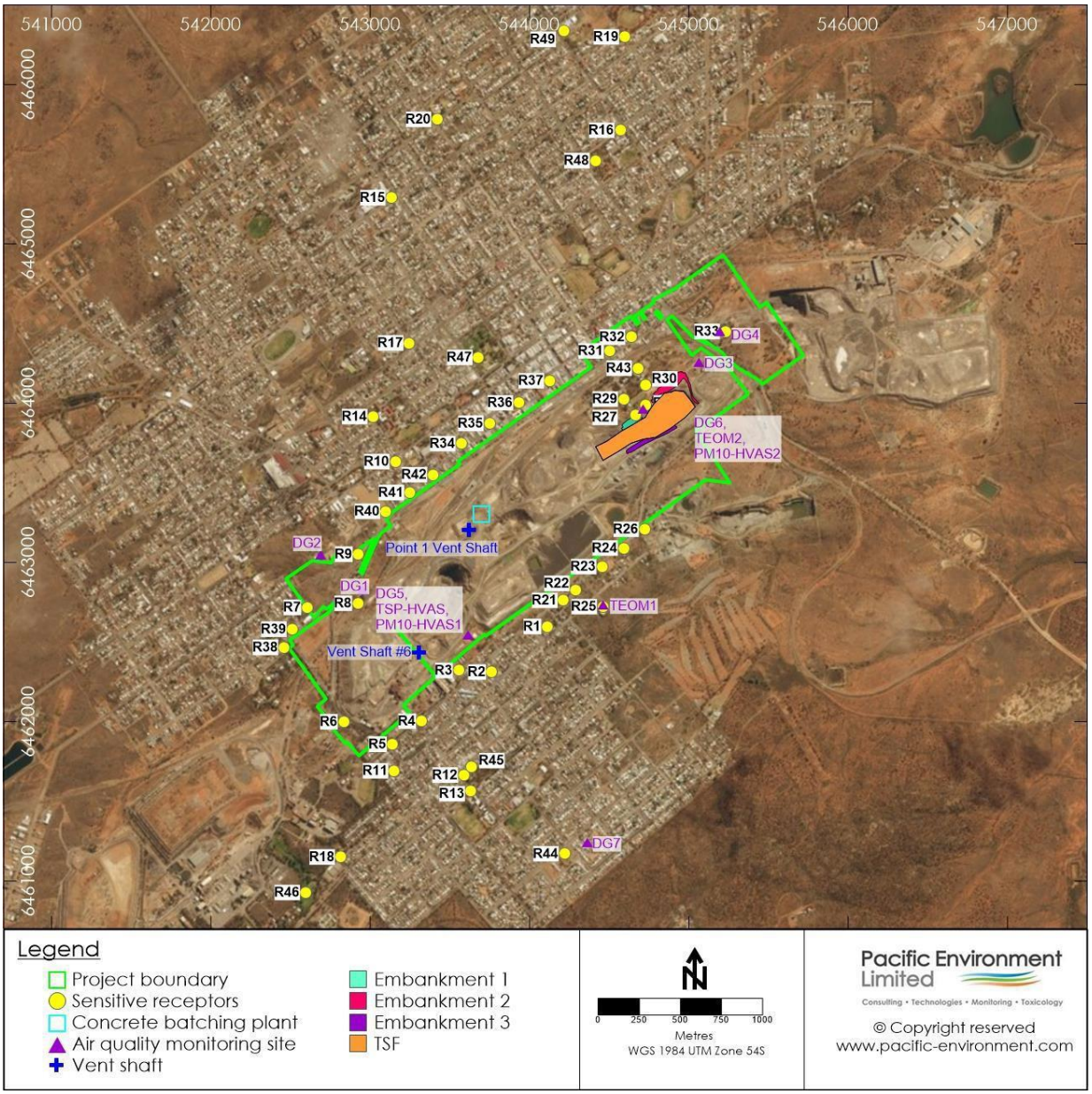
Pacific Environment Ltd (PEL) was engaged to complete an Air Quality Assessment for the Rasp Mine Rasp Mine Modification 4, March 2017 (AQIA) (Appendix I) for the construction and operation of a CBP and of the TSF2 extension. The AQIA included:

- Review of current air quality modelling to determine current background and current mine works contribution (2016 was chosen as the model year), with a review of emissions inventories and meteorological data;
- Atmospheric dispersion modelling for the worst case emissions scenario (cumulative assessment of current operations, including TSF at both normal and upset conditions);
- Comparison of the current mine works (using 2016 as the base year of operations) with predicted incremental air quality predictions provided in the PPR;
- A cumulative assessment of all construction works with current operations;
- A cumulative assessment of the operations of the CBP with current operations;
- A qualitative assessment of the potential cumulative impacts with the Perilya's proposed Broken Hill North Mine Recommencement Project; and
- A Greenhouse Gas (GHG) assessment.
    - In addition PEL also completed field testing on the Mine Site to identify:
    - control efficiency (expressed as a percentage of uncontrolled conditions) of moisture and crusting in restricting particulate emissions from wind erosion; and
    - specific meteorological conditions under which wind erosion has the potential to occur.

Sensitive Receptors

The sensitive receptors (R1 to R42) from the original study (PPR) were supplemented with a further seven receptors, including the bowling green (R43) located in Proprietary Square and 6 additional playgrounds (R44 to 49). Receptor locations are depicted in Figure 10-2 and are described in the AQIA.

Figure 10-2 Sensitive Receptor Locations with Location of CBP and TSF2 Extension, and Rasp Mine Air Quality Monitoring Network



Summary of Impact Assessment Results

The AQIA identified the construction of Embankment 2 as the worst-case scenario and conducted dispersion modelling for this case with current operations including the operations of the CBP and TSF under both normal and upset conditions. The impact assessment compared the results against the NSW EPA criterion listed below (and reflected in the PA), as well as the predictions provided in the PRP. As there is no criterion for deposited lead these results were only compared to the results provided in the PPR.

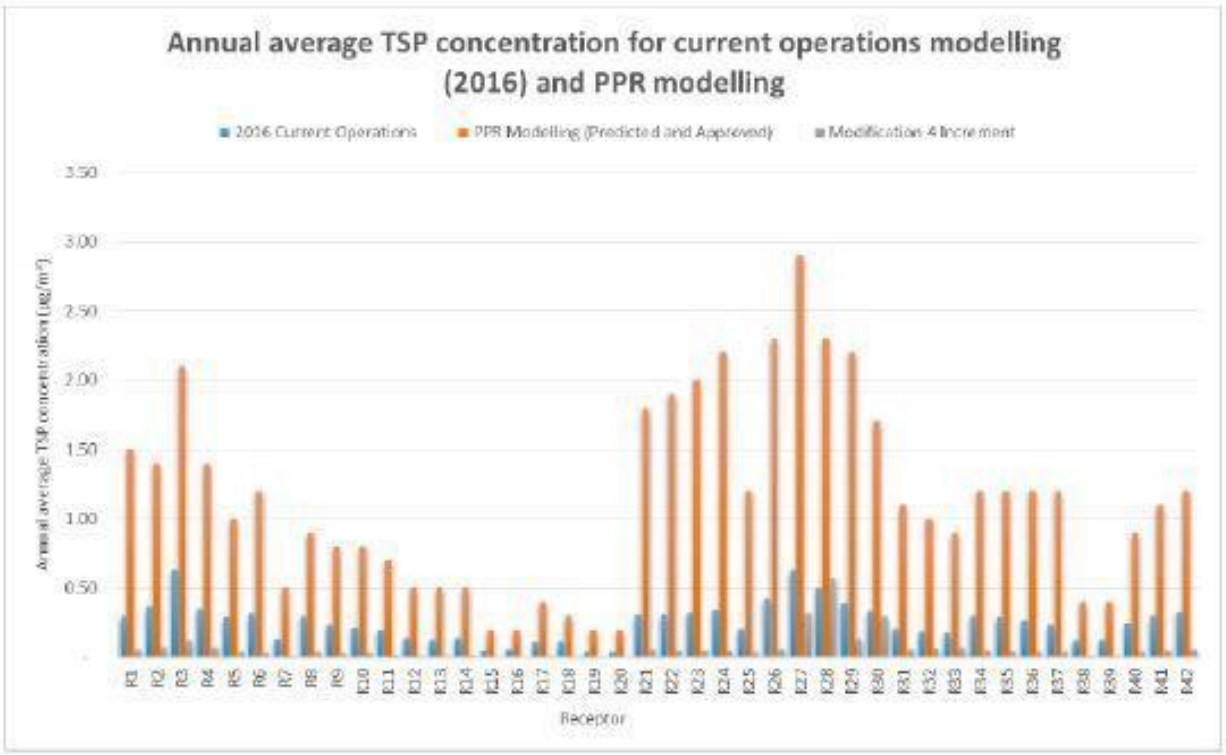
- Total suspended solids (TSP) (90 µg/m^3).
- Annual average lead (as part of TSP) (0.5 µg/m^3).
- Maximum 24 hour PM_{10} (50 µg/m^3).
- Annual average PM_{10} (25 µg/m^3) (PA criterion is 25 µg/m^3).
- Monthly average deposited dust (site increment 2 g/m^2/month, cumulative 4 g/m^2/month).
- Annual average lead dust deposition (compared to PPR predictions only).

In summary, the vast majority of receptors were below the applicable criteria and the original predictions in the PPR. The air quality modelling results are discussed in detail below.

Total Suspended Solids

The cumulative results for Total Suspended Solids (TSP) show that at all receptors, the predicted annual average TSP concentrations are well below the NSW impact assessment criterion of 90 µg/m^3 (refer to Figure 10-3). The highest predicted cumulative annual average TSP concentration is 36 µg/m^3, which was recorded from R28 and includes an incremental increase above current concentration levels of 0.53 µg/m^3. PEL concluded this would make negligible contributions to the PM exposure in the Broken Hill area. As shown in Figure 10-3, the results also indicated that TSP incremental concentrations are all below the predicted incremental levels provided in the PPR.

Figure 10-3 TSP Comparison of Current (Modelled) Operations 2016 and PPR Predictions

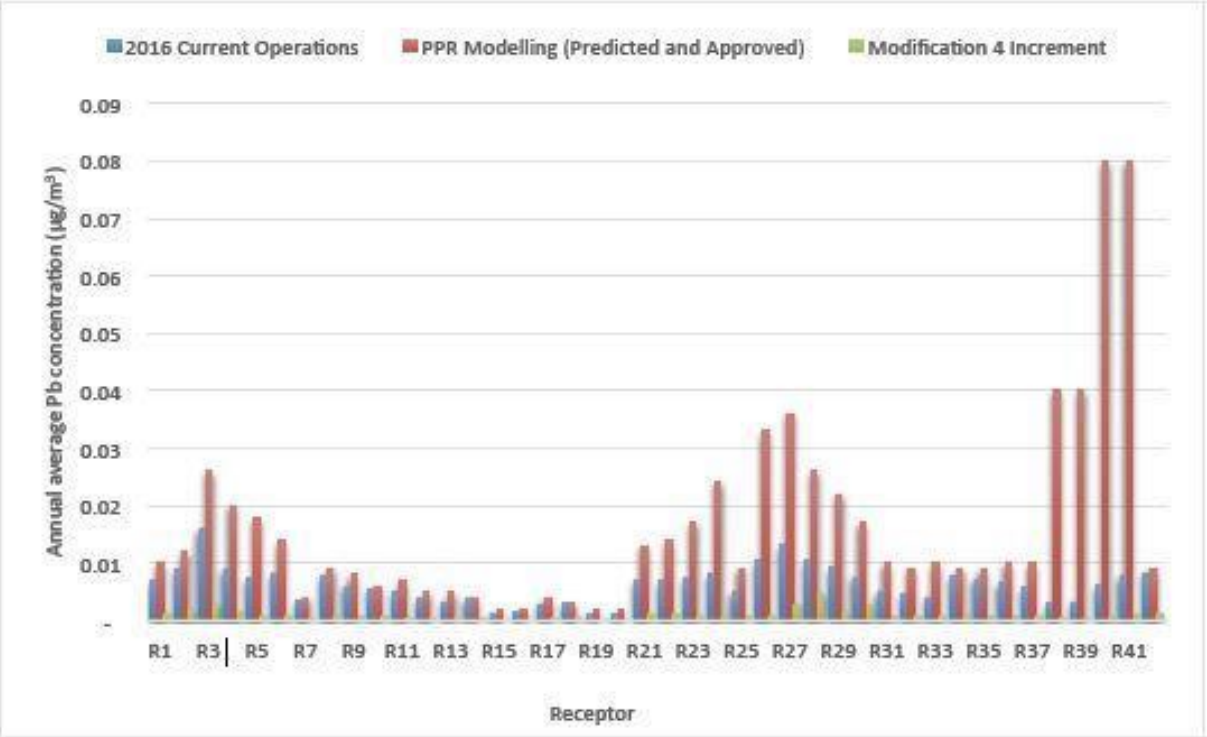


Annual Average Lead (as part of TSP)

The cumulative results for annual average lead (Pb dust) show that at all receptors, the predicted annual average Pb concentrations are well below the NSW impact assessment criterion of 0.5 µg/m^3 (refer to **Figure 10-4**). The highest predicted cumulative annual average Pb dust concentration is 0.24

µg/m^3, which was recorded from R2 and R3, and includes an incremental increase above current concentration levels of 0.0055 and 0.0080 µg/m^3, respectively. As shown in **Figure 10-4**, the results also indicated that annual average lead incremental concentrations are all below the predicted incremental levels provided in the PPR.

Figure 10-4 Annual Average Lead Comparison of Current (Modelled) Operations 2016 and PPR Predictions



Maximum 24-hour PM_{10}

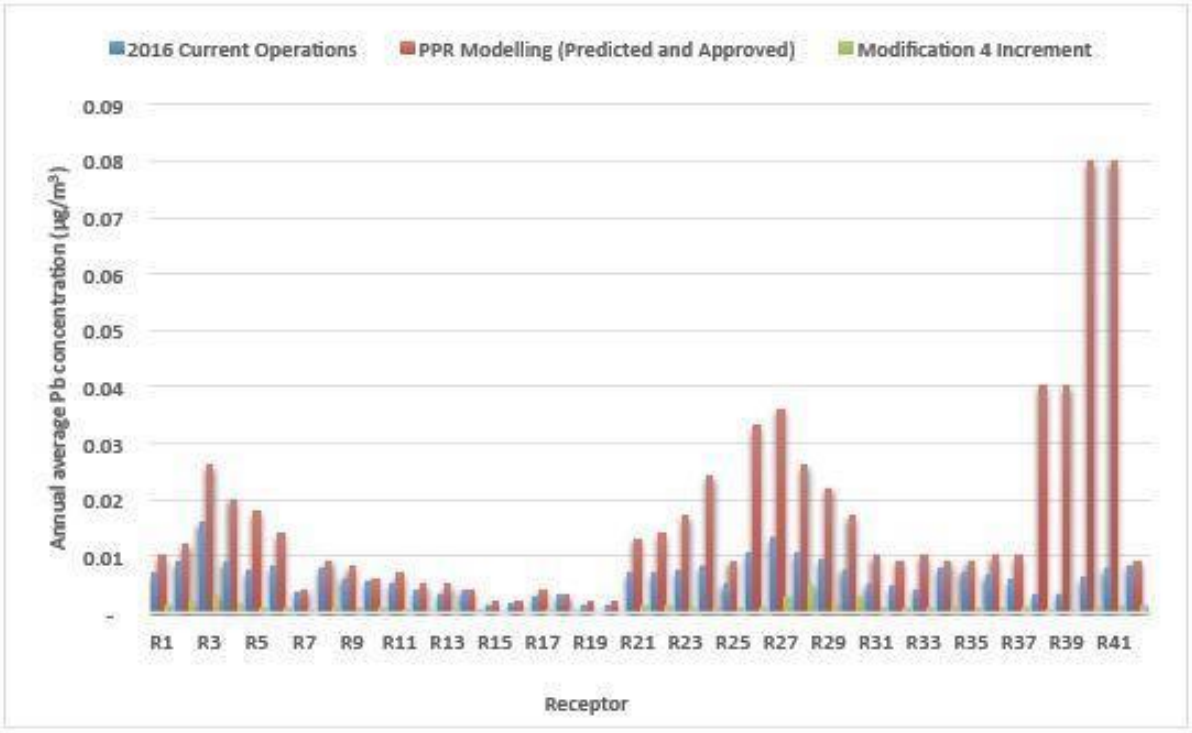
The cumulative results for maximum 24-hour PM_{10} show that at all receptors the predicted concentrations are well below the NSW impact assessment criterion of 50 µg/m^3 (refer to **Figure 10-5**). The highest predicted cumulative maximum 24-hour PM_{10} concentration is 46 µg/m^3, which includes incremental increases above current concentration levels ranging from 0.3 to 3.1 µg/m^3.

The comparison study of current operations 2016 with results predicted in the PPR found that in general, the maximum 24-hour average predictions are also below the PPR predicted increments. However there are several receptors where the predicted increment is marginally higher than the PPR predictions. These include a group of receptors close to the TSF Extension Embankments 1 and 2 (R27, R28, R29, R30 and R33) and a group of receptors located along Crystal Street (R34, R36, R37, R41 and R42).

PEL concluded that the major influence to these changes are anticipated to be as a result of different meteorological files being used, where the 2016 current operations modelling adopted calendar year 2016 observations, while the PPR adopted 2008/2009 and therefore the 24-hour predictions will not always align with the annual results.

Other factors which may have influenced these results include the change in source configuration where the Primary Ventilation Shaft has been relocated and Ventilation Shaft No. 6 has been added. The 2016 current operations modelling also references site-specific data (e.g. empirically derived control factors and materials samples) in derivation of the emission inventory.

Figure 10-5 Maximum 24-hour PM_{10} Comparison of Current (Modelled) Operations 2016 and PPR Predictions



Annual Average PM_{10}

The cumulative results for annual average PM_{10} show that at all receptors, the predicted annual average concentrations are well below the NSW impact assessment criterion of 25 µg/m^3 (PEL compared results against the new EPA NSW criterion, the PA lists 30 µg/m^3 criteria) (refer to **Figure 10-6**). The highest predicted cumulative annual average PM_{10} concentration is 13 µg/m^3 recorded at all receptors. This includes incremental increases above current concentration levels ranging from <0.01 to 0.19 µg/m^3.

As shown in **Figure 10-6**, the results also indicated that annual average PM_{10} incremental concentrations are all below the predicted incremental levels provided in the PPR, with the exception of R17 which shows a negligible increase (0.011 µg/m^3).

Monthly Average Deposited Dust

The results for monthly average deposited dust (DD) show that at all receptors, the predicted dust deposition concentrations are well below both of the NSW impact assessment criterion of 2 g/m^2/month and cumulative 4 g/m^2/month (refer to **Figure 10-7**). The highest predicted cumulative monthly average deposited dust concentration is 2.8 µg/m^3 recorded from R27, R28 and R30 and R3, and includes incremental increases above current concentration levels of 0.08 and 0.15 g/m^2/month. As shown in **Figure 10-7**, monthly average dust deposition incremental concentrations are all belowthe predicted incremental levels provided in the PPR.

Annual Average Lead Dust Deposition

There is no NSW EPA criterion for lead deposition. The highest cumulative annual average Pb deposition level predicted for MOD4 is 0.053 g/m^2/year recorded at R3 which includes an incremental increase of 0.028 g/m2/year (refer to **Figure 10-8**). As shown in **Figure 10-8**, annual average lead deposition incremental concentrations are all below the predicted incremental levels provided in the PPR.

Figure 10-6 Annual Average PM_{10} Comparison of Current (Modelled) Operations 2016 and PPR Predictions

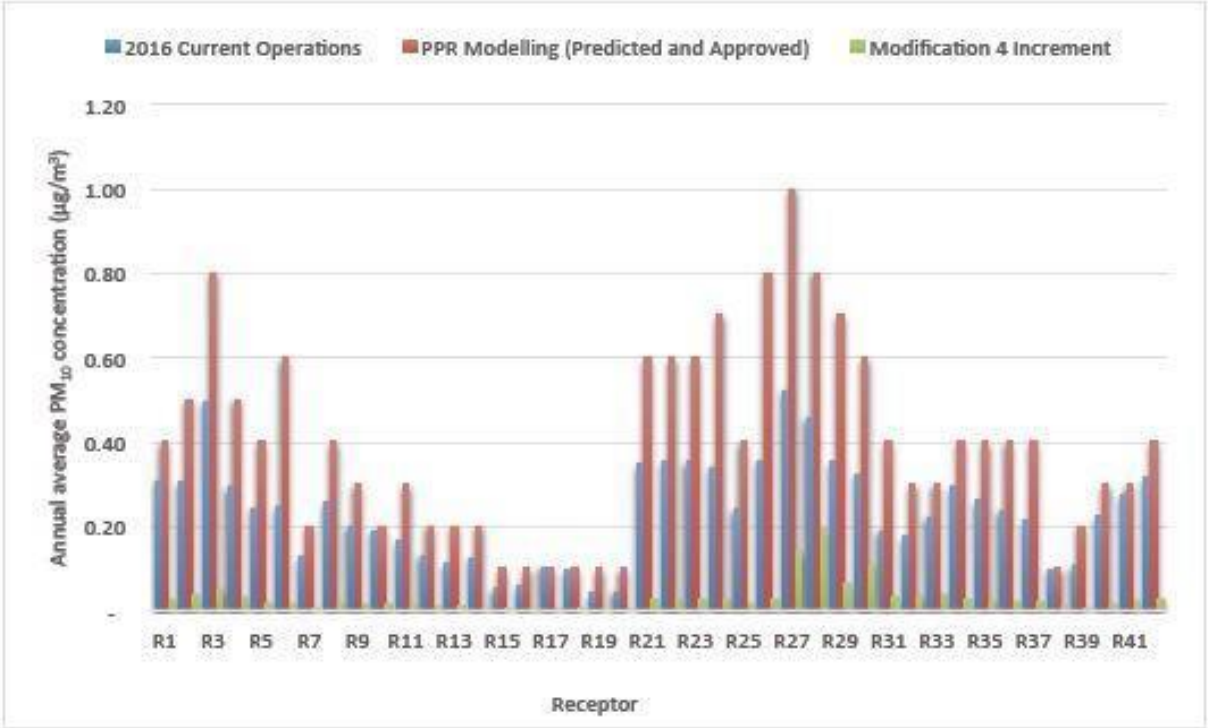


Figure 10-7 Monthly Average Dust Deposition Comparison of Current (Modelled) Operations 2016 and PPR Predictions

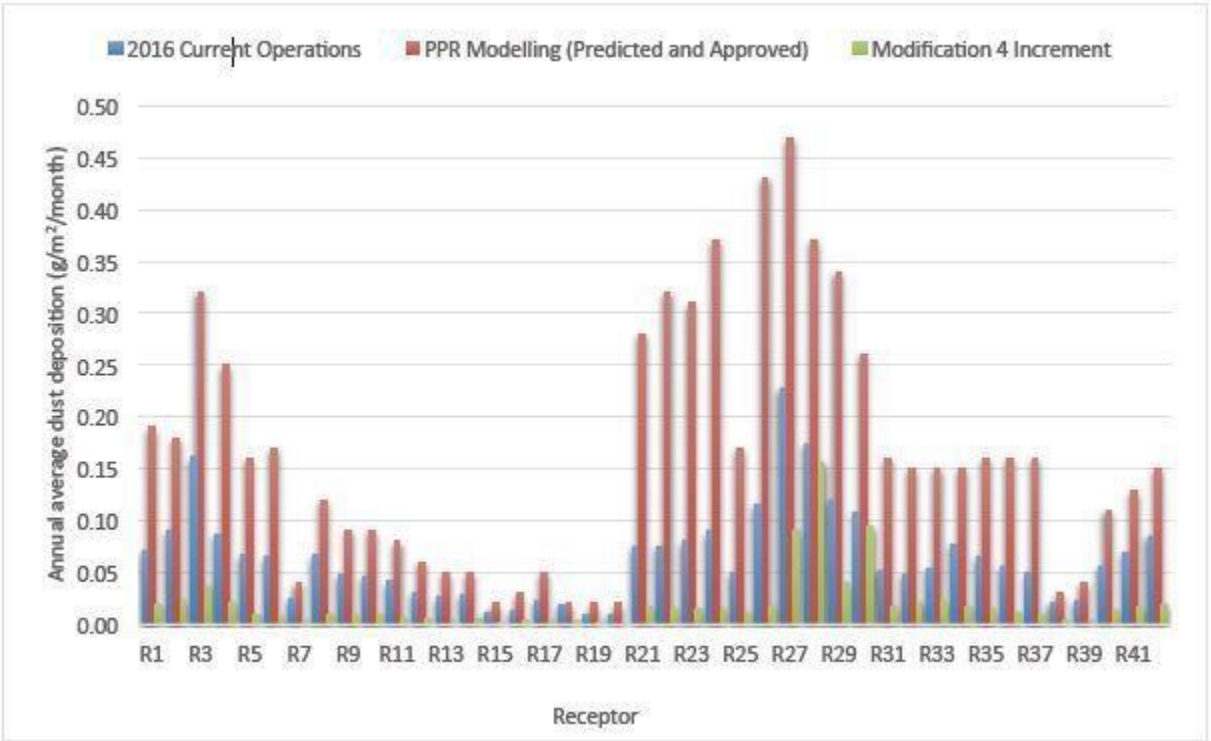
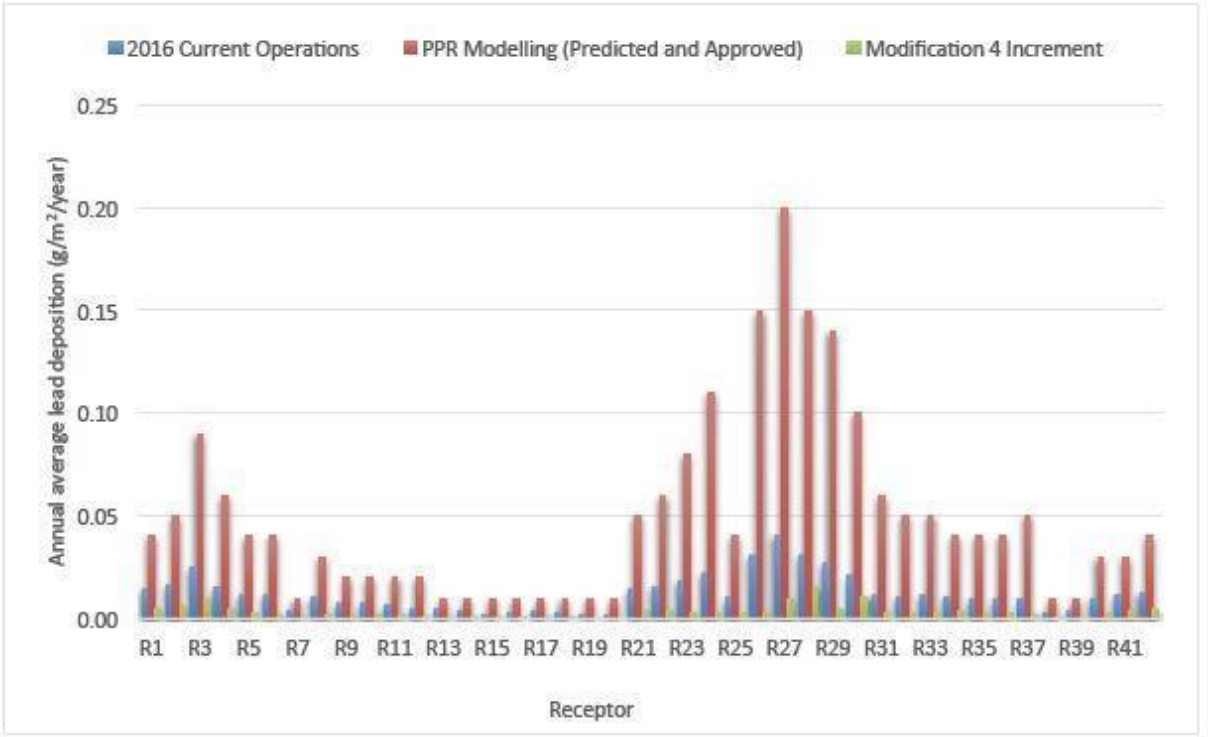


Figure 10-8 Annual Average Lead Dust Deposition Comparison of- Current (Modelled) Operations 2016 and PPR Predictions



Summary of Cumulative Impact Assessment Results

PEL completed a cumulative assessment of proposed construction and operation of the CBP and TSF2 extension with Perilya's proposed Broken Hill North Mine Recommencement Project (SSD 7538) .The Broken Hill North Mine is located to the north-east of Rasp Mine and therefore PM emissions from thissource would have the potential to result in cumulative impacts when combined with predictions associated with the Rasp Mine Modification.

PEL noted that there are eight receptors that align with those used in Broken Hill North Mine air quality assessment such that impacts can be evaluated cumulatively. These receptors comprise R2, R11, R17, R18 R23, R24, R32 and R43 from the Rasp Mine (refer to Figure 10-2).

PEL conclude that for all of the air quality metrics assessed (including annual average and maximum 24-hour predictions for PM_{10} and $PM_{2.5}$, annual results for TSP, dust deposition and lead concentration) the cumulative results that combine emissions from Rasp Mine's existing operations, the proposed Modification, the proposed Broken Hill North Mine Recommencement Project and contributions from other background sources are all below the NSW impact assessment criteria at the nominated co-located receptors. PEL also highlighted that the Modification construction is only scheduled to occur over a short period (ie. 14 months).

Without additional knowledge as to the Broken Hill North Mine's proposed scheduling and development consent pathway, it should further be acknowledged that the two activities may or may not be undertaken at the same time, and as such the above discussion of cumulative impacts shouldbe regarded as worst-case.

Greenhouse Gas (GHG) Assessment Results

PEL's AQIA also considered the potential increase in GHG emissions as a result of the Modification. The World Resources Institute / World Business Council for Sustainable Development Greenhouse Gas

Protocol (the GHG Protocol) originally documented the different scopes for GHG emission inventories.

The GHG Protocol is the most widely used international accounting tool for government and business leaders to understand, quantify, and manage greenhouse gas emissions. This corporate accounting and reporting standard is endorsed by the Australian Department of Climate Change and Energy Efficiency.

The GHG Protocol defines three scopes for developing inventories leading to reporting of emissions. These scopes help to delineate direct and indirect emission sources, improve transparency, and provide a degree of flexibility for individual organisations to report based on their organisational structure, business activities and business goals.

Three scopes of emissions are defined in the GHG Protocol:

- 'Scope 1' emissions: direct GHG emissions occurring from sources owned or controlled by the company – for example vehicle fleet and direct fuel combustion. Any negative emissions (sequestration), for example from a plantation owned by the entity, would also be included in Scope 1.
- 'Scope 2' emissions: indirect GHG emissions from purchasing electricity or heat from other parties; and
- 'Scope 3' emissions: indirect emissions which occur due to the company's business activities, but from sources not owned or controlled by the company - for example emissions from employee business-related air travel.

Scope 1, 2 and 3 greenhouse gas emissions were quantified as part of the EA. The proposed Modification would be limited to Scope 1 emissions from diesel combustion. PEL estimated the diesel fuel consumption for the modification to be approximately 350,000L of diesel fuel which equates to 0.9 $ktCO_2$-eq.

For the Rasp Mine Project in its entirety annual emissions of GHG (Scope 1 and 2) are estimated at

40.21 $ktCO_2$-e per year. This Modification would add an additional 2% loading, which is considered negligible.

Field Testing for Dust Control Efficiency

In addition to completing the AQIA, PEL completed field testing at the Mine site to identify the dust control efficiency and wind erosion / dust generating potential of various surface materials. Two testing methods were used, including (1) The Confined Air Burst Chamber (CABC) for measuring relative control efficiency; and (2) The USEPA AP-42 sieving method for determination of threshold friction velocity.

The Confined Air Burst Chamber (CABC) testing method was used to estimate either the relative dust emission potential of different surface types, or the effectiveness of measures for controlling dust on a given surface type (% Control Efficiency). A total of 52 CABC tests were conducted on various surfaces at the Mine. Results are summarised in **Table 10-5**.

Table 10-5 Results from Field Testing November 2016

Material Type	Control (%)
Dry Tailings – Crusted	99.7
Wet Tailings	100
Waste Rock Trial	99.7
Uncontrolled Free Areas – Crusted	96.6
Controlled Free Areas – 5 month old dust suppressant	98.9
Unsealed Road Areas - Crusted	90
Unsealed Road Areas – Fresh dust suppressant	99.2

The USEPA AP-42 sieving test method was used to for the determination of site-specific threshold friction velocities. A total of four sieve tests were conducted on tailings surfaces at TSF2. The results deriving the lift-off threshold wind speeds for tailings under various conditions are presented in Table 10-6.

Table 10-6 Results of USEPA Sieve Testing Rasp Mine November 2016

Sieve Test	Erosion Surface	Tyler Sieve Mode (opening – mm)	Lift-off Threshold Wind Speed (m/s)
1	Dry tailings	1	14.3
2	Dry fines in drainage gullies of the tailings	0.5	10.9
3	Wet tailings	>4	N/A
4	Dry tailings	1	14.3

Note wind speed 10 m above ground level.

PEL concluded that the results of the testing indicated that observed levels of moisture at TSF2 are adequate for operational dust control. For moist surfaces within TSF2, the CABC testing indicated 100% control efficiency, whilst the USEPA sieving method classified the material as being non-conducive to wind erosion. Dry, crusted areas were also observed to provide a high level of control (99.7%) relative to disturbed surfaces, equivalent to the proposed final waste rock cover.

The above conclusion assumes that crusted tailings remain undisturbed. On that basis, the use of waste rock cover is considered by PEL a more resilient and less readily disturbed surface for the long- term containment of TSF2 material after the point at which the TSF2 is no longer active.

The field testing results have been used by BHOP to inform future operational dust control measures for the TSF2, including:

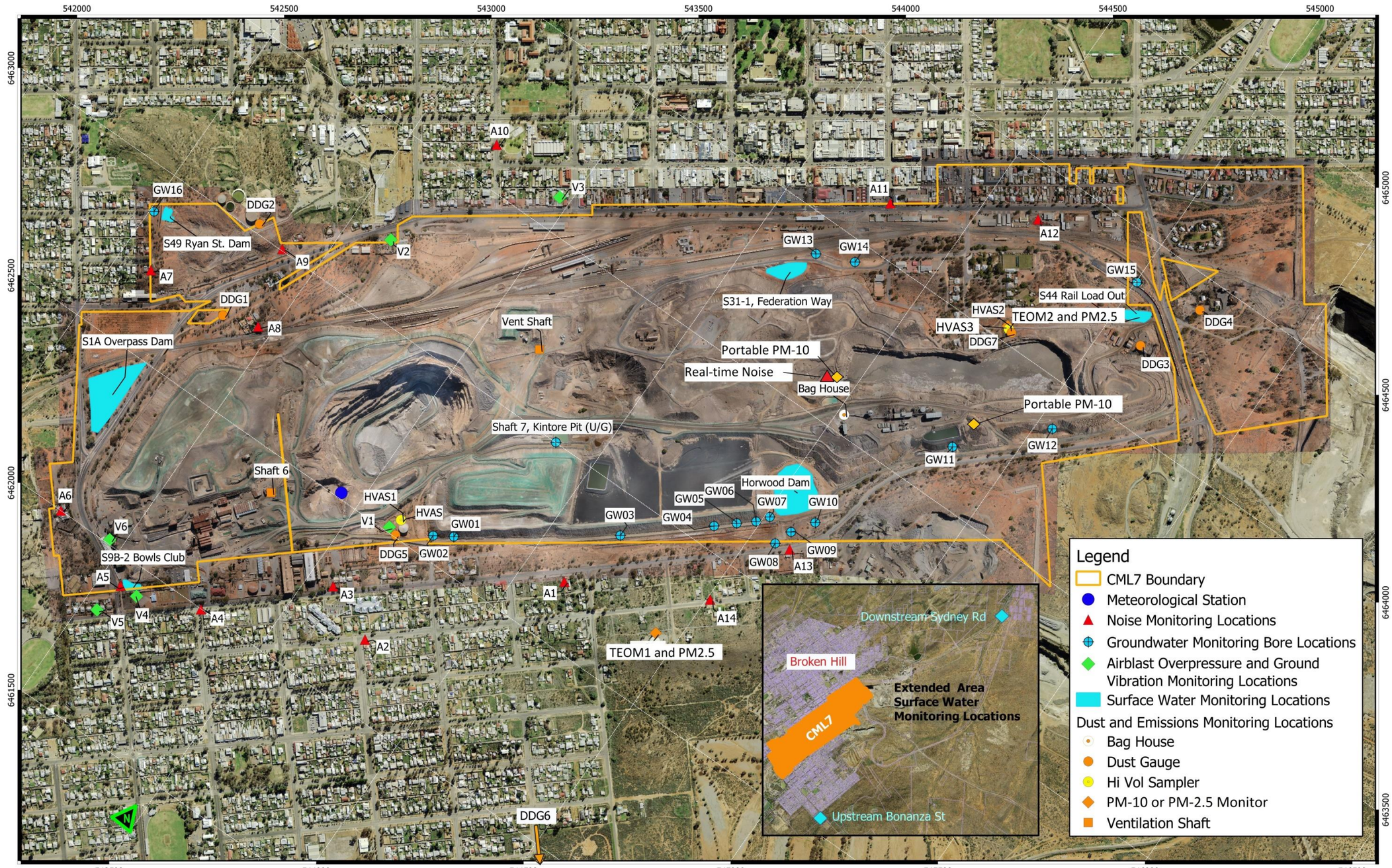
- Determining the threshold wind velocity for TSF2 material for alerts / alarms when combined with local wind speed observations.
- Selective use of dust suppressant in TSF2 spray system, which will aid control of the TSF2when used in the proposed TSF2 spray system, particularly at the end of the TSF's

operational life.

- Setting up alerts / alarms on existing instrumentation to inform the use of TSF2 spray system
- Setting alerts both for critical PM concentrations and wind velocities recorded in proximity to the TSF2 surface.

These dust control measures would be considered in the revision of the BHOP Air Quality Management Plan.

Appendix C
Monitoring Locations



Map of CML7 Environmental Monitoring Locations

Data Sources:
Aerial 25/04/2016 MGA54 10cm - CBH
Environmental Monitoring Locations and CML7 Boundary - CBH.
NSW Six Map Best Imagery © Department Finance, Services & Innovation 6/03/2018

File Reference: JMC-C003-002 V2
Date: 26/04/2018

Appendix F
Rasp Mine Risk Matrix

Broken Hill Operations Pty Ltd – RASP Mine

Risk Ranking Matrix

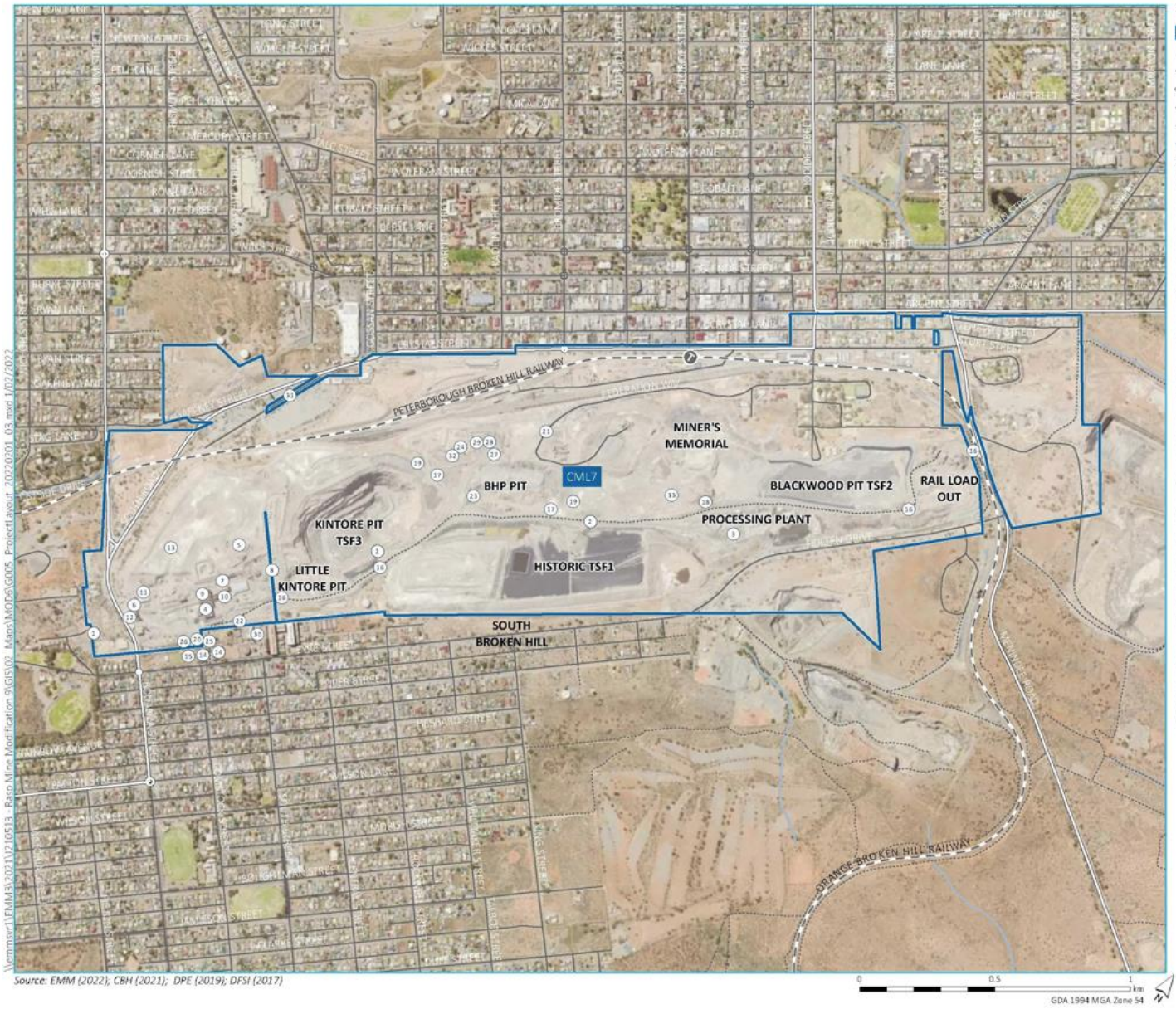
BHO-FRM-SAF-004

Likelihood	Consequence				
	1- Minor	2 - Moderate	3 - Significant	4 - Major	5 - Catastrophic
A - Almost Certain	Medium 11	High 16	Extreme 20	Extreme 23	Extreme 25
B - Likely	Medium 7	Medium 12	High 17	Extreme 21	Extreme 24
C - Possible	Low 4	Medium 8	Medium 13	High 18	Extreme 22
D - Unlikely	Low 2	Low 5	Medium 9	High 14	Extreme 19
E - Rare	Low 1	Low 3	Low 6	Medium 10	High 15

Likelihood	Likelihood description	Frequency guide
Almost Certain	Event will occur if controls are not implemented or there is a critical control failure.	Weekly
Likely	The event will probably occur if controls are not implemented or there is a critical control failure.	Monthly
Possible	The event may occur, would require multiple control failures.	Yearly
Unlikely	The event could occur, would require multiple control failures, and could only result in the specific consequence.	Once every 5+ years
Rare	The event is practically impossible or may only occur in exceptional circumstances. Requires a combination of circumstances and multiple system and control failures.	Once every 10+ years

CONSEQUENCE CATEGORIES					
Impact	Minor	Moderate	Significant	Major	Catastrophic
People	No Injury/report only	First Aid Injury	Medically Treated Injury or Illness (MTI) or Restricted Work Injury or Illness (RWI).	Lost Time Injury or Illness (LTI)	Fatality/Fatalities
Environment	Spill of substance on site 5 - 20 litres	Spill of substance on site 21 - 200 litres	Offsite release of substance that exceeds license criteria. Spill of substance on site greater than 200 litres.	Offsite release impacting residents, flora or fauna. Major damage to heritage item	Death of or severe impact to protected flora or fauna. Severe impact on community members. Destruction of Heritage item
Property	Damage or loss $0 - $5,000	Damage or loss $5,000 - $20,000	Damage or loss $20,000 - $200,000	Damage or loss $200,000 - $1,000,000	Damage or loss greater than $1,000,000
Business	Production loss 30 minutes - 2 hours.	Production loss of 2 - 12 hours.	Production loss of 12 hours - 1 week.	Production loss of 1 week - 1 month.	Production loss greater than 1 month.
Community Reputation	Single complaint. No impact to operations.	Single complaint with regulator involvement or some impact to operations.	Community complaints, Local council level/media exposure.	Community complaints with Regulator involvement. Prosecution State government level/media exposure.	Community complaints with Regulator involvement. Prosecution/litigation National level exposure

Appendix G
Approved Project Layout



KEY

- Broken Hill Operations mining lease
- Train station
- Rail line
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line

Project layout

1. CML7 boundary
2. Haul road (paved)
3. ROM pad
4. Old concentrator building (not used)
5. Old sand fill plant (not used)
6. Old No7 shaft (water pump)
7. Old No6 shaft (sealed)
8. Old No6 shaft (U/G intake air)
9. Electrical workshop
10. Maintenance workshop
11. Core shed
12. Old No7 underground offices (not used)
13. Telecommunications compound (not BHOP)
14. Administration offices
15. Former bowling green
16. Access road (paved)
17. Pipe corridor
18. Decant pond
19. 22kV power supply
20. Eyre St 22kV power supply
21. Federation Way access to Café and Miner's Memorial
22. Vehicle wash
23. Surface magazines
24. Primary ventilation exhaust rise
25. Change rooms and laundry
26. Car park
27. Backfill plant
28. Cement silo
29. Concrete batching plant
30. Extension to warehouse
31. Sublease region with Perilya
32. Surface escape ladderway
33. Box cut location

Source: EMM (2022); CBH (2021); DPE (2019); DFSI (2017)

\\emmsvr1\EMM43\2021\210513 - Rasp Mine Modification 9\GIS\02 - Maps\MOD6\G005 - Project layout - 20220201 - 03.mxd 1/02/2022

Project layout

Rasp Mine

EMM
creating opportunities