AIR QUALITY & GREENHOUSE GAS MANAGEMENT PLAN

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<th>Author</th>
<th>Authorised By</th>
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<td>R. Kellaghan (PAEHolmes)</td>
<td>Daniel Martin</td>
<td>November 2012</td>
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<td>R. Kellaghan (PAEHolmes)</td>
<td>Craig Simmons</td>
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1.0 INTRODUCTION

Maules Creek Coal Pty Ltd (MCC) is required to prepare an Air Quality and Greenhouse Gas Management Plan (AQGHGMP) for the Maules Creek Coal Mine (MCCM) in accordance with Project Approval (PA) 10_0138 (the approval) Schedule 3, Condition 34. The MCCM involves the development of a 21 year open cut coal mining operation and associated infrastructure (see Figure 1).

1.1 Background

The ownership of the Project currently lies with the Maules Creek Coal Joint Venture (MCCJV), which is 75% owned by Aston Coal 2 Pty Limited (a company 100% owned by Whitehaven Coal), 15% owned by Itochu Coal Resources Australia Maules Creek Pty Ltd (ICRA MC) and 10% owned by J-Power Australia (J-Power).

The Project is an open-cut coal mine located on the northwest slopes and plains of NSW in the Gunnedah Coal basin.

Land-use in the local area is a combination of agricultural operations and open cut mining, with rural residential holdings mainly located to the north and west of the Project. The Project Boundary is situated on land largely occupied by the Leard State Forest (which has historically been predominantly utilised for forestry, recreation and more recently mining related activities). Various coal mines exist within close proximity to the Project including Boggabri Coal Mine, Tarrawonga Coal Mine and Goonbri Exploration Lease located to the southeast of the Project Boundary.

There are a number of isolated rural residences associated with the surrounding farms within the vicinity of the Project, as well as the Fairfax Public School located in the Maules Creek Village (see Figure 1). The surrounding terrain is gently undulating in the north, with steeper slopes emerging near ridgelines towards the central portion of the Project. Much of the higher ground and steeper slopes retain moderately dense woodland cover, which forms part of the National Parks and State Forests occurring within the region.

MCC submitted a Project Application to the NSW Department of Planning and Environment (DP&E) (formerly Department of Planning and Infrastructure (DP&I)) in August 2010 for a new Project Approval under Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act) to enable the construction and operation of the MCCM. The application was supported by an Environmental Assessment (EA). PA 10_0138 (the approval) was granted on 23 October 2012 by the Planning Assessment Commission under delegation of the then Minister for Planning and Infrastructure.

The environmental approvals for the MCCM allow for the construction and operation of an open cut coal mine up to 2034. In particular, the approvals allow for the following aspects and activities:

- Open cut mining operation extracting up to 13 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal to the Templemore Seam;
- Open cut mining fleet including excavator / shovels and fleet of haul trucks, dozers, graders and water carts utilising up to 470 permanent employees;
- Coal Handling and Preparation Plant (CHPP) with a throughput capacity of 13 Mtpa ROM coal;
- Tailings Drying Area;
- Rail spur, rail loop, associated load out facility and connection to the Werris Creek to Mungindi Railway Line;
- Water Management infrastructure including a water pipeline, pumping station and associated infrastructure for access to water from the Namoi River;

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• Supporting power and communications infrastructure;
• Explosive magazine and storage areas;
• Mine Access Road; and
• Administration, workshop and related facilities.

A general layout of the Project is shown in Figure 1.

1.2 Scope

This AQGHGMP has been prepared in accordance with the requirements of the approval. The aim of this plan is to manage project specific and cumulative air quality and greenhouse gas emission impacts associated with the construction and operational phases of the Project. This AQGHGMP is a requirement of Schedule 3, Condition 34 of the approval.

1.3 Objectives

The purpose of this document is to:

• Address the requirements of the approval, in particular Schedule 3, Condition 34 “Air Quality and Greenhouse Gas Management Plan”;
• Ensure that all relevant statutory requirements in relation to air quality and GHG emissions are met during the operation of the Project;
• Provide Preventative Air Quality Management Measures to be implemented on a daily basis;
• Outline the Corrective Air Quality Management Measures implemented in the event of elevated dust levels from the operations;
• Ensure that air quality monitoring is utilised proactively and reactively to ensure compliance with the relevant criteria;
• Describe the Predictive and Real-Time Air Quality Management System and Cumulative Air Quality Management Strategy;
• Outline the roles and responsibilities for air quality and GHG management onsite; and
• Outline the reporting requirements.

The AQGHGMP forms part of the MCCM Environmental Management Strategy (EMS). It will form the basis behind the management of air quality and GHG emissions at the MCCM operation.
Figure 1  Project Layout
1.4 Baseline Data

An automatic weather station (AWS) was installed on the western edge of the Project Boundary on 14 May 2010, in accordance with the Approved Methods for the Sampling and Analysis of Air Pollutants in NSW guideline (NSW DEC 2005a), and in general accordance with condition 35 (a) of the approval. The monitoring site and instrumentation is in compliance with Australian Standard (AS) 2923 – 1987: “Ambient Air Guide for the measurement of horizontal wind for air quality applications”. The parameters measured by the AWS are presented in Table 1.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Frequency</th>
<th>Averaging Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rainfall</td>
<td>mm</td>
<td>Continuous</td>
<td>1 hour</td>
</tr>
<tr>
<td>Temperature @ 2m</td>
<td>°C</td>
<td>15 Minute</td>
<td></td>
</tr>
<tr>
<td>Temperature @ 10m</td>
<td>°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wind Speed @ 10 m</td>
<td>m/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wind Direction @ 10 m</td>
<td>Degrees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sigma Theta</td>
<td>Degrees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solar Radiation</td>
<td>W/m2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The AWS records sigma theta which can be subsequently used to derive stability class and inversion strength in accordance with the NSW Industrial Noise Policy (as required by condition 35 (b)).

On an annual basis, the most common winds are from the southeast and northwest quadrants. During summer and autumn winds from the southeast are dominant. During winter and spring, winds most commonly occur from the southeast and west-northwest.

Baseline air quality monitoring for the Maules Creek Coal Project commenced in 2010. A network of three dust deposition gauges (DDGs) was installed in August 2010 with an additional DDG installed in December 2010. The annual average dust deposition monitoring data are presented in Table 2 prior to commencement of Project construction.

Baseline dust deposition monitoring is generally below the air quality goals. The exception is 2010 when MC03 recorded 4.6 g/m²/month. The results presented for 2010 at MC03 are based on only 3 months of monitoring, and therefore not representative of a true annual average.

A PM₁₀ High Volume Air Sampler (HVAS) commenced monitoring in October 2010, and run on a one day in six cycle. The annual average PM₁₀ are shown in Table 3.
Table 2: Dust Deposition Monitoring

<table>
<thead>
<tr>
<th>Year</th>
<th>PM$_{10}$ Concentration (µg/m$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>9.9</td>
</tr>
<tr>
<td>2011</td>
<td>13.2</td>
</tr>
<tr>
<td>2012</td>
<td>11.3</td>
</tr>
<tr>
<td>2013</td>
<td>16.2</td>
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</tbody>
</table>

Table 2 Annual Average PM$_{10}$ (HVAS)

<table>
<thead>
<tr>
<th>Year</th>
<th>PM$_{10}$ Concentration (µg/m$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>9.9</td>
</tr>
<tr>
<td>2011</td>
<td>13.2</td>
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<tr>
<td>2012</td>
<td>11.3</td>
</tr>
<tr>
<td>2013</td>
<td>16.2</td>
</tr>
</tbody>
</table>

Table 3: Annual Average PM$_{2.5}$ and PM$_{10}$ (TEOM)

<table>
<thead>
<tr>
<th>Year</th>
<th>PM$_{2.5}$ Concentration (µg/m$^3$)</th>
<th>PM$_{10}$ Concentration (µg/m$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>3.7</td>
<td>7.4</td>
</tr>
<tr>
<td>2012</td>
<td>2.9</td>
<td>6.7</td>
</tr>
<tr>
<td>2013</td>
<td>2.0</td>
<td>5.7</td>
</tr>
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</table>
1.5 Structure of the Air Quality Management Plan

Key areas of the AQGHG are outlined in Table 4.

Table 4 Key Areas of his AQGHGMP

<table>
<thead>
<tr>
<th>Key Information</th>
<th>Relevant Section</th>
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<tbody>
<tr>
<td>Approval Conditions and Compliance Criteria</td>
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<td>Air Quality Management Measures</td>
<td>Section 3.0</td>
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<tr>
<td>Predictive and Real-Time Air Quality Management System</td>
<td>Section 5.2</td>
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<td>Blast Fume Management and Monitoring</td>
<td>Section 1.6.4</td>
</tr>
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<td>Monitoring Requirements</td>
<td>Section 5.0</td>
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<td>GHG Emissions</td>
<td>Section 4.0</td>
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<tr>
<td>Reporting</td>
<td>Section 8.0</td>
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<tr>
<td>Roles and Responsibilities</td>
<td>Section 10.0</td>
</tr>
</tbody>
</table>

1.6 Sources of Emissions to Air

Dust emissions are generally considered in three separate size fractions. These are described as total suspended particulate matter (TSP), particulate matter with equivalent aerodynamic diameter 10 \( \mu m \) or less (PM\(_{10}\)) and particles with equivalent aerodynamic diameter of 2.5 \( \mu m \) or less (PM\(_{2.5}\)). Emissions of fugitive dust from mining activity will comprise of mostly coarse particle size fractions, in the PM\(_{10}\) and TSP range (SPCC, 1986).

1.6.1 Dust Emissions

The principal activities associated with mining operations that may generate dust emissions include:

- Construction activities;
- Vehicles travelling on unsealed local roads;
- Clearing of vegetation;
- Topsoil and subsoil stripping and stockpiling;
- Spreading topsoil on rehabilitation areas;
- Drilling and blasting to support mining activities;
- Loading and unloading of coal and overburden material during mining operations;
- Loading, transporting and unloading of coal by truck or conveyor;
- Operation of the CHPP, associated product coal stockpile and rail loadout facility;
- Movement of vehicles along haul routes and other areas, both paved and unpaved roads within the mine;
- Bulldozer and grader activity within the open cut, on haul roads, on overburden emplacements and during rehabilitation-related activities; and
- Wind erosion from all open disturbed surfaces and stockpiles.

The majority of these activities may occur 24 hours per day, with the exception of during shift changes / breaks. Wind erosion can occur at any time, however would generally be limited to periods of moderate to strong winds.
although this is dependent on the material properties (i.e. type of material, moisture content and threshold friction velocity).

1.6.2 GHG Emissions

The main sources of GHG emissions that are under the control of MCCM and considered in the AQGHGMP are:

- Fuel consumption (diesel) during mining operations – Scope 1;
- Release of fugitive methane (CH₄) from the mining of coal seams – Scope 1; and
- Indirect emissions resulting from the MCCM’s consumption and use of purchased electricity - Scope 2.

1.6.3 Spontaneous Combustion

Spontaneous combustion events have the potential to give rise to odour impacts. Spontaneous combustion is a low risk at MCCM with material identification and information obtained during the project life to date. Management and mitigation measures to reduce the potential for spontaneous combustion events include:

- Identification of potential self-heating coal seams; and
- Placement of inert material over areas where known self-heating seams would otherwise be exposed.

1.6.4 Blast Fume

In addition to the generation of dust emissions, blasting can generate oxides of nitrogen (NOₓ) together with other gases as by-products of ammonium nitrate based explosives. NOₓ fumes generated during blasting can manifest as yellow to dark red clouds, the colour depending on the concentration of the gas.

The management of fume generation from blasting activities is described in the approved MCCM Blast Management Plan, with the potential for cumulative blast impacts described in the approved BTM Blast Management Strategy. The MCCM Blast Management Plan, which includes a Blast Fume Management Procedure, provides detailed management measures related to:

- Blast design;
- Drill and blast practices;
- Fume control;
- Blast scheduling;
- Cumulative blast management; and
- Blast monitoring, notification, complaint response, reporting and roles and responsibilities.

1.6.5 Vehicle Emissions

Vehicle exhaust emissions from equipment operated on site will result in emissions from diesel exhaust, including fine particulate matter (PM₂.₅), oxides of nitrogen (NOₓ), carbon monoxide (CO), sulphur dioxide (SO₂) and organic compounds.
2.0 STATUTORY REQUIREMENTS AND COMMITMENTS

This AQGHGMP has been prepared to fulfil the requirements of relevant legislation, approval conditions, Environment Protection Licence (EPL) conditions, EA commitments, and, relevant standards and guidelines.

2.1 Relevant Legislation

The Protection of the Environment Operations Act 1997 (POEO Act) is the principal piece of legislation governing air quality emissions in NSW. The POEO Act requires an EPL be held for mining operations such as MCCM and EPL 20221 was granted in 2013 for operations on site. The air quality and greenhouse gas management conditions, criteria and monitoring requirements from EPL 20221 are generally consistent with those in the approval (see Section 2.2).

2.1.1 Environment Protection Licence

From time to time the Environment Protection Authority (EPA) may modify the MCCM EPL to include Special Conditions, Pollution Reduction Programs and Environment Improvement Programs. Responses to these special conditions will be provided to the EPA in accordance with MCCM EPL requirements and relevant management plans will be updated as required.

2.2 Project Approval Conditions

2.2.1 Air Quality Criteria

The approval requires that all reasonable and feasible avoidance and mitigation measures are employed at MCCM so that particulate matter emissions generated by the project do not exceed the relevant criteria listed in Table 5 and Table 6 at any residence on privately-owned land or on more than 25 percent of any privately-owned land unless except under the applicable project approval conditions. The criteria are also applicable at any occupied residence on mine owned land, subject to the conditions outlined in Schedule 3, Conditions 30 - 31 of the approval.

If the air quality emissions generated by MCCM activities exceed or contribute to an exceedance of the criteria in Table 5 and Table 6 at any residence on privately-owned land or on more than 25 percent of any privately-owned land, then upon receiving a written request for acquisition from the landowner, MCC is required to acquire the land in accordance with the procedures outlined in the approval and described in Section 3.5.

Table 5 Air Quality Criteria (Particulate Matter)
### Table 6 Air Quality Criteria (Long Term, Deposited Dust)

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging period</th>
<th>Maximum increase in deposited dust level</th>
<th>Maximum total deposited dust level</th>
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</thead>
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<td>Deposited dust</td>
<td>Annual</td>
<td>*2 g/m²/month</td>
<td>*4 g/m²/month</td>
</tr>
</tbody>
</table>

Notes to Table 5:

- Total impact (i.e. incremental increase in concentrations due to the project plus background concentrations due to all other sources);
- Incremental impact (i.e. incremental increase in concentrations due to the project on its own);
- 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.
- Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents or any other activity agreed by the Secretary.

### 2.2.2 Air Quality and Greenhouse Gas Management Plan

An approval condition for the Project requires an AQGHGMP to be prepared for MCCM operations. This AQGHGMP has been developed in accordance with the Schedule 3, Condition 34 of the approval and other relevant conditions, as provided below in Table 7 and Table 8.

### Table 7 Air Quality and Greenhouse Gas Management Requirements

<table>
<thead>
<tr>
<th>Approval Condition</th>
<th>Relevant section of this AQGHGMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Conditions</td>
<td></td>
</tr>
<tr>
<td>33. The Proponent shall:</td>
<td>Section 3.0</td>
</tr>
<tr>
<td>(a) implement best management practice to minimise the off-site odour, fume and dust emissions of the project, including best practice coal loading and profiling and other measures to minimise dust emissions from coal transportation by rail;</td>
<td></td>
</tr>
<tr>
<td>(b) operate a comprehensive air quality management system on site that uses a combination of predictive meteorological forecasting, predictive and real time air dispersion modelling and real-time air quality monitoring data to guide the day to day planning of mining operations and implementation of both proactive and reactive air quality mitigation measures (such as relocate, modify, and/or suspend operations) to ensure compliance with the relevant conditions of this approval;</td>
<td>Section 5.0</td>
</tr>
<tr>
<td>(c) manage PM&lt;sub&gt;2.5&lt;/sub&gt; levels in accordance with any requirements of the EPL;</td>
<td>Section 5.0</td>
</tr>
</tbody>
</table>
Approval Condition | Relevant section of this AQGHGMP
--- | ---
(d) minimise the air quality impacts of the project during adverse meteorological conditions and extraordinary events; | Section 3.0
(e) minimise any visible off-site air pollution; | Section 3.0
(f) minimise the surface disturbance of the site generated by the project; and | Section 3.0
(g) co-ordinate the air quality management on site with the air quality management at other mines within the Leard Forest Mining Precinct to minimise the cumulative air quality impacts of the mines, to the satisfaction of the Secretary. | Section 3.3

### Air Quality and Greenhouse Gas Management Plan

34. The Proponent shall prepare and implement an Air Quality and Greenhouse Gas Management Plan for the project to the satisfaction of the Secretary. This plan must:

(a) be prepared in consultation with the EPA and be submitted to the Secretary for approval prior to the commencement of construction | Section 2.4

(b) describe the measures that would be implemented to ensure:
- best management practice is being employed;
- the air quality impacts of the project are minimised during adverse meteorological conditions and extraordinary events; and
- compliance with the relevant conditions of this consent. | Section 3.0

(c) describe the proposed air quality management system | Section 5.0

(d) include a risk/response matrix to codify mine operational responses to varying levels of risk resulting from weather conditions and specific mining activities | Section 5.2

(e) include commitments to provide summary reports and specific briefings at CCC meetings on issues arising from air quality monitoring | Section 8.4

(f) include an air quality monitoring program that:
- uses a combination of real-time monitors and supplementary monitors to evaluate the performance of the project;
- includes PM$_{2.5}$ monitoring;
- includes monitoring of occupied project-related residences and residences on air-affected land listed in Table 1 and Table 8 of PA 10_0138, subject to the agreement of the tenant and/or landowner;
- evaluates and reports on the effectiveness of the air quality management system;
- includes sufficient random audit of operational responses to the real time air quality management system to determine the ongoing effectiveness of these responses in maintaining the project within the within the relevant criteria in this Schedule and the requirements of conditions 29 and 30 above; and
- includes a protocol for determining any exceedances of the relevant conditions in this approval; and | Section 5.0

(g) includes a Leard Forest Mining Precinct Air Quality Management Strategy that has been prepared in consultation with other coal mines in the Precinct to minimise the cumulative air quality impacts of all mines within the Precinct, that includes:
- systems and processes to ensure that all mines are managed to achieve their air quality criteria;
- a shared environmental monitoring network and data sharing protocol;
- control monitoring site(s) to provide real time data on background air quality levels (ie not influenced by mining from the Leard Forest Mining Precinct and representative of regional air quality);
- a shared predictive and real time air dispersion model covering the Leard Forest Mining Precinct to be used for assessment of cumulative impacts, optimising location of the shared real time monitoring network, validation of air predictions and optimising mitigation measures; and
- procedures for identifying and apportioning the source/s and contribution/s to cumulative air impacts for both mines and other sources, using the air quality and meteorological monitoring network and appropriate investigative tools such as modelling of post incident plume dispersion, dual synchronised monitors and chemical methods of source apportionment (where possible). | Section 3.3
### Table 8 PA 10_0138 General Requirements

<table>
<thead>
<tr>
<th>Approval Condition</th>
<th>Relevant Section of this AQGHGMP</th>
</tr>
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<tbody>
<tr>
<td>Schedule 3 Condition 26. Control of offensive odour</td>
<td>Section 3.0</td>
</tr>
<tr>
<td>Schedule 3 Condition 27. Minimising Greenhouse Gas emissions</td>
<td>Section 4.0</td>
</tr>
<tr>
<td>Schedule 3 Condition 28. Additional air quality mitigation on request</td>
<td>Section 3.4</td>
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<td>Schedule 3 Condition 35. Meteorological Monitoring</td>
<td>Section 1.4</td>
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<td>Schedule 4 Condition 1-3. Notification of Landowners/Tenants</td>
<td>Section 3.5</td>
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<tr>
<td>Schedule 5 Condition 13. Online reporting</td>
<td>Section 8.0</td>
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</tbody>
</table>

#### 2.3 Relevant Standards & Guidelines

Standards and guidelines relevant to the preparation this AQGHGMP and the management of emissions from MCCM include the following:

- Approved methods for the sampling and analysis of air pollutants in NSW.
- Meteorological Monitoring Guidance for Regulatory Modelling Applications (USEPA 454/R-99-005);
- AS/NZS 3580.10.1:2003 Methods for sampling and analysis of ambient air - Determination of particulate matter - Deposited matter - Gravimetric method;
- AS/NZS 3580.9.6:2003 Methods for sampling and analysis of ambient air – Determination of suspended particulate Matter – PM10 - high volume air sampler with size selective inlet – gravimetric method;
- AS/NZS 3580.9.8 – 2008 Methods for sampling and analysis of ambient air; and
- National Environmental Protection Measure for Ambient Air Quality.

#### 2.4 Regulatory Consultation

As required under the approval, the AQGHGMP was prepared in consultation with the NSW Environment Protection Authority (EPA) and Department of Planning and Environment (DP&E).
3.0 AIR QUALITY MANAGEMENT MEASURES

3.1 Objectives and Performance Indicators

The key objectives and performance indicators for this AQGHGMP are generally in accordance with the operating conditions of the approval (see Section 2.2). A summary of these objectives and performance indicators are presented below in Table 9.

Table 9 AQGHG Objectives and Performance Indicators

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Requirement</th>
<th>Performance Indicator</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implement best management practice to minimise the off-site odour, fume and dust emissions of the project</td>
<td>No offensive odours emitted from the site.</td>
<td>Number of odour complaints received.</td>
<td>Zero complaints</td>
</tr>
<tr>
<td></td>
<td>No exceedance of the air quality criteria listed in the Approval.</td>
<td>Air quality monitoring data does not exceed impact assessment criteria.</td>
<td>Zero exceedances of criteria</td>
</tr>
<tr>
<td></td>
<td>No exceedance of the land acquisition criteria listed in the Approval.</td>
<td>Air quality monitoring data does not exceed land acquisition criteria.</td>
<td>Zero exceedances of criteria</td>
</tr>
<tr>
<td></td>
<td>Management measures in AQGHGMP are in line with established best management practices.</td>
<td>Dust management measures in place.</td>
<td>Dust management measures meet best practice or actions in place to address.</td>
</tr>
<tr>
<td></td>
<td>Minimise air quality complaints from the community.</td>
<td>Number of air quality complaints from the community.</td>
<td>Decrease number of complaints received over time.</td>
</tr>
<tr>
<td></td>
<td>Minimise visible off-site air pollution</td>
<td>Number of air quality complaints from the community.</td>
<td>Decrease number of complaints received over time.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monitoring results attributable to MCCM.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Minimise the surface disturbance</td>
<td>Actual surface disturbance in accordance with Mining Operations Plan (MOP).</td>
<td>No disturbance in addition to the areas identified in the approval and in the MOP.</td>
</tr>
</tbody>
</table>
### Objectives

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Requirement</th>
<th>Performance Indicator</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air quality management system includes predictive meteorological forecasting, predictive air dispersion modelling and real time air quality monitoring to guide day to day operations.</td>
<td>Operations planned and/or modified based on the predictive modelling and reactive monitoring.</td>
<td>Zero exceedances of criteria</td>
<td></td>
</tr>
<tr>
<td>Minimise air quality impacts of the project during adverse meteorological conditions and extraordinary events.</td>
<td>Air quality management system includes a risk/response matrix to modify activities as risk increases from weather conditions</td>
<td>Operations modified during adverse weather conditions</td>
<td>Zero exceedances of criteria</td>
</tr>
<tr>
<td>Implement all reasonable and feasible measures to minimise the release of greenhouse gas emissions.</td>
<td>Minimise release of greenhouse gas emissions.</td>
<td>Annual energy usage and reported emissions.</td>
<td>Energy use in line with operational requirements</td>
</tr>
</tbody>
</table>

Note: * Does not apply to land in Table 1 of the approval and for mine owned land where Condition 31 are applied.

#### 3.2 Management Measures

The air quality management measures employed for the Project are based on the recommendations of the *NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining* (Donnelly et al., 2011) (the Best Practice Report), a study that was commissioned by the NSW EPA.

A summary of the EPA best practice measures (BPM), as documented within the Best Practice Report, are provided in Appendix C, and compared with the measures applied for the Project.

A Best Practice Dust Benchmarking Study was undertaken by an independent consultant during 2016. The Study included a review of management activities in comparison to the Best Practice Report (Donnelly et al., 2011). Overall, a number of best practice management measures were noted with additional recommendations regarding adverse weather and dozer operations, and loading and unloading trucks. The EPL number 20221 was revised to investigate opportunities for improvement regarding truck loading and unloading practices.

MCCM have also completed a number of Pollution Reduction Programs required under Environment Protection Licence 20221, including assessment and management controls of wheel generated dust. Reports are publically available on the Whitehaven Coal website.

Actions completed following the Study included a variation to the EPL to further investigate loading and unloading material and dust management measures, revisions to this AQGHGMP and the Blast Management Plan, implementation of the BTM Air Quality Management Strategy, and measures to assist dust management from drills.

Preventative dust management measures employed at the Project are outlined in Table 10, with corrective measures outlined in Table 11. Preventative measures aim to minimise environmental impact by integrating controls and systems into the mining activities. Corrective measures aim to minimise environmental impact by instigating an appropriate operational response to visual inspections and/or when alerts are triggered by real-time dust management system (refer Table 11).
In addition to the Preventative and Corrective measures listed in Table 10 and Table 11, the Project also uses a predictive air quality management system to guide the day to day planning of mining operations, this is discussed further in Section 3.3 and 5.2. The predictive, preventative and corrective measures will help ensure any visible off-site dust generated by the Project is minimised to the greatest possible extent, in accordance with Schedule 3, Condition 33 (e) of the approval.
### Table 10  Dust Emissions – Preventative Management Measures

<table>
<thead>
<tr>
<th>Mining Activity</th>
<th>Management Action</th>
<th>Responsibility*</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hauling on Unsealed Road</td>
<td>Use of wet suppression and / or chemical suppressant</td>
<td>Operations Manager</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>Optimisation of fleet to reduce vehicle travel kilometres where possible</td>
<td>Technical Services Superintendent</td>
<td>Ongoing</td>
</tr>
<tr>
<td></td>
<td>Haul roads clearly marked and vehicles restricted to these areas</td>
<td>Operations Manager</td>
<td>Ongoing</td>
</tr>
<tr>
<td></td>
<td>All trafficked areas are maintained. Grader speed reduction when working and routes watered.</td>
<td>Operations Manager</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>Visual dust from haul trucks regularly assessed</td>
<td>Operations Manager</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>Shuttle bus at shift change for operational staff</td>
<td>Operations Manager</td>
<td>Daily</td>
</tr>
<tr>
<td>Wind Erosion on Exposed Areas &amp; Overburden Emplacements</td>
<td>Minimise pre-strip and disturbed areas by delineating areas for stripping</td>
<td>Operations Manager</td>
<td>As required</td>
</tr>
<tr>
<td>Wind Erosion and Maintenance - Coal Stockpiles</td>
<td>Water sprays on product stockpiles</td>
<td>Manager CHPP</td>
<td>As required</td>
</tr>
<tr>
<td></td>
<td>Use of watercarts on product stockpiles</td>
<td>Operations Manager</td>
<td>As required</td>
</tr>
<tr>
<td>Buildozers on Overburden</td>
<td>Minimise travel speeds and distance where possible. Assess location of operation.</td>
<td>Production Superintendent</td>
<td>As required</td>
</tr>
<tr>
<td>Blasting and drilling</td>
<td>Reschedule blast to avoid adverse weather conditions where required</td>
<td>Drill &amp; Blast Superintendent</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>Dust suppression while drilling - water sprays / dust curtains</td>
<td>Drill operators</td>
<td>Ongoing</td>
</tr>
<tr>
<td></td>
<td>Care taken not to disturb drill cuttings</td>
<td>Drill operators</td>
<td>Ongoing</td>
</tr>
<tr>
<td></td>
<td>Water truck available</td>
<td>Drill operators</td>
<td>As required</td>
</tr>
<tr>
<td>Loading and dumping overburden</td>
<td>Minimise loading height</td>
<td>Operators</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>Modify the use of equipment in adverse weather conditions</td>
<td>Production Superintendent</td>
<td>As required</td>
</tr>
<tr>
<td>Loading and dumping ROM coal</td>
<td>Bypass ROM stockpiles and direct dump to hopper (product dependent)</td>
<td>Production Superintendent</td>
<td>Ongoing</td>
</tr>
<tr>
<td></td>
<td>Minimise loading height</td>
<td>Operators</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>Water sprays on ROM bin</td>
<td>Manager CHPP</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>Three sided and roofed enclosure of ROM bin</td>
<td>Manager CHPP</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Conveyors and transfers</td>
<td>Application of water at transfers</td>
<td>Manager CHPP</td>
<td>As required</td>
</tr>
<tr>
<td></td>
<td>Transfer point covers</td>
<td>Manager CHPP</td>
<td>Ongoing</td>
</tr>
<tr>
<td></td>
<td>Belt cleaning and spillage minimisation</td>
<td>Manager CHPP</td>
<td>As required</td>
</tr>
<tr>
<td>Stacking and reclaiming</td>
<td>Variable height stack</td>
<td>Manager CHPP</td>
<td>Ongoing</td>
</tr>
</tbody>
</table>
### Mining Activity

<table>
<thead>
<tr>
<th>Mining Activity</th>
<th>Management Action</th>
<th>Responsibility*</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>product coal</td>
<td>Water sprays on product stockpiles</td>
<td>Manager CHPP</td>
<td>As required</td>
</tr>
<tr>
<td>Train load out and transportation</td>
<td>Volumetric loading from overhead silo</td>
<td>Manager CHPP</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>Maintain a consistent profile</td>
<td>Manager CHPP</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>Telescoping chute</td>
<td>Manager CHPP</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>Loading area enclosed</td>
<td>Manager CHPP</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>Profiling to manage overloading/underloading wagons. Limit load size to ensure coal is below sidewalls.</td>
<td>Manager CHPP</td>
<td>Daily</td>
</tr>
<tr>
<td>Diesel exhaust from mining equipment</td>
<td>Trucks and plant on-site will be well maintained. Registered road vehicles with smoky exhausts more than 10 seconds will be maintained.</td>
<td>Maintenance Superintendent</td>
<td>Ongoing</td>
</tr>
<tr>
<td></td>
<td>Unnecessary idling for trucks and plant will be avoided</td>
<td>Operations Manager</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>Optimisation of fleet to reduce kilometres equipment travel where possible</td>
<td>Technical Services Superintendent</td>
<td>Ongoing</td>
</tr>
</tbody>
</table>

1 Or delegated alternative

**Table 11** Dust Emissions – Corrective Measures
### Cumulative Air Quality Management in the Leard Forest Mining Precinct

The approval requires MCC to co-ordinate the air quality management on site with the air quality management at other mines within the Leard Forest Mining Precinct to minimise the cumulative air quality impacts of the mines and develop a Leard Forest Mining Precinct Air Quality Management Strategy (AQMS).

The approved AQMS for the Boggabri Mine, Tarrawonga Mine and MCCM Complex (BTM Complex) includes details on:

- Shared monitoring network,
- Predictive and real-time air dispersion model,
- Configuring predictive and reactive triggers
- Generating reports and alerts
- Communication between mining operations relating to air quality triggers
- Process of identifying and apportioning the source/s and contribution/s to cumulative air impacts.

### Table: Timing/Trigger, Measure, Responsibility

<table>
<thead>
<tr>
<th>Timing/Trigger</th>
<th>Measure</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visible dust from haul roads</td>
<td>Visually monitor dust from haul roads and allocate water carts to areas of dust generation from mine equipment.</td>
<td>All personnel</td>
</tr>
<tr>
<td>Winds &gt;6m/s and Air Quality Monitoring Triggers</td>
<td>Refer air quality monitoring triggers including Relocate overburden emplacement operations away from elevated levels as part of assessment of operations and activities. Review blasting conditions as per the Blast Management Plan.</td>
<td>Operations Manager</td>
</tr>
<tr>
<td>Dust emissions are above the height of drill rig floor</td>
<td>Ensure water application is applied during drilling. Identify material type.</td>
<td>Drill Operators</td>
</tr>
<tr>
<td>Excessive dust generation from exposed material stockpiles or other exposed areas</td>
<td>Limited vehicle access to these areas Operations modified after review. Water application where possible. Identify temporary rehabilitation opportunities dependent on mine progression.</td>
<td>Operations Manager</td>
</tr>
<tr>
<td>Excessive/prolonged generation of exhaust fumes</td>
<td>Ensure equipment is maintained to manufacturer or industry specifications. Turn equipment engines off when not required.</td>
<td>Maintenance Superintendent</td>
</tr>
<tr>
<td>Air quality complaints received from the public</td>
<td>Investigation into activities occurring at the time with reference to meteorological conditions, dust levels measured by monitoring equipment and operational activities. Where the investigation can identify the activity, modification to the activity will occur.</td>
<td>External Relations Superintendent</td>
</tr>
</tbody>
</table>
The implementation of any site management and/or corrective measures will be the responsibility of each operation as per their sites AQGHGMP’s. A copy of the AQMS is publicly available on the Whitehaven Coal website and is also provided in Appendix B.

3.4 Additional Air Quality Mitigation Upon Request

In accordance with Project Approval Schedule 3, condition 28, if the owner of any residence on land listed in Table 1 (on the basis of air quality) or Table 8 of the approval provides a written request to MCC, MCC will implement additional air quality mitigation measures at the residence in consultation with the owner, the measures must be reasonable and feasible and directed towards reducing the air quality impacts of the MCCM operations.

3.5 Notification of Landholders or Tenants

MCC undertook consultation and the required notification of landowners listed within Table 1 during the approval process including those with acquisition rights.

MCC has sent a copy of the NSW Health fact sheet entitled “Mine Dust and You” to the owners and/or existing tenants of land (including mine owned land) where the predictions within the EA identified that dust emissions generated by the Project are likely to be greater than the relevant air quality criteria.

Prior to entering into a tenancy agreement for land owned by MCC that is predicted to experience exceedances of the recommended noise and dust criteria, MCC will advise the prospective tenants of the potential health and amenity impacts associated with living on the land and provide a copy of the “Mine Dust and You” factsheet. MCC will advise the prospective tenants of the rights that they have under the Project Approval. MCC will also request the prospective tenants to visit their medical practitioner to discuss the air quality monitoring data and predictions and the health impacts arising from that information. Any tenancy agreement that MCC implement will be undertaken to the satisfaction of the Secretary. Should monitoring results show that the relevant criteria listed in the Project Approval be exceeded, MCC will as soon as practicable notify the landholder(s) whose land which the monitoring has shown an exceedance in writing and provide regular monitoring results to these landholder(s) until MCC has demonstrated compliance of MCCM operations with the relevant criteria. MCC will send any affected landholder(s) a copy of the “Mine Dust and You” fact sheet and monitoring data in an appropriate format.

4.0 GREENHOUSE GAS MANAGEMENT

GHG management for the Project will focus on emissions management and reductions associated with:

- Electricity usage in the CHPP; and
- Diesel consumption by mining vehicles and plant.

4.1 Electricity

Electricity use during operations will be minimised as follows:

- Consideration of the energy efficiency of all new electrical equipment during procurement;
- Use of variable speed drives on pumps and conveyors in the CHPP;
- Avoiding idle running of conveyors in the CHPP; and
- Turning off unnecessary lighting around the mine site consistent with safety requirements.

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4.2 Diesel Consumption

Diesel use during operations will be minimised as follows:

- Consideration of the fuel efficiency of all mobile and fixed equipment during procurement;
- Ensure dump trucks are fully loaded for each load prior to hauling to maximise productivity and efficiency with regard to the amount of fuel used per unit of material moved; and
- Investigate biodiesel use and where possible source from local and sustainable agricultural resources.

4.3 Reporting

Ongoing monitoring and management of GHG emissions and energy consumption MCCM would be achieved through participation in the Commonwealth Government’s National Greenhouse and Energy Report Scheme (NGERS). Under NGERS requirements, relevant sources of GHG emissions and energy consumption must be measured and reported on an annual basis, allowing major sources and trends in emissions/energy consumption to be identified.

GHG emissions and performance for each calendar year will be reported within the MCCM Annual Review. This will included reporting on any new energy savings projects that have been implemented by MCC or are planned to be implemented in the following year.
5.0 AIR QUALITY MONITORING PROGRAM

5.1 Monitoring Network

The MCCM air quality monitoring network has been established with consideration to the following objectives:

- To assess operational compliance with the criteria outlined in the approval;
- To integrate with the predictive and real-time dust management system; and
- To form part of a cumulative air quality monitoring network for BTM Complex AQMS.

Alternate monitoring locations to those currently identified in this section may be subject to further negotiation and agreement with the Landowner for access, revision within the EPL, installation and monitoring of the equipment.

The MCCM air quality monitoring network is shown on Figure 2 and consists of:

- Three TEOM units (TEOM1-3), currently able to measure PM\textsubscript{10} and PM\textsubscript{2.5}. TEOM 1 provides continuous monitoring of PM\textsubscript{10} levels in accordance with EPL20221, while TEOM 2 is used by MCC for internal management purposes only;
- One HVAS (HVAS 1), measuring PM\textsubscript{10} and TSP for compliance purposes. PM\textsubscript{10} levels are measured at the HVAS 1 on a twenty-four hour basis and collected every six days. TSP levels are inferred from the measured PM\textsubscript{10} data;
- Four depositional dust gauges (DDG1 – DDG4). Depositional dust readings are collected from these monitors on a monthly basis for compliance purposes.

In addition to the above, through the AQMS the BTM complex has installed portable real-time PM\textsubscript{10} monitors (i.e. e-samplers or equivalent) to assist with cumulative air quality predictive modelling from the BTM Complex. These portable monitoring devices will be placed at appropriate locations close to mining operations. The location of these ‘e-samplers’ will move periodically as BTM Complex mining operations progress. The monitors are for management purposes and not to assess compliance as they inform predictive assessments together with not remaining in fixed locations. The use of these portable real-time monitors is discussed in the AQMS provide in Appendix B.

The above monitoring suite is one tool to assist in the management of operations and monitoring dust levels from all sources, including non-mining activities. Please refer to the Risk Response Matrix in Appendix D.

5.2 Predictive and Real Time Monitoring

MCCM has implemented a comprehensive air quality management system on site that uses a combination of predictive meteorological forecasting, predictive and real time air dispersion modelling and real-time air quality monitoring data to guide the day to day planning of mining operations. This web based management system is utilised by both operational and environmental support staff to assist in the management of air quality impacts from the project.

The predictive modelling system provides:

- Daily forecast reports providing information on temperature inversions, wind conditions, dust risk, and recommended control actions;
- Graphical representation of the forecasted meteorology and real-time monitoring data via the system’s web interface;
- Capability to analyse and confirm the likely source(s) of dust and path(s) that the dust has travelled, and;
- Incorporated real time air quality and meteorological monitoring data.
Triggers are set to alert the operation when real time air quality readings reach a set limit. This alert triggers additional operational responses such as relocate, modify, and/or suspend operations to ensure compliance with the relevant conditions and criteria of the MCCM approval. The Risk Response Matrix outlines the trigger levels and the operational responses when a certain trigger level has been reached, and is provided in Appendix D.
Figure 2  MCCM Air Quality Monitoring Network
6.0 PROTOCOL FOR DETERMINING EXCEEDANCES

The following section outlines how compliance against the approval Impact Assessment Criteria for 24-hour PM$_{10}$ and annual average PM$_{10}$, TSP and dust deposition will be evaluated and reported.

Where monitoring results are below the levels indicated for the approval Impact Assessment Criterion, no further action is required and results are reported with no additional analysis.

Where monitoring results are above the air quality criteria in the approval, an analysis will be done at the earliest opportunity to determine if MCCM exceeded the criteria or contributed to an exceedance of the criteria. The air quality management system will be used to analyse and provide information on potential dust sources including:

- Investigate if any potential contamination of sample may have occurred and if the monitoring results are valid.
- Investigate the meteorological data for the relevant period.
- Compare the upwind, downwind and regional monitoring data for the same period.
- Obtain operations activity logs for the elevated level day to determine what activities were occurring and characterise the activities based on being wind speed independent, wind speed dependent or wind erosion sources.
- On the basis of wind speed, direction and the upwind and downwind results, determine the likelihood of the site causing or contributing to elevated levels above the approval criteria.

Where it is determined MCCM contributed to the air quality monitoring results exceeding approval criteria, the relevant agencies will be notified.

7.0 COMPLAINTS HANDLING

Any complaint received relating to any air quality issues will be managed in accordance with the Maules Creek Coal Complaint Handling and Response processes as outline in the MCC EMS.

8.0 REPORTING

8.1 Online Reporting

In accordance with Schedule 5 Condition 13, daily updates are provided on the WHC website, including:

- Daily weather forecasts for the week.
- Real-time (daily non-validated air quality monitoring data) from the TEOM 1 monitoring site.
- Operational responses to noise and dust levels.
- Monthly reporting results as per the BTM AQMS.
- Summary reports available on a monthly basis required under the EPL.

Provision is also made on the website for the community to submit comments to Whitehaven Coal.

MCCM also provide data from the Maules Creek monitoring station to the NSW EPA which is published on the EPA website detailing daily air quality information.
8.2 Annual Review

By the end of March each year, MCC will review the environmental performance of MCCM (including air quality) for the previous calendar year. The air quality component of the Annual Review includes the required detail as per the DPE Annual Review Guideline (2015). The Annual Review will be sent to the relevant regulatory agencies for review and made publically available on the WHC website.

8.3 Incident Reporting / Affected Residences

In accordance with Schedule 5 Condition 8 of the approval and under Section 148 of the Protection of the Environment Operations Act 1997 (POEO Act) the Secretary of DP&E and representatives of all relevant regulatory agencies will be informed of any incident that has caused, or threatens to cause, material harm to the environment, at the earliest opportunity. For other incidents, notification of the Secretary and any other relevant agencies as soon as practicable after becoming aware of the incident and the provision of a report within seven days.

In accordance with Schedule 4 Condition 3 of the approval, any affected private landowner will also be notified and provided with a summary of the relevant monitoring data.

8.4 Community Consultation

A Community Consultative Committee (CCC) has been established and will continue to be operated for the duration of operations on site. Regular briefings to the CCC will be provided, including a summary of results from the MCCM air quality monitoring network.

8.5 Auditing

Under the approval, an Independent Environmental Audit (IEA) of MCCM was undertaken in 2015 and a further IEA is required to be undertaken every 3 years thereafter. The IEA will include a review of the air quality performance of MCCM, assess compliance with the requirements in this plan, and implementation of air quality management measures.

9.0 REVISION

This AQGHGMP will be reviewed and if necessary revised, within 3 months of the submission of an;

- Annual Review as required under the approval,
- Incident Report as required under the approval,
- An Independent Environmental Audit as required under the approval or
- Any modification to the conditions of the approval.
10.0 **ROLES AND RESPONSIBILITIES**

In addition to the specific responsibilities for dust management outlined in Table 7, general roles and responsibilities for the implementation of the AQGHGMP are presented in Table 12.

<table>
<thead>
<tr>
<th>Role</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Manager – Maules Creek</td>
<td>• Ensure required resources and support to implement the management plan.</td>
</tr>
</tbody>
</table>
| Environment Superintendent & Environmental Officer        | • Authorise the AQGHGMP and future amendments.  
• Ensure induction and training relevant to the AQGHGMP  
• Management and maintenance of monitoring network  
• Regulatory notification and engagement  
• Reporting and data review  
• System maintenance and development  
• Specific dust management responsibilities outlined in Table 7 |
| Operations Manager & Technical Services team              | • Accountability for dust management performance by operations and controls implemented  
• Optimisation of mining fleet to ensure efficiency and reduce vehicle travel distance.  
• Mine plans to enable update the predictive model  
• Operational modifications to triggers and alarms  
• Overseeing implementation of dust management measures  
• Assist in mine technical detail for stakeholder enquiries  
• Specific dust management responsibilities outlined in Table 7 |
| CHPP Manager                                              | • Ensure management of dust from CHPP product stockpiles and coal transfer points.  
• Speed restrictions of equipment within CHPP area  
• Ensure dust management responsibilities outlined in Table 7 |
| External Relations Superintendent                         | • Provide response to stakeholder and community enquiries.                                                                                                                                                           |
| All personnel                                             | • Adhere to the relevant requirements of this AQGHGMP.  
• Modify activities to reduce dust levels.  
• Specific dust management responsibilities outlined in Table 7 |
11.0 REFERENCES

AS/NZS 3580.1.1:2007 “Methods for sampling and analysis of ambient air - Guide to siting air monitoring equipment”.

AS/NZS 3580.9.6:2003 “Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM(sub)10 high volume sampler with size-selective inlet - Gravimetric method”.

AS/NZS 3580.10.1:2003 “Methods for sampling and analysis of ambient air - Determination of particulate matter - Deposited matter - Gravimetric method”.

BTM Air Quality Management Strategy (2016)


## 12.0 TERMS AND ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approved Methods</td>
<td>Approved Methods for the Sampling and Analysis of Air Pollutants in NSW</td>
</tr>
<tr>
<td>AQGHGMP</td>
<td>Air Quality and Greenhouse Gas Management Plan</td>
</tr>
<tr>
<td>AQMS</td>
<td>Air Quality Management System</td>
</tr>
<tr>
<td>AWS</td>
<td>Automatic weather station</td>
</tr>
<tr>
<td>BPM</td>
<td>Best Practice Measures</td>
</tr>
<tr>
<td>Best Practice Determination / Report</td>
<td>NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining</td>
</tr>
<tr>
<td>BTM Complex</td>
<td>Boggabri Coal Mine, Tarrawonga Coal Mine and Maules Creek Coal Mine</td>
</tr>
<tr>
<td>CCC</td>
<td>Community Consultation Committee</td>
</tr>
<tr>
<td>CHPP</td>
<td>Coal Handling and Preparation Plant</td>
</tr>
<tr>
<td>CH₄</td>
<td>Methane</td>
</tr>
<tr>
<td>DDG</td>
<td>Dust Deposition Gauge</td>
</tr>
<tr>
<td>EEO</td>
<td>Energy Efficiency Opportunities</td>
</tr>
<tr>
<td>EPA</td>
<td>Environment Protection Agency</td>
</tr>
<tr>
<td>EPL</td>
<td>Environment Protection Licence</td>
</tr>
<tr>
<td>GHG</td>
<td>Greenhouse Gas</td>
</tr>
<tr>
<td>GLC/s</td>
<td>Ground level concentration/s</td>
</tr>
<tr>
<td>HVAS</td>
<td>High Volume Air Sampler</td>
</tr>
<tr>
<td>km/hr</td>
<td>Kilometers per hour</td>
</tr>
<tr>
<td>MCC</td>
<td>Maules Creek Coal Pty Limited</td>
</tr>
<tr>
<td>MCCM</td>
<td>Maules Creek Coal Mine</td>
</tr>
<tr>
<td>Mtpa</td>
<td>Million Tonnes Per Annum</td>
</tr>
<tr>
<td>NGERS</td>
<td>National Greenhouse and Energy Report Scheme</td>
</tr>
<tr>
<td>NOₓ</td>
<td>Oxides of nitrogen</td>
</tr>
<tr>
<td>NSW</td>
<td>New South Wales</td>
</tr>
<tr>
<td>PM₂.₅</td>
<td>Particulate matter with equivalent aerodynamic diameter 2.5 microns or less</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>Particulate matter with equivalent aerodynamic diameter 10 microns or less</td>
</tr>
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<td>The approval</td>
<td>Project Approval (PA) 10_0138 (as modified)</td>
</tr>
<tr>
<td>The Project</td>
<td>Maules Creek Coal Project</td>
</tr>
<tr>
<td>ROM Coal</td>
<td>Run of Mine Coal</td>
</tr>
<tr>
<td>TEOM</td>
<td>Tapered Element Oscillating Microbalance</td>
</tr>
<tr>
<td>TSP</td>
<td>total suspended particulate matter</td>
</tr>
<tr>
<td>VKT</td>
<td>Vehicle Kilometers Travelled</td>
</tr>
<tr>
<td>WHC</td>
<td>Whitehaven Coal Limited</td>
</tr>
</tbody>
</table>
Appendix A

Land Ownership

(Please see Figure 2)
Appendix B
BTM Air Quality Management Strategy
AIR QUALITY MANAGEMENT STRATEGY

For Boggabri – Tarrawonga – Maules Creek Complex

MAY 2017

Idemitsu Australia Resources
Boggabri Coal Operations Pty Ltd

Whitehaven Coal Limited
Tarrawonga Coal Pty Ltd, Maules Creek Coal Pty Ltd
<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Prepared by</th>
<th>Reviewed by</th>
<th>Approved by</th>
</tr>
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<tbody>
<tr>
<td>01</td>
<td>27 Sep 12</td>
<td>PAE Holmes</td>
<td>B Bird</td>
<td>J Green, D Martin, D Young</td>
</tr>
<tr>
<td>02</td>
<td>21 March 14</td>
<td>PAE Holmes / Parsons Brinckerhoff</td>
<td>J Green, D Martin, D Young</td>
<td>J Green, D Martin, D Young</td>
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<tr>
<td>03</td>
<td>16 December 14</td>
<td>Parsons Brinckerhoff</td>
<td>J Green, D Martin, J Johnson</td>
<td>J Green, D Martin, J Johnson</td>
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<td>J Green, D Martin, J Johnson</td>
</tr>
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<td>05</td>
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<td>J Green, D Martin, T Dwyer</td>
<td>J Green, D Martin, T Dwyer</td>
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<tr>
<td>06</td>
<td>October 15</td>
<td>S.Crick</td>
<td>C Simmons / L Johnson / T Dwyer,</td>
<td>H. Russell, J Johnson</td>
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<tr>
<td>07</td>
<td>11 December 2015</td>
<td>Parsons Brinckerhoff</td>
<td>C Simmons / L Johnson / T Dwyer,</td>
<td>H. Russell, J Johnson</td>
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<td>08</td>
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<td>C Simmons / L Johnson / T Dwyer,</td>
<td>D. Martin, J Johnson</td>
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Appendices

Appendix A Requirements of Project Approvals
## Glossary

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEMR</td>
<td>Annual Environmental Management Report</td>
</tr>
<tr>
<td>AQGHGMP</td>
<td>Air Quality and Greenhouse Gas Management Plan</td>
</tr>
<tr>
<td>AQMS</td>
<td>BTM Complex Air Quality Management Strategy</td>
</tr>
<tr>
<td>BCM</td>
<td>Boggabri Coal Mine</td>
</tr>
<tr>
<td>BCOPL</td>
<td>Boggabri Coal Operations Pty Limited</td>
</tr>
<tr>
<td>BTM Complex</td>
<td>Boggabri-Tarrawonga-Maules Creek Complex (previously known as the Leard Forest Mining Precinct)</td>
</tr>
<tr>
<td>CALPUFF</td>
<td>An air quality dispersion model</td>
</tr>
<tr>
<td>CCC</td>
<td>Community Consultative Committee</td>
</tr>
<tr>
<td>CHPP</td>
<td>Coal Handling and Preparation Plant</td>
</tr>
<tr>
<td>CL</td>
<td>Coal Lease</td>
</tr>
<tr>
<td>DP&amp;E</td>
<td>NSW Department of Planning and Environment</td>
</tr>
<tr>
<td>EA</td>
<td>Environmental Assessment</td>
</tr>
<tr>
<td>EPA</td>
<td>Environment Protection Authority</td>
</tr>
<tr>
<td>EP&amp;A Act</td>
<td>Environmental Planning and Assessment Act, 1979</td>
</tr>
<tr>
<td>EPL</td>
<td>Environment Protection Licence</td>
</tr>
<tr>
<td>GHG</td>
<td>Greenhouse Gas</td>
</tr>
<tr>
<td>HVAS</td>
<td>High Volume Air Sampler</td>
</tr>
<tr>
<td>IAR</td>
<td>Idemitsu Australia Resources Pty Limited</td>
</tr>
<tr>
<td>LAN</td>
<td>Local Area Network</td>
</tr>
<tr>
<td>MCCM</td>
<td>Maules Creek Coal Project</td>
</tr>
<tr>
<td>Mtpa</td>
<td>Million Tonnes Per Annum</td>
</tr>
<tr>
<td>PAC</td>
<td>NSW Planning Assessment Commission</td>
</tr>
<tr>
<td>PM$_{10}$</td>
<td>Particulate matter &lt; 10 µm</td>
</tr>
<tr>
<td>PM$_{2.5}$</td>
<td>Particulate matter &lt; 2.5 µm</td>
</tr>
<tr>
<td>ROM</td>
<td>Run of Mine</td>
</tr>
<tr>
<td>TCM</td>
<td>Tarrawonga Coal Mine</td>
</tr>
<tr>
<td>TEOM</td>
<td>Tapered Element Oscillating Microbalance</td>
</tr>
<tr>
<td>TCPL</td>
<td>Tarrawonga Coal Pty Ltd</td>
</tr>
<tr>
<td>TSP</td>
<td>Total Suspended Particulate</td>
</tr>
<tr>
<td>WRF</td>
<td>Weather Research and Forecasting</td>
</tr>
</tbody>
</table>
1. Introduction

1.1 Background and purpose

The purpose of this cumulative air quality management strategy (AQMS) is to document the approach that mines within the Boggabri-Tarrawonga-Maules Creek Complex (BTM Complex) will take to monitor and manage cumulative air quality impacts. The AQMS details the relevant cumulative air quality impact assessment criteria for each mine and outlines the cumulative air quality management protocols that will be implemented within the BTM Complex.

The BTM Complex is an existing mining precinct centred within and around the Leard State Forest, approximately 15 km northeast of Boggabri in the Narrabri Shire local government area. The BTM Complex currently includes the existing Tarrawonga Coal Mine (TCM) in the south, the Boggabri Coal Mine (BCM) to the north and the Maules Creek Coal Mine (MCC) to the northwest. The extents of the EA boundaries for each of the mines that comprise the BTM Complex are presented in Figure 1.1.

BCM is managed by Boggabri Coal Operations Pty Limited (BCOPL), a subsidiary of Idemitsu Australia Resources Pty Limited (IAR). MCC is a joint venture between Whitehaven Coal Limited (75%), ITOCHU Australia Limited (15%) and J-Power Australia (10%). TCM is also a joint venture operation, with ownership shared between Whitehaven Coal Mining Limited (70%) and Boggabri Coal Pty Ltd (30%). A summary of the ownership details for mines within the BTM Complex is provided below in Table 1.1.

Table 1.1 Management and ownership of BTM Complex mines

<table>
<thead>
<tr>
<th>Mine</th>
<th>Management</th>
<th>Ownership</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boggabri Coal Mine</td>
<td>Boggabri Coal Operations Pty Limited</td>
<td>Idemitsu Australia Resources I Pty Ltd</td>
<td>80%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chugoku Electric Power Australia Resources Pty Ltd</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NS Boggabri Pty Limited</td>
<td>10%</td>
</tr>
<tr>
<td>Maules Creek Coal Mine</td>
<td>Maules Creek Coal Joint Venture</td>
<td>Aston Coal 2 Pty Limited (owned 100% by Whitehaven Coal Limited)</td>
<td>75%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Itochu Coal Resources Australia Maules Creek Pty Ltd (ICRA MC)</td>
<td>15%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>J-Power Australia (J-Power)</td>
<td>10%</td>
</tr>
<tr>
<td>Tarrawonga Coal Mine</td>
<td>Tarrawonga Coal Pty Limited (TCPL) - Tarrawonga Joint Venture</td>
<td>Whitehaven Coal Mining Limited</td>
<td>70%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Boggabri Coal Pty Limited</td>
<td>30%</td>
</tr>
</tbody>
</table>

Project applications for the continued operation of BCM (application number 09_0182) and the development of the MCCM (application number 10_0138) were determined by the NSW Planning Assessment Commission (PAC) in July and October 2012 respectively, under delegation by the NSW Minister for Planning and Infrastructure. Subsequent to this, the (now) Commonwealth Department of the Environment (DoE) granted conditional approval for both the BCM Extension (EPBC 2009/5256) and the MCC Project (EPBC 2010/5566) on 11 February 2013. Given the level of public interest in these
projects and the potential for cumulative impacts, approvals were granted subject to stringent conditions related to the management of cumulative impacts.

The TCM application for continuation of mining was approved on 22 January 2013, with similar cumulative impact management conditions to those detailed in the BCM and MCCM approvals. EPBC approval for the Tarrawonga project was granted by the DoE on 11th March 2013.

Approval conditions require the preparation of a suite of regional strategies for environmental management, developed in partnership by all three mines of the BTM Complex. This AQMS has been developed to serve as the Leard Forest Mining Precinct Air Quality Management Strategy, in accordance with each project’s approval requirements. Approval conditions relevant to the management of cumulative air quality impacts within the BTM Complex are detailed in Table 1.2.

Table 1.2 Approval requirements for cumulative air quality impact management

<table>
<thead>
<tr>
<th>Boggabri Coal Mine Project Approval 09-0182</th>
<th>Maules Creek Coal Mine Project Approval 10_0138</th>
<th>Tarrawonga Project Approval PA 11_0047</th>
<th>Details</th>
<th>Section reference in AQMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schedule 3, Condition 30 (b)</td>
<td>Schedule 3, Condition 33 (b)</td>
<td>Schedule 3, Condition 28(b)</td>
<td>The proponent shall… “Operate a comprehensive air quality management system on site that uses a combination of predictive meteorological forecasting, predictive and real time air dispersion modelling and real-time air quality monitoring data to guide the day to day planning of mining operations and implementation of both proactive and reactive air quality mitigation measures to ensure compliance with the relevant conditions of this approval”.</td>
<td>Whole of document, specifically Sections 4.2 and 4.6</td>
</tr>
<tr>
<td>Schedule 3, Condition 30 (g)</td>
<td>Schedule 3, Condition 33 (g)</td>
<td>Schedule 3, Condition 28(g)</td>
<td>“Co-ordinate the air quality management on site with the air quality management at other mines within the Leard Forest Mining Precinct to minimise the cumulative air quality impacts of the mines, to the satisfaction of the Director-General”</td>
<td>Whole AQMS, including Section 5.3</td>
</tr>
</tbody>
</table>
| Schedule 3, Condition 31 (h)               | Schedule 3, Condition 34 (g)                   | Schedule 3, Condition 29(g)           | Prepare and implement an Air Quality and Greenhouse Gas Management Plan that… “includes a Leard Forest Mining Precinct Air Quality Management Strategy that has been prepared in consultation with other coal mines in the Complex (formerly Precinct) to minimise the cumulative air quality impacts of all mines within the Complex (formerly Precinct), that includes:
- Systems and processes to ensure that all mines are managed to achieve their air quality criteria;
- A shared environmental monitoring network and data sharing protocol
- Control monitoring site(s) to provide real time data on background air quality levels (i.e. not influenced by mining from the Leard Forest Mining Precinct and representative of regional air quality);
- A shared predictive and real time air dispersion model covering the Leard Forest Mining Precinct to be used for the” | Whole of AQMS, specifically Section 4 |
<table>
<thead>
<tr>
<th>Boggabri Coal Mine Project Approval 09-0182</th>
<th>Maules Creek Coal Mine Project Approval 10_0138</th>
<th>Tarrawonga Project Approval PA 11_0047</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Table" /> assessment of cumulative impacts, optimising location of the shared real time monitoring network, validation of air predictions and optimising mitigation measures; and</td>
<td>Section 5.1 Procedures for identifying and apportioning the source/s and contribution/s to cumulative air impacts for both mines and other sources, using the air quality and meteorological monitoring network and appropriate investigative tools such as modelling of post incident plume dispersion, dual synchronised monitors and chemical methods of source apportionment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes:</td>
<td>The requirement for regionally based control sites can be further reviewed if a regional air monitoring network is implemented and operated by the EPA as recommended in the draft Strategic Regional Land Use Plan for New England and North West.</td>
<td>Section 4.3 The Leard Forest Mining Complex (formerly Leard Forest Mining Precinct) Air Quality Management Strategy can be developed in stages and will need to be subject to ongoing review dependent upon the determination of and commencement of other mining projects in the area.”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The management plan should be consistent with the EPA’s guidance on Best Management Practice reporting and Reactive Particulate Management Strategies.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 1-1  Location of the BTM Complex mines
1.2 Document structure

The structure of this report is as follows:

- **Section 1** provides an introduction to the AQMS, including the background to the AQMS, and the scope of the AQMS.
- **Section 2** provides an overview of the BTM Complex mines (BCM, TCM, and MCM).
- **Section 3** describes air quality criteria to be considered in the design and operation of the network and monitoring programs.
- **Section 4** describes existing monitoring networks; sets objectives for cumulative monitoring; outlines the cumulative BTM Complex monitoring program.
- **Section 5** discusses corrective and preventative actions.
- **Section 6** summarises the implementation of the AQMS.
- **Section 7** describes document control.
- **Section 8** provides a list of references used in this document.

1.3 Scope

This document is the overarching strategy for management of the BTM Complex and associated zones of air quality affectation.

Individual mines will manage their ongoing operations and associated air quality in accordance with their site specific Air Quality and Greenhouse Gas Management Plans (AQGHGMPs). Statutory requirements relating to air quality will be provided in each individual AQGHGMP and are summarised in this AQMS.
2. BTM Complex

The BTM Complex includes the existing Tarrawonga Coal Mine (TCM) in the south, the Boggabri Coal Mine (BCM) to the north and the Maules Creek Coal Mine (MCCM) to the northwest.

2.1 Boggabri Coal Mine

Boggabri Coal Operations Pty Limited (BCOPL) is majority owned (80%) by Idemitsu Australia Resources Pty Limited (Idemitsu), a subsidiary of Japanese company Idemitsu Kosan Pty Ltd which operate the BCM. The BCM is located 15 kilometres (km) north-east of the township of Boggabri in the north-west Region of NSW.

Full scale mining commenced at BCM in 2006. In 2009, BCOPL lodged an application for the continuation of BCM (the Boggabri Coal Project). This included an increase of production from five to seven million tonnes of product coal per annum. The Boggabri Coal Project was approved under PA 09_0182 on 18 July 2012 and activities have continued at the site since, including:

- construction of a new Coal Handling and Preparation Plant (CHPP)
- construction of a 17 km rail spur line and rail load-out facility
- construction of a high voltage power line (275kV) and associated substations
- upgrade of other ancillary infrastructure.

Four modifications of the Project Approval have subsequently been approved. Modification 2, approved on 17th February 2015 permits the CHPP to process up to 3.5 Mtpa of ROM coal and the transport of up to 3 Mtpa of ROM coal from Tarrawonga Coal Mine to BCM. Modification 3, approved on 17th March 2014, permits the construction of permanent mine access roads from the Kamilaroi Highway and use of other infrastructure. Modification 4, approved on 23rd March 2014 permits project boundary adjustments, realignment of a haul road, extension of the ROM coal stockpile and construction of new hardstand areas & a project boundary security fence. Modification 5, approved on 30th August 2016, permits the use of groundwater production bores for the supply of water to BCM.

BCOPL also operates under an approval granted under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (EPBC Approval 2009/5256).

Condition 31(h) in schedule 3 of the Boggabri Project Approval (DA 09_0182) requires the preparation of an AQMS for the BTM Complex.

2.2 Tarrawonga Coal Mine

The Tarrawonga Coal Mine is an existing coal mining operation which obtained approval to extract 2 Mtpa of ROM coal in 2005 (DA 88-4-2005). TCPL, a subsidiary of Whitehaven Coal, submitted a Project application in July 2011 for an extension of open cut mining operations with an increased production rate to 3 Mtpa of ROM coal for a further 17 years from 2013 to 2030. This project application was determined by the PAC on 22nd January 2013, and included, under Condition 29 (g) that ‘the proponent shall prepare and implement an Air Quality and Greenhouse Gas Management Plan for the Project that must include an AQMS’.
A modification was lodged with the DP&E in May 2013 to allow for the processing of up to 3 Mtpa of ROM coal from Tarrawonga Coal Mine at the Boggabri Infrastructure Facilities in Coal Lease (CL) 368, and the associated transport of up to an additional 3 Mtpa of product coal along the private Boggabri rail spur. This modification was approved 17th February 2015.

A further modification was lodged with the DP&E in February 2014 to allow continued trucking of Tarrawonga coal to the Whitehaven CHPP located west of Gunnedah post commissioning of the Boggabri Coal CHPP and rail spur. This modification was determined on 6 November 2014.

2.3 Maules Creek Coal Mine

The Maules Creek Coal Mine is located directly to the northwest of Boggabri Coal Mine. There is an existing development consent covering coal mining within an area delineated as Coal Lease 375 (CL 375). Aston Resources Pty Limited, which has subsequently been acquired by Whitehaven Coal, submitted a project application under Part 3A of the EP&A Act seeking a contemporary Project Approval for coal mining and ancillary activities within this area.

The application sought approval for extraction of up to 13 Mtpa ROM coal for 21 years. Other key features of this Project include transportation of coal by rail to Newcastle; and development of site infrastructure including the CHPP and associated facilities; train loading facility; rail spur and loop; a mine access road; communications and power reticulation; explosives storage; and a water pipeline from the Namoi River.

The Maules Creek Coal Project (MCCM) application (number 10-0138) under the now-repealed Part 3A of the EP&A Act was granted approval by the DP&E in October 2012. Condition 34 (g) of the Project Approval also requires the preparation of an AQMS for the BTM Complex.

Three modifications have subsequently been lodged. Modification 1, lodged in April 2013, was lodged to gain approval for construction and operation of high voltage transmission lines and an associated switching station, following detailed design; a minor extension to existing 11 kV transmission line; and realignment of the CHPP area and associated facilities. Approval for this modification was received in July 2013. Modification 2 was lodged in February 2014 seeking approval for an optimised design for key water related infrastructure components (raw water pipeline and pump station). This modification was determined on 10 March 2014. Modification 3 was submitted in 2016 and approved in January 2017 approving a modification to employee transport and the percentage of shuttle bus use.
3. Air quality strategy criteria

3.1 Air quality assessment criteria

Relevant air quality impact assessment criteria have been extracted from the most recent BCOPL Project Approval, the MCCM Project Approval and the TCM Project Approval. These criteria are provided in Table 3.1, Table 3.2 and Table 3.3.

The conditions require that BCOPL, MCCM and TCM must ensure particulate emissions generated by BTM Complex operational activities do not exceed the criteria listed in Tables 3.1 to 3.3 at any residence on privately-owned land or on more than 25 per cent of any privately owned-land.

Table 3.1 Long term criteria for particulate matter

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Period</th>
<th>d Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total suspended particulate (TSP) matter</td>
<td>Annual</td>
<td>a 90 ug/m³</td>
</tr>
<tr>
<td>Particulate matter &lt; 10 um (PM₁₀)</td>
<td>Annual</td>
<td>a 30 ug/m³</td>
</tr>
</tbody>
</table>

Table 3.2 Short term criteria for particulate matter

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Period</th>
<th>d Criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particulate matter &lt; 10 um (PM₁₀)</td>
<td>24 hour</td>
<td>a 50 ug/m³</td>
</tr>
</tbody>
</table>

Table 3.3 Long term criteria for deposited dust

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Period</th>
<th>Maximum Increase in Deposited Dust Level</th>
<th>Maximum Total Deposited Dust Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposited Dust</td>
<td>Annual</td>
<td>b 2 g/m²/month</td>
<td>a 4 g/m²/month</td>
</tr>
</tbody>
</table>

Notes to Table 3.1, Table 3.2 and Table 3.3

a Total impact (i.e. incremental increase in concentrations due to the Project plus background concentrations due to other sources).
b Incremental impact (i.e. incremental increase in concentrations due to the Project on its own).

c Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580:10.1:2003: Methods for Sampling and Analysis of Ambient Air – Determination of Particulate Matter – Deposited Matter – Gravimetric Method.
d Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents, or any other activity as agreed by the Director General.

3.2 Air quality acquisition criteria

The acquisition criteria for operations is detailed and addressed in each mine site's individual AQGHGMPs.
4. Monitoring

The mines of the BTM Complex already have comprehensive air quality monitoring systems in place. It is proposed that the existing air quality monitoring network will be upgraded to reflect the implementation of the BTM Complex cumulative air quality monitoring network.

4.1 Existing monitoring network

A review of the individual mines’ existing air quality monitoring networks has considered High Volume Air Samplers (HVAS) and real-time (TEOM) PM$_{10}$ and PM$_{2.5}$ monitors. The locations of monitors within the existing air quality monitoring network proposed for use in the BTM Strategy are shown on Figure 4-1. Proposed modifications to the existing monitoring network are described in the following section and specific BTM complex monitoring locations are shown on Figure 4-1.

4.2 Proposed cumulative monitoring network

The requirements of the cumulative monitoring network at the BTM Complex are to:

- facilitate compliance with existing and likely future consent conditions
- allow proactive management and real-time dust monitoring to assist in day to day operations of each mine site
- develop an integrated and coordinated approach to air quality management of the BTM Complex
- consolidate existing monitoring
- allow for predictive meteorological forecasting
- include procedures for identifying and apportioning the source(s) and contribution(s) to cumulative air impacts for mines and other sources, using the air quality and meteorological monitoring network
- include appropriate investigative tools such as modelling of post incident plume dispersion.

The mines of the BTM Complex implement comprehensive air quality management systems. These air management systems utilise a combination of dust deposition and HVAS monitoring for compliance with project approval’s and EPL’s for the individual mines, and TEOMs for use as management tools as part of the day to day operations.

Four TEOMs, one capable of measuring PM$_{2.5}$, and current HVAS from the existing air monitoring network will be used to monitor and manage cumulative impacts associated with the operation of mines in the BTM Complex.

In addition, the BTM Complex monitoring network will include:

- Installation of up to four portable real-time PM$_{10}$ monitors for day to day operational dust management (e.g. e-samplers or equivalent).
- Implementation of a web based system to manage real-time monitoring data (as well as weather, emissions and modelled predictions for air quality).
Figure 4-1  BTM Complex air quality monitoring locations
4.2.1 Real-time monitors

Critical to the AQMS are the locations of the real-time monitors, which will guide the implementation of reactive dust management measures by respective mines.

It is important to understand the different roles of monitors in the cumulative network. The four real-time monitors proposed for use in the BTM system (e.g. TEOMs) are for management purposes and will be placed at the locations as described in each mines AQGHGMPs, as amended over time. The TEOM units are positioned at locations to monitoring air quality at receivers including the Maules Creek public school. The units may also be relocated for operational purposes. The units will be capable of measuring PM$_{10}$ and for at least one monitor PM$_{2.5}$. These monitors will be used to determine (in real time) if pre-defined trigger levels have been reached and when additional dust control is required. Other real-time monitors may be used by individual sites for performance evaluation at non-fixed sites.

The real-time air quality monitoring allows relevant personnel to react when short term trigger levels are reached, which are set at a level that allows reactive dust management (to control 24-hour and ultimately annual average impacts).

The TEOM's located on privately owned land to the South-West of BCM and North MCCM will be used by individual mines to assess compliance with their respective air quality criteria. These monitors and the air quality criteria are further discussed in each mines AQGHGMP's.

The locations of the TEOM units will be reviewed by individual mines (following an annual review, audits, complaints, modifications) and where required relocated to provide representative coverage to assess air quality from mining operations.

4.2.2 Portable real-time PM$_{10}$ monitors

The BTM Complex has installed four portable real-time PM$_{10}$ monitors (e-samplers or equivalent) for the day to day dust management of mining operations. Prior to operating, a period of commissioning of portable real-time PM$_{10}$ monitors will be undertaken to allow calibration of the instruments, verification of the monitoring results, and determination of the number of samplers actually required to achieve the required monitoring outcome.

Following this commissioning period it is intended that these portable monitors will be placed at appropriate locations close to mining operations. The portable monitoring locations will move periodically as BTM Complex mining operations progress. As the monitors will not be located in fixed locations, they will not be used to assess compliance against each sites project approval. Their locations will take account of a number of factors, such as:

- seasonally predominant daily wind patterns (e.g. upwind and downwind of operations given predominant SE/NW wind directions)
- the relative locations of each mines’ highest controllable dust generating sources
- practicality of locating monitoring equipment close to the mining operations, and
- suitability of immediate location where sited eg not immediately next to unsealed roads.
An indicative array of monitoring locations is shown in Figure 4.1. These are positioned according to an operational mine plan scenario for concurrent mining at all three mine sites.

The suggested monitoring locations will allow for the analysis of upwind PM$_{10}$ concentrations along the north/south and southeast/northwest axis that correspond to the prevailing wind directions; and areas that are predicted to be impacted by BTM Complex operations. The portable monitors should also capture any impacts during less frequent wind directions.

This combined network of portable monitors and TEOMs will allow for the identification of which mining may be contributing to any elevated measurements, so that appropriate mitigation measures can be employed.

### 4.2.3 High volume air samplers

Each of the BTM Complex mines operate HVAS for the purpose of compliance monitoring. The HVAS located on private land will be used to assess compliance with the air quality criteria detailed in each mines AQGHGMP. The HVAS sample PM$_{10}$ by passing an air stream through a filter paper for a period of 24 hours every 6 days. The location and operation of each HVAS is illustrated in Figure 4.1 and detailed in each mines AQGHGMP.

### 4.3 Regional monitoring (control site)

Approval conditions require control monitoring sites to provide real time data on background air quality levels (i.e. not influenced by mining from the BTM Complex).

Approval conditions also note that the requirement for regionally based control sites can be reviewed if a regional air monitoring network is implemented and operated by the EPA as recommended in the draft Strategic Regional Land Use Plan for New England North West. The need for commissioning a control air quality monitoring site will be reviewed, in consultation with DP&E and EPA, pending EPA’s decision on implementing the regional air quality monitoring network. This Strategy will be reviewed, and if required revised, pending the outcomes of this review.

As an interim control site, reference will be made to EPA monitoring data collected at Tamworth, which will provide an indication of regional air quality not influenced by mining from the BTM Complex.

### 4.4 Responsibility of the individual mines

Each mine shares responsibility for the maintenance, calibration, repair, operating costs and site access agreements for the operation of the monitoring network. Arrangements have been confirmed between the mines regarding the ongoing logistics of operating the monitoring network.

### 4.5 Data management and interpretation

It is proposed that real time air quality monitoring data from the three mine sites will be stored in a central data repository. The data will be available for use by each mine site and will be able to be viewed in various formats on a secure website to display the data in real-time.

Air quality data will be summarised, validated and available for the public and agencies on a monthly basis, via each mine site’s website. The BTM Complex will also investigate systems for web based real-
time data publishing. The availability of this data will be staged, as detailed in Section 6.1, as the air quality monitoring system is installed, commissioned and proven.

4.6 Predictive and real-time air quality management

4.6.1 Overview of requirements

A key method to ensure that air quality management systems maintain standards of best available technology is to incorporate predictive and real-time reactive capability.

It is proposed that a predictive and reactive air quality management system will be implemented for the BTM Complex that personnel will use to:

- assess potential offsite impacts and evaluate community risk in advance and in real-time
- perform scenario modelling under predicted adverse or other operating conditions
- evaluate community complaints and determine if BTM Complex activities may have caused an impact
- accept information and data inputs from various instruments and data sources (e.g. web services, real-time monitoring)
- provide alerts with respect to abatement or avoidance of potential issues and operational requirements based on outputs of the system and site specific management measures.

4.6.2 Components

It is proposed that the predictive and reactive air quality management system will include:

- a predictive component: using forecast weather data and dispersion modelling
- a reactive component: using real-time meteorology, air quality monitoring and dispersion modelling
- a non-steady state air quality dispersion model (that is capable of processing data at a sub-hourly time interval)
- short term tiered trigger levels and notifications for managing potential impacts
- a daily forecast report: providing information on temperature inversions, wind conditions at various heights, dust risk.

The system requires reliable and frequent data communications from monitoring equipment and weather stations and will be maintained and supported to ensure that the information it provides is reliable and as accurate as possible.

It is extremely important to maintain periodic review of any forecast and real-time air quality system to ensure that the system is operating using:

- validated meteorological forecasts
- data from calibrated monitoring equipment
accurate varying emission rates, informed by campaign monitoring where necessary
accurate emission source parameters, i.e. updated as the mine plan evolves.

4.6.3 Predictive forecast meteorology

It is proposed that a predictive forecast meteorology system be implemented based on the Weather Research & Forecasting (WRF) model and CALMET, specifically for the BTM Complex, and data be made available for each of the mine sites, with half hourly forecasts up to 48 hours in advance. This system will download meteorological data and forecasts on a daily basis and process and run the WRF model to produce the information required for input to a real-time 3D dispersion model.

As with any predictive forecast, confidence reduces with longer predictions, however the half hourly 48-hour forecasts will provide useful planning information for operations. The forecasts for the next 24-hour and 12-hour periods will provide more confidence in predictions for the day ahead and how weather may affect operations.

Within 12 months of this meteorological system being configured and operating and every 3 years after commencing, the outcomes will be subject to an evaluation by a competent meteorologist or atmospheric science professional against actual meteorological and dust measurements and the meteorological system and refinements to the predictive system made where appropriate. The scope of the evaluation will include a review of predictive forecast models and analysis of data outputs to assess the accuracy of the dispersion modelling compared against measured meteorological and air quality levels.

This system’s performance will be reviewed, including operating, reporting and accuracy performance every three months and validation reports will be produced.

Data from local automatic weather stations will be used to validate weather forecasting model performance over time.

Meteorological instrumentation or data communications equipment will be reviewed to confirm that the right quality of data is available to the system.

4.6.4 Integrated real-time monitoring data

To enable real-time reactive feedback from the system, a connection has been established to receive a data feed from weather stations and air quality monitoring equipment in the BTM Complex network.

These data feeds have been connected to the system from a central data repository and via a connection to loggers on infield monitors and weather stations using Wi-Fi and/or mobile networks to transfer data.

Real-time dust management capability builds on the information gained from predictive systems to proactively manage dust. The system will be improved further by incorporating real-time modelling and analysing modelled source contributions in real-time to identify the instantaneous main source of high emissions at specific locations around the operations. Protocols will be put in place to react to rising dust levels, e.g. automated notices sent to Open Cut Examiners to alert the need to respond with control/mitigation, and focus can be given to the most significant identified dust source in accordance with site specific management measures.

Real-time air quality monitoring data gathered from monitors will be used in the first instance to determine level of emissions and to manage dust generating activities from the operations. However, this data can
also be used to validate the air quality dispersion model predictions. Other monitoring data such as HVAS data may also be used for periodic validation.

4.6.5 Air quality dispersion model

The air quality dispersion model proposed for the BTM Complex will:
- be a 3 dimensional non-steady state model
- accommodate reliable, rapid-update data feed
- assimilate multiple data sources
- be accessible – for integration to a system
- be validated.

It is proposed that the BTM Complex system will use the WRF/CALMET/CALPUFF modelling system. CALMET is a meteorological pre-processor that provides the meteorological inputs required to run the CALPUFF dispersion model. It creates a fine resolution, three-dimensional meteorological field and includes a wind field generator that takes into account slope flows, terrain effects and terrain blocking effects. CALMET produces fields of wind components, air temperature, relative humidity, mixing height and other micro-meteorological variables for each time average step of the modelling.

CALPUFF is a multi-layer, multi-species non-steady state puff dispersion model that can simulate the effects of time and space varying meteorological conditions on pollutant transport, transformation and removal. The model contains algorithms for near-source effects such as building downwash, partial plume penetration, sub-grid scale interactions as well as longer-range effects such as pollutant removal, chemical transformation, vertical wind shear and coastal interaction effects. The model uses dispersion equations based on a Gaussian distribution of pollutants across the puff and takes account of complex arrangements of emissions from point, area, volume, and line sources.

Upper air data will be provided by the WRF system that automatically downloads global meteorological conditions and processes these to provide local information. This information is required to generate upper air meteorological data as well as a forecast meteorology prediction. CALMET will then be configured to use these weather data.

The CALPUFF model will be configured specifically for the BTM Complex operations and will use forecast meteorological data and real-time data from the ambient weather station network. Source emissions data will be configured and modelled in CALPUFF. Source emissions data will involve constant emission factors initially, and if considered appropriate, later improvements could include emission factors that are derived from ambient or campaign monitoring for significant sources.

4.7 Predictive and reactive triggers

Predictive and ‘near real-time’ reactive triggers will be configured in the system. These triggers will be initially set based on analysis of the available monitoring data, a review of the existing triggers at each site and experience from other similar operations where these systems are operating.
Predictive triggers will be set for typical meteorological conditions that are known to have adverse impacts on air quality due to dust generated during mining operations. Over time predictive triggers can be updated for conditions resulting in observed increases in dust impacts. The predictive triggers are incorporated into the daily dust risk forecast report. Reactive triggers will be set to alert operations when monitoring data for short term average periods indicate that the 24-hour air quality criteria may be reached at areas of relevant exposure. Short term triggers allow for proactive dust management to control 24-hour and ultimately annual average impacts based on measured shorter term average concentrations.

The monitoring data from the real-time monitors in the BTM Complex air quality monitoring network (i.e. e-samplers and TEOMs) will be assessed to determine if pre-defined trigger levels have been reached and when action is required.

Associated with each trigger level is a response which will inform the course of action taken by the relevant personnel. Two trigger levels are defined that require a response from the relevant personnel, as follows:

- investigation level
- action level.

An example of Investigation and Action trigger levels are shown in Table 4-1. These trigger levels have been set based on real-time monitoring data recorded at the Fairfax Public School. The relationship between peak 1-hour PM$_{10}$ concentrations and mean 24-hour PM$_{10}$ concentrations are analysed to determine the level of 1-hour PM$_{10}$ concentrations that may result in elevated 24-hour PM$_{10}$ concentrations.

<table>
<thead>
<tr>
<th>Action level</th>
<th>Trigger level</th>
<th>Description/action required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investigation</td>
<td>1-hour average PM$_{10}$ concentration above 100 µg/m$^3$</td>
<td>Relevant personnel are required to identify what activities are occurring and notify plant/equipment operators that dust emissions may be elevated and additional dust controls may need to be implemented. Preparatory measures will be implemented or ready to be implemented.</td>
</tr>
<tr>
<td>Action</td>
<td>Consecutive 1-hour average PM$_{10}$ concentration above 150 µg/m$^3$</td>
<td>Relevant personnel are required to implement controls such as additional water spraying or modifying work practices.</td>
</tr>
</tbody>
</table>

It is important to note that once the real-time air quality management system is operational, trigger levels will be reviewed, updated and refined following a review of the data and calibration of the system.

If the trigger levels are determined not appropriate to site operations, for example, there are too many or too few investigation or action responses, they will be reviewed and updated. Different trigger levels may be set for each monitoring location within the cumulative network. For example, they may be set higher for monitoring locations closer to dust sources. Trigger levels will also be regularly assessed as part of the ongoing review of this plan.

Actual predictive and reactive triggers will be reviewed regularly, and be based on the initial air quality data collected during commissioning of air quality monitoring equipment as well as ongoing monitoring results.

SMS and email alerts will be sent to relevant personnel and monitoring data will be displayed in near real-time on a customised web based reporting system.
Real-time dust management alerts are sent if the trigger conditions outlined above are met. The notification will also identify which criteria have triggered the alert.

Alerts will be sent when a new level is triggered, i.e. subsequent time periods that result in the same dust level will not generate multiple warnings. When the conditions increase to a higher alert level or when conditions return to a lower alert level, the system will send a new notification alerting all relevant personnel to the new dust management alert level.

All alerts are recorded by the system in an alert log that can be analysed at any time to identify trends or patterns in alerts that may lead to improvements in operational planning and/or dust control that is focussed on certain areas of operations or times of the day.

4.7.1 System outputs

Once the predictive and reactive system is implemented and configured as described above, a range of user interface, templates and reports will be able to be generated and used as part of standard operating procedures.

Some system outputs that will be required include:

- Daily forecast reports providing information on temperature inversions, wind conditions, dust risk, and recommended control actions.
- Graphical representation of the forecasted meteorology and real-time monitoring data via the system’s web interface.
- Capability to analyse and confirm the likely source(s) of dust and path(s) that the dust has travelled. This functionality is critical in apportioning responsibility to operations for mitigating emissions.

This analysis provides the modelled path of a parcel of air and alternative paths accounting for uncertainty. It provides an indication of the time that the plume will have travelled over a certain area, which may assist operations in pinpointing activities that were occurring at that time in the locations highlighted for investigation.

A source apportionment chart can also be generated from modelled predictions and monitoring data at a selected location.
5. Corrective and preventative actions

5.1 Process to identify main source of dust impacts

It is proposed that the reactive component of the dust management system will be designed to process real-time data from PM$_{10}$ monitors and weather stations. It will generate outputs (such as those outlined in Section 4.7.1) that are used with predetermined triggers to assess the potential for dust impacts from operations. The system will notify operators when triggers are activated. The system will be used to analyse and provide information on potential dust sources that are responsible for the increase in monitored dust.

For the BTM Complex, real-time monitors will be used to measure PM$_{10}$ concentrations at a number of locations around the operations (for example as shown in Figure 4-1 and AQGHGMPs). The dust monitoring data will be sent in short time steps to a web server where it will be processed by the air quality management system. Trigger levels will be set for the real-time monitors (i.e. TEOMs and portable samplers). As the system operates over time the trigger levels will be refined through consideration of historical data and any other relevant observations.

If a real-time monitor triggers an alert, the system will query the monitoring data to determine if mining operations are upwind of the triggered monitor. If so, it will be used to assess whether activities occurring between upwind and downwind monitors are creating an increased level of dust that has set off an alert. The system will use available weather data to determine the likely area of the operations that contains the dust generating source. This can be done by activating a reverse trajectory analysis of the plume that has triggered an alert.

Figure 5-1 shows a logic diagram for responding to an alert that has been triggered.

5.2 Mitigation

Processes to mitigate air quality outcomes associated with operations are addressed in each mine sites individual AQGHGMPs.

Operational activities will be ranked based on dust generation potential. Recent studies performed as part of responses to the Coal Mine Particulate Matter Control Best Practice Pollution Reduction Program have confirmed that the main dust source at coal mines is hauling on unsealed roads, followed by wind erosion from exposed areas, trucks loading and unloading and bulldozer operations, blasting and graders.

Each mines’ rankings will be used as the basis for scheduling operational activities or increasing dust control measures to mitigate risks when dust generation is predicted to reach trigger levels.

Dust generation assessment will be undertaken by experienced site personnel (e.g. OCE), with the assistance of various specialists (e.g. operations, environment and air quality specialists) as required.
Figure 5-1  Logic diagram for system response to triggered levels

Monitor triggers alert based on set concentration value or rate of increasing concentration

Is there a difference in concentrations between the upwind and downwind monitors

YES

Does wind direction indicate that mining operation is the source

NO

Sites to manage activities as per their respective AQMP’s

YES

Sites to manage activities as per their respective AQMP’s

NO

Analyse wind direction to determine upwind/downwind monitors

Use models in system to determine potential area of influence, eg. back trajectory analysis

Check all active sources within area of influence for potential major cause of increased dust

Determine most likely cause of alert based on this information

Determine most appropriate mitigation options based on potential cause of alert

Send SMS and/or email to designated personnel to implement mitigation options
5.3 Communication

Regular meetings will be held by nominated personnel representing each of the mines in the BTM Complex (at least quarterly) to discuss predictive model outcomes, monitoring results and future operational events. Meeting minutes will be documented and retained at each mine site.

The trigger levels will initiate automated system alerts to relevant personnel within the BTM Complex to allow the complex to implement management measures in order to reduce dust generation.

When air quality criteria are exceeded, discussions will be held within the BTM Complex, regulatory agencies and affected landholders (where an exceedance occurs on privately-owned land).

Reporting of air quality exceedances will also be made in accordance with relevant project approval conditions.

5.4 Reporting

External reporting will include:

- updates on individual company websites
- presentations to Community Consultative Committees (CCCs)
- reporting as required under each mine’s approvals.

5.5 Unpredicted contingency

Unpredicted events such as dust storms, bushfires, agricultural activities, hazard reduction burning or similar activities that influence dust levels will be identified and reported as impacting on air quality trigger levels on a case by case basis.

Where air quality triggers occur and are outside forecast predictions or unexpected from model inputs, and can’t be identified from specific source information from the BTM Complex operations, an air quality specialist will be consulted to investigate the cause of the impact. The specialist will refine the predictive model, and recommend appropriate action to address the outcomes of the unpredicted event.
6. Implementation

6.1 Staged approach

It is proposed that a staged approach will be taken to install the equipment and systems which are additional to individual mine’s existing air quality monitoring systems.

This proposed staged approach of implementation is detailed in Figure 6-1 below and in the following sections.

Figure 6-1 Staged approach to implementation
6.1.1 Stage 1 - Equipment acquisition, installation and commissioning

As detailed in Section 4.2, the real time monitoring network will include: 4 x real time PM$_{10}$ (TEOM) monitors, one with real time PM$_{2.5}$ (TEOM) capability (Fairfax School) and 4 x portable (e-sampler) PM$_{10}$ monitors.

The 4 x real-time portable PM$_{10}$ monitors will be acquired and commissioned at locations relevant to current mining operations, as part of the day to day management of real-time dust. An indicative layout of these monitors is also shown in Figure 4-1. The installation of these portable PM$_{10}$ monitors will be reviewed as part of Stage 2, to ensure they allow sufficient coverage to achieve the required monitoring goals. The configuration may change over time as each mining pit develops.

The central data repository will be created and the real time PM$_{10}$ monitors will be linked into the repository.

BCM, MCCM and TCM have all acquired, installed and commissioned meteorological stations.

Stage 1 equipment was installed and commissioned in April 2016.

6.1.2 Stage 2 - Review equipment and processes

Within three months of the installation, approval of the strategy and commissioning of Stage 1 equipment the following will be reviewed:

- performance and reliability of the cumulative air quality monitoring equipment
- triggers proposed in this protocol
- central data repository and data interface.

6.1.3 Stage 3 - Implement predictive modelling and management

The predictive modelling system is scheduled to have been acquired, installed and commissioned by the end July 2017.

This system’s performance will be reviewed every three months and validation reports will be produced.

6.1.4 Stage 4 - Publish webpages

Each mine site will maintain a Company webpage.

Continuous data collected by the real-time monitors will undergo preliminary data validity checks (for example, to identify outliers, negatives etc.). Each mines webpage will present summarised and validated real-time air quality results in respective Annual Reviews as the results from the staged implementation of the real-time air monitoring system are made available.

The Project Approval requirements to provide data from real-time monitors as described in each mines AQGHGMP, which include the publication of validated real-time monitoring data in a clearly understandable form, identification of mine operational responses to real-time monitoring data and weather forecasts and provision for on-line input by members of the community and regionally-based government regulators.
7. **Document control**

This cumulative air quality management strategy has been developed with the input of representatives of BCM, TCM and MCCM.

7.1 **Review and revision**

In accordance with the project approvals, the AQMS will also be reviewed within three months of:

- an annual review
- incident threatening material harm, requiring notification of the Secretary / relevant agencies
- statutory audit, and
- modification of project approval.

In addition this Strategy will be reviewed, and if required revised, pending the outcomes of the EPA regional network decision, refer section 4.3.
8. References


Project Approval (PA 09_0182) for Boggabri Coal Mine.

Project Approval (PA 10_0138) for Maules Creek Coal Mine.

Project Approval (PA 11_0047) for Tarrawonga Coal Mine.

Tarrawonga Coal Mine, 2015. Air Quality and Greenhouse Gas Management Plan
Appendix A

Requirements of Project Approvals
Table A.1 Project Conditions from Project Approval for Boggabri Coal Mine (Application No. 09-0182), July 2012.

<table>
<thead>
<tr>
<th>Applicable Condition</th>
<th>Requirement</th>
<th>BCM Plan/BTM Complex Strategy</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schedule 3 Condition 23</td>
<td>Unless otherwise authorised by an EPL, the Proponent shall ensure that no offensive odours are emitted from the site, as defined under the POEO Act</td>
<td>AQGHGMP</td>
<td>5.1 to 5.6</td>
</tr>
<tr>
<td>Schedule 3 Condition 24</td>
<td>The Proponent shall implement all reasonable and feasible measures to minimise the release of greenhouse gas emissions from the site</td>
<td>AQGHGMP</td>
<td>5.1 to 5.6</td>
</tr>
<tr>
<td>Schedule 3 Condition 25</td>
<td>Upon receiving a written request for acquisition from an owner of the land listed in Table 7, Boggabri Coal shall acquire the land in accordance with the procedures in the Project Approval Schedule 4 Condition 8 and 9.</td>
<td>AQGHGMP</td>
<td>5.7</td>
</tr>
<tr>
<td>Schedule 3 Condition 26</td>
<td>Upon receiving a written request from the owner of any residence on the land listed in Table 7 or the land listed in Table 8, the Proponent shall implement additional air quality mitigation measures (such as air filters, a first flush roof water drainage system and/or air conditioning) at the residence in consultation with the owner. These measures must be reasonable and feasible and directed towards reducing the air quality impacts of the project on the residence. If within 3 months of receiving this request from the owner, the Proponent and the owner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Director-General for resolution.</td>
<td>AQGHGMP</td>
<td>5.6</td>
</tr>
<tr>
<td>Schedule 3 Condition 26</td>
<td>The Proponent shall ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the development do not exceed the criteria listed in Tables 6, 7 or 8 at any residence on privately-owned land or on more than 25 percent of any privately-owned land.</td>
<td>AQGHGMP</td>
<td>4.2, 5.1-5.6, 6.1-6.3</td>
</tr>
<tr>
<td>Schedule 3 Condition 27</td>
<td>Except for the air quality affected land in Table 7, the Proponent shall ensure that particulate matter emissions generated by the project do not exceed the criteria listed in Table 9, Table 10 and Table 11 at any residence on privately owned land or on more than 25 percent of any privately-owned land.</td>
<td>AQGHGMP</td>
<td>4.2</td>
</tr>
<tr>
<td>Schedule 3 Condition 28</td>
<td>Boggabri Coal shall ensure that particulate matter emissions generated by the project do not exceed the criteria listed in Tables 4-1, 4-2 and 4-3, at any occupied residence on any mine owned land (including land owned by adjacent mines) unless: (a) all reasonable and feasible avoidance and mitigation measures have been employed to prevent exceedance of the criteria (b) the tenant, and landowner (where owned by a mine other than Boggabri Coal), has been notified of health risks in accordance with the notification requirements under Schedule 4 of the Project Approval (c) the tenant on project owned land can terminate their tenancy agreement without penalty, subject to giving reasonable notice, and Boggabri Coal uses its best endeavours to provide assistance with relocation and</td>
<td>AQGHGMP</td>
<td>4.2</td>
</tr>
<tr>
<td>Applicable Condition</td>
<td>Requirement</td>
<td>BCM Plan/BTM Complex Strategy</td>
<td>Section</td>
</tr>
<tr>
<td>----------------------</td>
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</tr>
<tr>
<td></td>
<td>sourcing of alternative accommodation (d) air mitigation measures such as air filters, a first flush roof water drainage system and/or air conditioning are installed at the residence, if requested by the tenant and landowner (where owned by a mine other than Boggabri Coal)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(e) particulate matter air quality monitoring is undertaken to inform the tenant and landowner (where owned by a mine other than Boggabri Coal) of potential health risks</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(f) the monitoring data are provided to the tenant in an appropriate format, for a medical practitioner to assist the tenant in making an informed decision on the health risks associated with occupying the property, to the satisfaction of the Director-General.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schedule 3 Condition 29</td>
<td>If particulate matter emissions generated by Boggabri Coal exceed, or contribute to an exceedance of the relevant cumulative criteria, in Table 12, 13 or 14 at any residence on privately-owned land or on more than 25 percent of any privately-owned land, then upon receiving a written request for acquisition from the landowner, the Applicant shall acquire the land in accordance with the procedures in Project Approval Conditions 8 and 9 of Schedule 4.</td>
<td>AQGHGMP</td>
<td>4.2 and 5.7</td>
</tr>
<tr>
<td>Schedule 3 Condition 30</td>
<td>The Proponent shall: (a) implement best management practice to minimise the odour, fume and dust emissions of the project, including best practice coal loading and profiling and other measures to minimise dust emissions from coal transportation by rail (b) operate a comprehensive air quality management system onsite that uses a combination of predictive meteorological forecasting, predictive and real time air dispersion modelling and real-time air quality monitoring data to guide the day to day planning of mining operations and implementation of both proactive and reactive air quality mitigation measures to ensure compliance with the relevant conditions of the project approval (c) manage PM2.5 levels in accordance with the requirements of the EPL (d) minimise the air quality impacts of the project during adverse meteorological conditions and extraordinary events (e) minimise any visible air pollution (f) minimise the surface disturbance of the site generated by the project (g) co-ordinate the air quality management onsite with the air quality management at other mines within the Leard Forest Mining Precinct (Tarrawonga and Maules Creek) to minimise the cumulative air quality impacts of the mines, to the satisfaction of the Director-General.</td>
<td>AQGHGMP</td>
<td>5.1 to 5.6</td>
</tr>
<tr>
<td>Schedule 3 Condition 31</td>
<td>The Proponent shall prepare and implement an Air Quality and Greenhouse Gas Management Plan for the project to the satisfaction of the Director-General. This plan must: (a) be prepared in consultation with the EPA and CCC, and be submitted to the Director-General for approval within 6 months from the date of project approval (b) integrate the recommendations of a Site Specific Best Management Determination and Reactive Dust</td>
<td>AQGHGMP</td>
<td>Whole AQGHGMP Document</td>
</tr>
<tr>
<td>Applicable Condition</td>
<td>Requirement</td>
<td>BCM Plan/BTM Complex Strategy</td>
<td>Section</td>
</tr>
<tr>
<td>----------------------</td>
<td>-------------</td>
<td>-------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Management Strategy prepared to the satisfaction of the EPA</td>
<td>(c) describe the measures that would be implemented to ensure:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>‣ best management practice is being employed, consistent with the development of the site specific best management determination and reactive dust management strategy</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>‣ the air quality impacts of the project are minimised during adverse meteorological conditions and extraordinary events</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>‣ compliance with the relevant conditions of this consent.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(d) describe the proposed air quality management system</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(e) include a risk/response matrix to codify mine operational responses to varying levels of risk resulting from weather conditions and specific mining activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(f) include commitments to provide summary reports and specific briefings at CCC meetings on issues arising from air quality monitoring</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(g) include an air quality monitoring program that:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>‣ uses a combination of real-time monitors and supplementary monitors to evaluate the performance of the project</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>‣ adequately supports the proactive and reactive air quality management system</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>‣ includes PM$_{2.5}$ monitoring</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>‣ includes monitoring of occupied project-related residences and residences of air-affected land listed in Table 7 and Table 8, subject to the agreement of the tenant or landowner</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>‣ evaluates and reports on the effectiveness of the air quality management system</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>‣ includes a protocol for determining any exceedances of the relevant conditions in this approval.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schedule 3 Condition 31</td>
<td>(h) includes a Leard Forest Mining Precinct Air Quality Management Strategy that has been prepared in consultation with other coal mines in the Precinct to minimise the cumulative air quality impacts of all mines within the Precinct, that includes:</td>
<td>AQMS</td>
<td>Whole AQMS Document</td>
</tr>
<tr>
<td></td>
<td>‣ systems and processes to ensure that all mines are managed to achieve their air quality criteria</td>
<td>AQMS</td>
<td>Whole AQMS Document</td>
</tr>
<tr>
<td></td>
<td>‣ a shared environmental monitoring network and data sharing protocol</td>
<td>AQMS</td>
<td>Section 4.2</td>
</tr>
<tr>
<td></td>
<td>‣ control monitoring site(s) to provide real time data on background air quality levels (i.e. not influenced by mining from the Leard Forest Mining Precinct and representative of regional air quality)</td>
<td>AQMS</td>
<td>Section 4.1 and 4.2</td>
</tr>
<tr>
<td></td>
<td>‣ a shared predictive and real time air dispersion model covering the Leard Forest Mining Precinct to be used for assessment of cumulative impacts, optimising location of the shared real-time monitoring network, validation of air predictions and optimising mitigation measures</td>
<td>AQMS</td>
<td>Section 4.6</td>
</tr>
<tr>
<td></td>
<td>‣ procedures for identifying and apportioning the source/s</td>
<td>AQMS</td>
<td>Section 5.1</td>
</tr>
</tbody>
</table>
and contribution/s to cumulative air impacts for both mines and other sources, using the air quality and meteorological monitoring network and appropriate investigative tools such as the modelling of post incident plume dispersion, dual synchronised monitors and chemical methods of source apportionment.

Maules Creek Mine

Table A.2  Project Conditions from Project Approval for Maules Creek Coal Project (Application No. 10_0138), July 2012.

<table>
<thead>
<tr>
<th>Applicable Condition</th>
<th>Requirement</th>
<th>BCM Plan/BTM Complex Strategy</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schedule 3 Condition 34 (g)</td>
<td>(The Proponent shall prepare and implement an Air Quality and Greenhouse Gas Management Plan for the project to the satisfaction of the Director-General. This plan) includes a Leard Forest Mining Precinct Air Quality Management Strategy that has been prepared in consultation with other coal mines in the Precinct to minimise the cumulative air quality impacts of all mines within the Precinct, that includes:</td>
<td>AQMS Whole AQMS Document</td>
<td>Section 4.1 and 4.2</td>
</tr>
<tr>
<td></td>
<td>▪ systems and processes to ensure that all mines are managed to achieve their air quality criteria</td>
<td>AQMS Whole AQMS Document</td>
<td>Section 4.2</td>
</tr>
<tr>
<td></td>
<td>▪ a shared environmental monitoring network and data sharing protocol</td>
<td>AQMS Whole AQMS Document</td>
<td>Section 4.6</td>
</tr>
<tr>
<td></td>
<td>▪ control monitoring site(s) to provide real time data on background air quality levels (i.e. not influenced by mining from the Leard Forest Mining Precinct and representative of regional air quality)</td>
<td>AQMS Whole AQMS Document</td>
<td>Section 4.1 and 4.2</td>
</tr>
<tr>
<td></td>
<td>▪ a shared predictive and real time air dispersion model covering the Leard Forest Mining Precinct to be used for assessment of cumulative impacts, optimising location of the shared real time monitoring network, validation of air predictions and optimising mitigation measures</td>
<td>AQMS Whole AQMS Document</td>
<td>Section 5.1</td>
</tr>
<tr>
<td></td>
<td>▪ procedures for identifying and apportioning the source/s and contribution/s to cumulative air impacts for both mines and other sources, using the air quality and meteorological monitoring network and appropriate investigative tools such as the modelling of post incident plume dispersion, dual synchronised monitors and chemical methods of source apportionment (where possible).</td>
<td>AQMS Whole AQMS Document</td>
<td></td>
</tr>
</tbody>
</table>

Tarrawonga Coal Mine

Table A.3  Project Conditions from Project Approval for Tarrawonga Coal Project (Application No. 11_0047), January 2013.

<table>
<thead>
<tr>
<th>Applicable Condition</th>
<th>Requirement</th>
<th>BCM Plan/BTM Complex Strategy</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schedule 3</td>
<td>The Proponent shall prepare and implement an Air Quality and Greenhouse Gas Management Plan for the project to the</td>
<td>AQMS Whole AQMS Document</td>
<td></td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Applicable Condition</th>
<th>Requirement</th>
<th>BTM Complex Strategy</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition 29 (g)</td>
<td>satisfaction of the Director-General. This plan must: (g) include a Leard Forest Mining Precinct Air Quality Management Strategy that has been prepared in consultation with other coal mines in the Precinct to minimise the cumulative air quality impacts of all mines within the Precinct, that includes:</td>
<td>AQMS</td>
<td>Document</td>
</tr>
</tbody>
</table>

- systems and processes to ensure that all mines are managed to achieve their air quality criteria
- a shared environmental monitoring network and data sharing protocol
- control monitoring site(s) to provide real time data on background air quality levels (i.e. not influenced by mining from the Leard Forest Mining Precinct and representative of regional air quality)
- a shared predictive and real time air dispersion model covering the Leard Forest Mining Precinct to be used for assessment of cumulative impacts, optimising location of the shared real time monitoring network, validation of air predictions and optimising mitigation measures
- procedures for identifying and apportioning the source/s and contribution/s to cumulative air impacts for both mines and other sources, using the air quality and meteorological monitoring network and appropriate investigative tools such as the modelling of post incident plume dispersion, dual synchronised monitors and chemical methods of source apportionment (where possible). |
Appendix C
Comparison with EPA Best Practice

A comparison to EPA Best Practice was undertaken. Please refer to the Katestone Dust Benchmarking Study available via the EPA website accessible via https://www.epa.nsw.gov.au/your-environment/air/regional-air-quality/namoi-air-quality-monitoring-project/maules-creek-monitoring-station/mauls-creek-coal-mine-dust-study
## Appendix D Risk Response Matrix

<table>
<thead>
<tr>
<th>Activity</th>
<th>Level 1 - Information</th>
<th>Level 2 - Investigation</th>
<th>Level 3 - Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hauling on Unsealed Roads</strong></td>
<td>Monitoring results below triggers</td>
<td>1-hour average PM10 above 100μg/m³ (hourly wind speed &gt; 6m/s)</td>
<td>Consecutive 1-hour average PM10 above 100μg/m³ (hourly wind speed &gt; 6m/s)</td>
</tr>
<tr>
<td><strong>Wind Erosion on Exposed Areas &amp; Overburden Emplacements</strong></td>
<td>Minimise pre-stripe and disturbed areas. Vegetative cover on long term topsoil stockpiles Progressively vegetate on final shaped topsoiled dumps. Limit vehicle access to areas.</td>
<td>Review operations. Modify operations on exposed areas.</td>
<td>Watering of active dump travel routes and topsoil stripping. Modify activities on exposed areas.</td>
</tr>
<tr>
<td><strong>Loading and Dumping of Overburden</strong></td>
<td>Minimise loading height. Awareness of material type.</td>
<td>Review operations. Identify specific sources &amp; locations of dust generation. Identify topographic location of operating equipment. Assess loading height and rate.</td>
<td>Implement mitigation options such as low loading and slowed loading rate. Utilise lower RLS for dumping. Water application by water cart of loading area.</td>
</tr>
<tr>
<td><strong>Loading and dumping of Coal</strong></td>
<td>Minimise dump height. Bypass ROM stockpiles and direct to hooper where possible. Water sprays active on ROM bin (coal moisture dependent). Three sided and roofed enclosure of ROM bin. Water cart route includes ROM circuit.</td>
<td>Identify dust sources &amp; prepare for modification activities.</td>
<td>Modify loading and dumping activity.</td>
</tr>
<tr>
<td><strong>Blasting and Drilling</strong></td>
<td>Blast scheduling to avoid unfavourable weather conditions. Use of water sprays for dust suppression while drilling. Minimise disturbance of drill cuttings.</td>
<td>Refer TARP of Blast Management Plan for Blasting limits. Identify dust levels if below drill deck. Identify material type.</td>
<td>Avoid blasting. Modify drilling activities. Water application to drill areas.</td>
</tr>
<tr>
<td><strong>Conveyors and Transfer</strong></td>
<td>Application of water at transfers. Transfer point covers. Belt cleaning and spillage minimisation.</td>
<td>Identify dust source locations.</td>
<td>Increased water application rates. Modify throughput.</td>
</tr>
<tr>
<td><strong>Stacking and Reclaiming product coal</strong></td>
<td>Variable stacking height. Water sprays on stacker point tip and product stockpiles. Inherent product moisture.</td>
<td>Identify locations of dust generation. Plan for operational changes.</td>
<td>Modify stacking and/or reclaiming activities.</td>
</tr>
<tr>
<td><strong>Train load out and transport</strong></td>
<td>Maintain a consistent load size and profile in wagon. Loading train wagon within enclosure.</td>
<td>Identify any dust sources from loading.</td>
<td>Adjust rate of loading</td>
</tr>
</tbody>
</table>