AIR QUALITY & GREENHOUSE GAS MANAGEMENT PLAN

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1	0.	Draft for Consultation	R. Kellaghan (PAEHolmes)	Daniel Martin	November 2012
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1.0 INTRODUCTION

1.1 Background

The Maules Creek Coal Project (the Project) is an open-cut coal mine located on the northwest slopes and plains of NSW, approximately 18 km northeast of Boggabri.

This Air Quality and Greenhouse Gas Management Plan (AQGHGMP) describes strategies for minimising and managing air quality (AQ) and greenhouse gas (GHG) emissions for the Project, including potential cumulative issues that could be caused by dust emissions from neighbouring mining operations and the Project.

The purpose of this document is to:

- Address the requirements of the Project Approval (PA) 10_0138 for the Maules Creek Coal Project, 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 Environmental Management Strategy for the Project. It will form the basis behind the management of AQ and GHG emissions from the Project.

1.2 Project Description

The Project Approval allows for the construction and operation of an open cut coal mine, with the recovery of up to 13 Mtpa Run of Mine (ROM) coal until end of December 2032.

Key aspects of the approval are:

- Open cut mining operation extracting up to 13 Mtpa 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;
- CHPP with a throughput capacity of 13 Mtpa ROM coal;
- Tailings Drying Area;

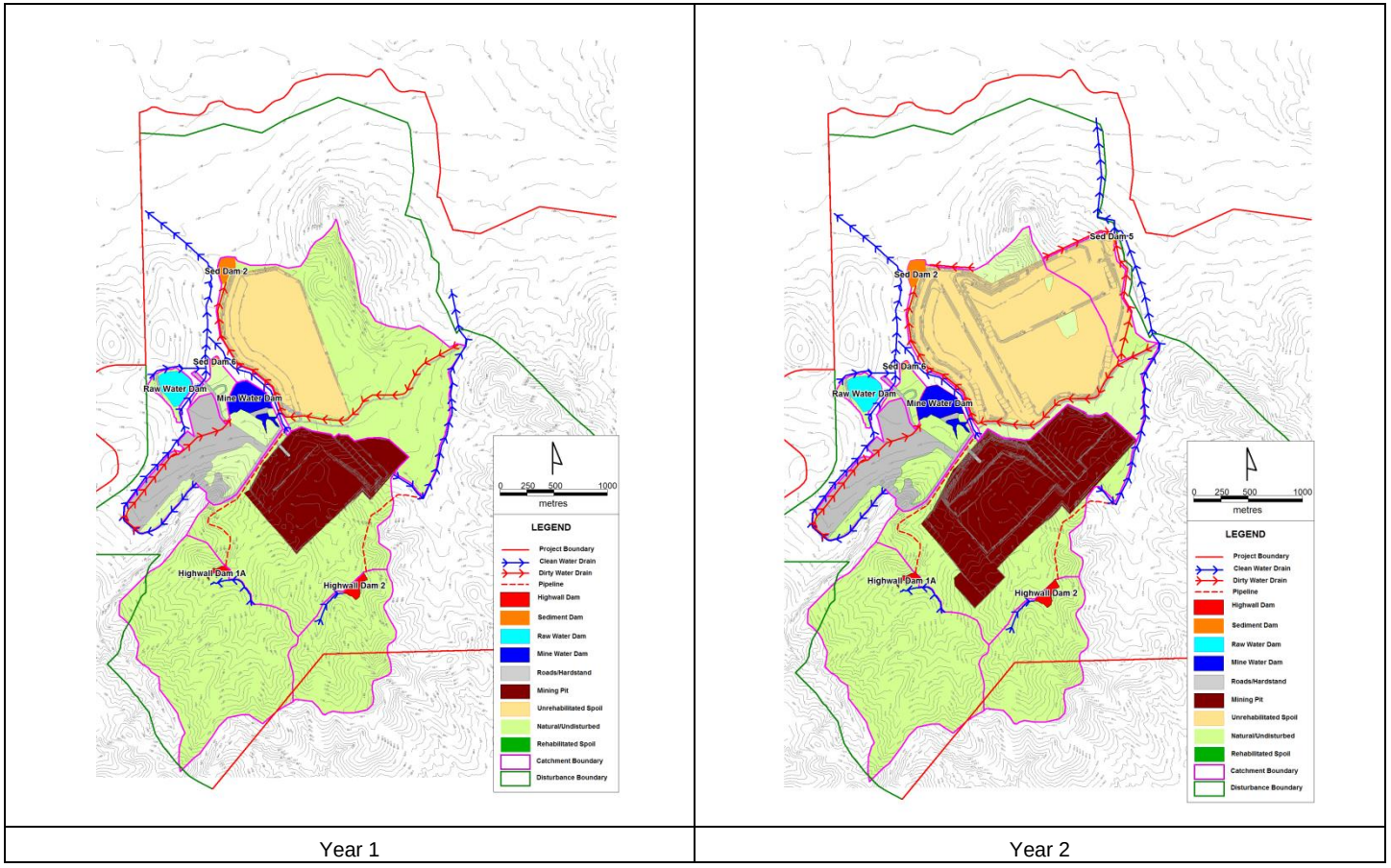
- Rail spur, rail loop, associated load out facility and connection to the Werris Creek to Mungindi Railway Line;
- Mine Access Road; and
- Administration, workshop and related facilities.

Snapshots of mines plans during the first five years of the Project are provided in **Figure 1** and **Figure 2.** The figures give an indication of the locations of dust generating activities (active mining, overburden emplacement, etc) for these initial mining periods.

Figure 3 presents an overview of the construction works, including works associated with a modification sought for the construction of a transmission line and a minor realignment to the approved CHPP.

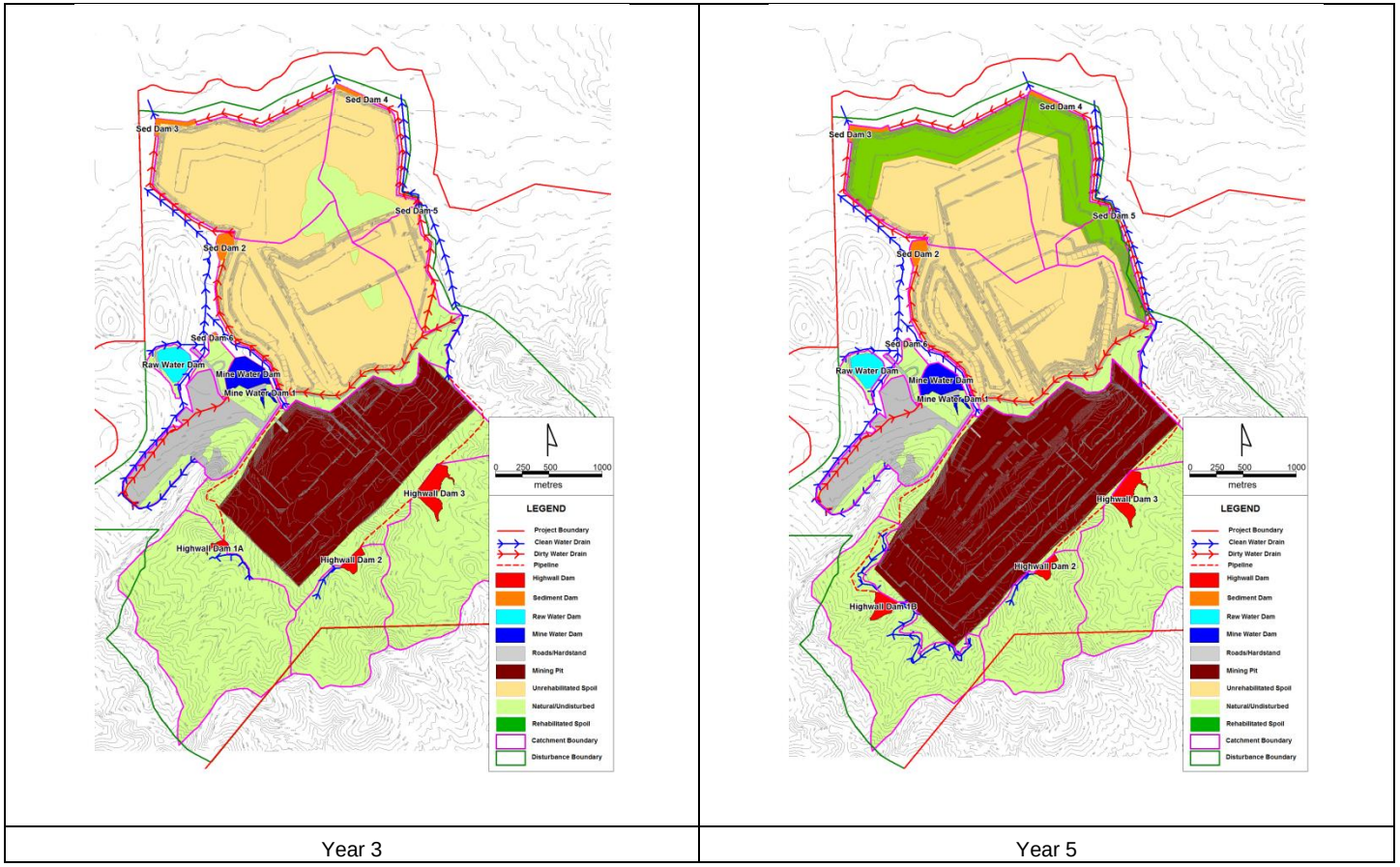
The relevant dust control and management measures for construction, including the modification works are outlined in **Section 3.1**. Construction works on the components subject to the modification will not commence until approval of the modification has been granted. This management plan will also be updated, as required following determination of the modification.

The construction and operation of the shared rail spur line is managed under the approval of the Boggabri Coal Mine.



Year 1	Year 2

Figure 1: Conceptual Mine Plans – Years 1 and 2



Year 3 | Year 5

Figure 2: Conceptual Mine Plans – Years 3 and 5

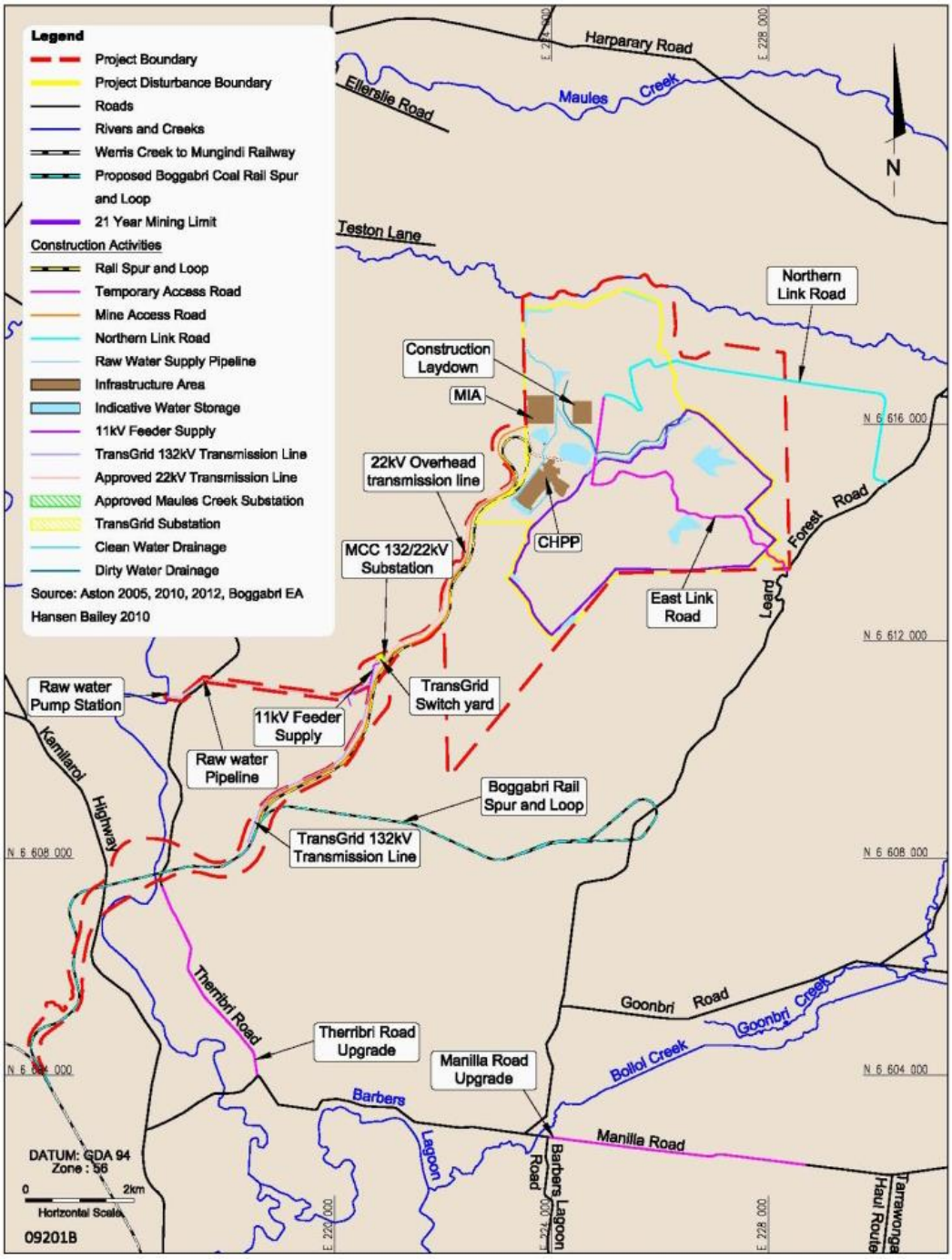


Figure 3: Construction Overview

1.3 Location

The Project is located on the northwest slopes and plains of NSW, approximately 18 km northeast of Boggabri. Further afield are the regional centres of Narrabri and Gunnedah approximately 35 km and 55 km from the Project respectively. The regional setting of the Project is shown in **Figure 4**.

Land-use in the local area is dominated by 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 south, 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. The locations sensitive receptors in the vicinity of Project is shown in **Figure 5**.

A tabulated summary of the sensitive receptors is provided in **Appendix A**.

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 form part of the National Parks and State Forests found within the region. To the south of the Project is the Gunnedah basin, with an altitude of 250 m AHD.

Figure 4: Regional Setting

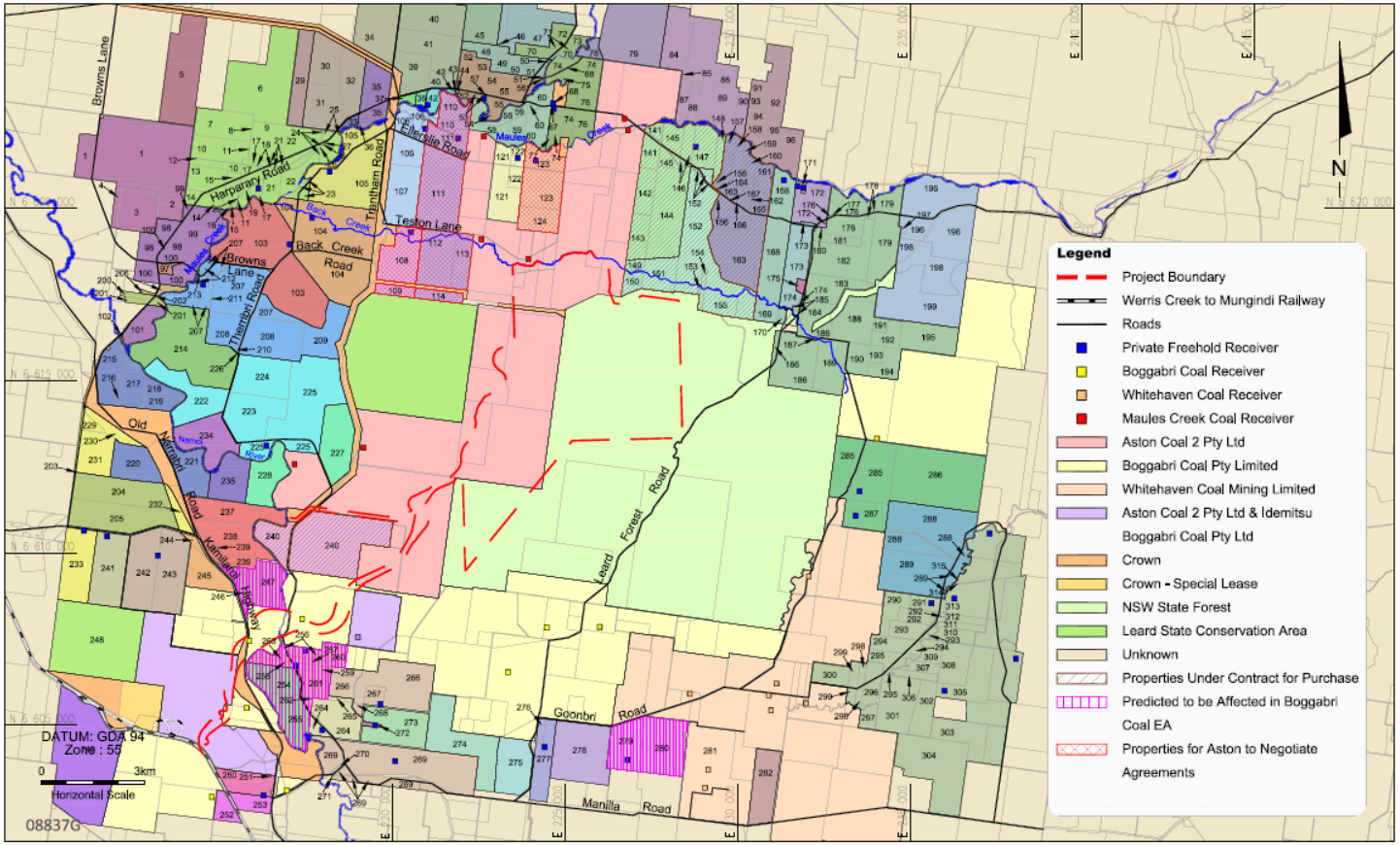


Figure 5: Land Ownership Overview

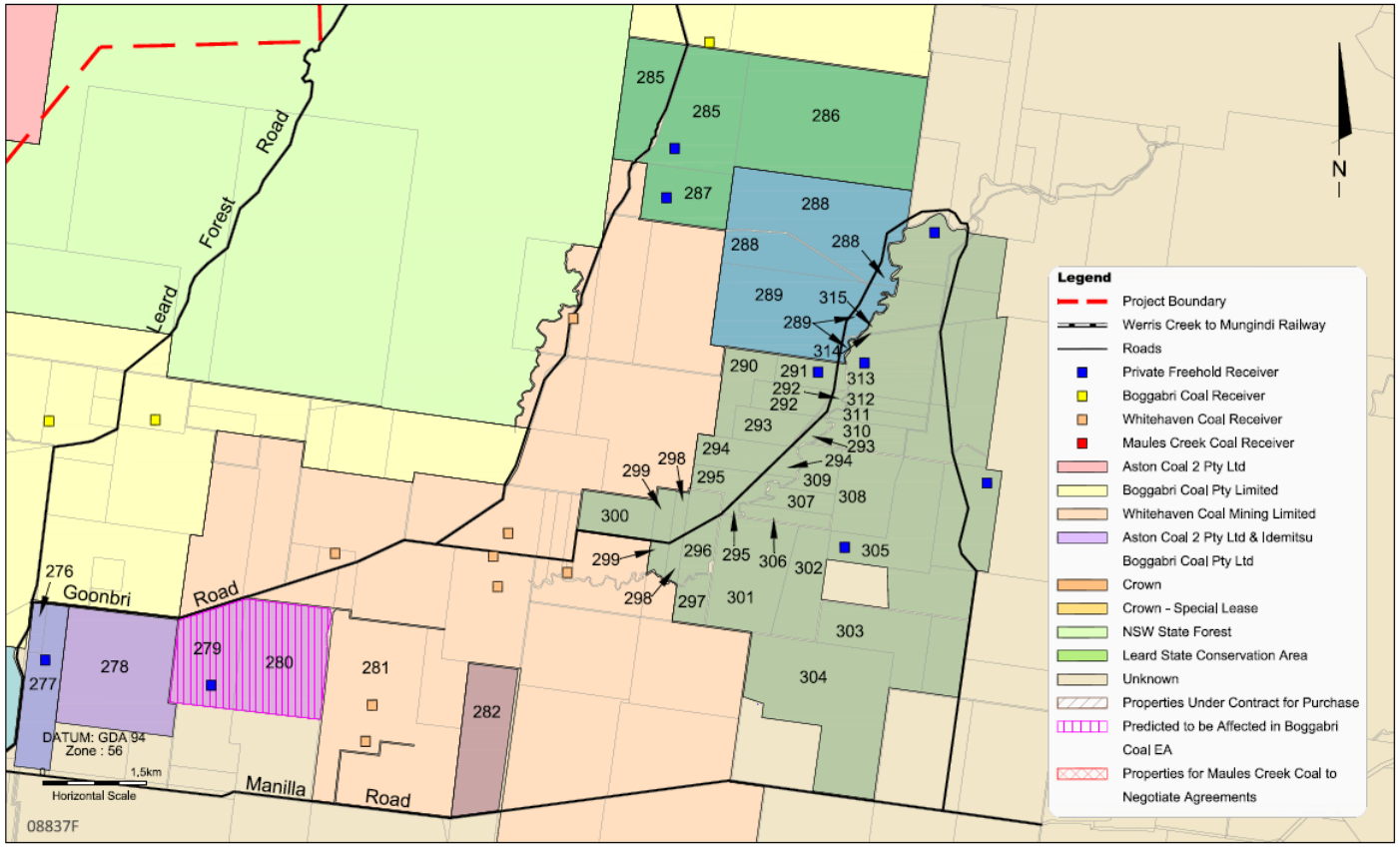


Figure 6: Land Ownership (Northeast)

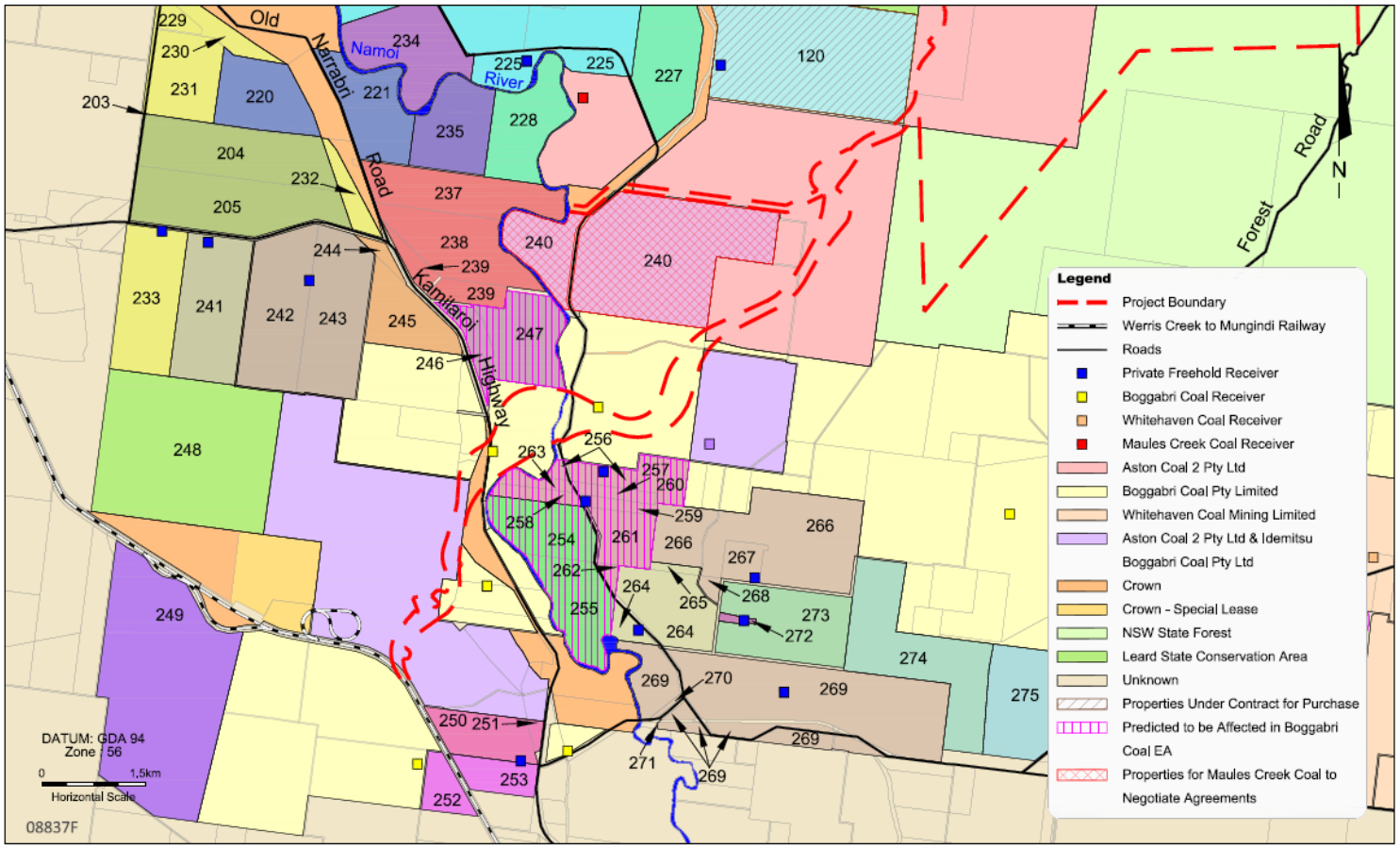


Figure 7: Land Ownership (Northwest)

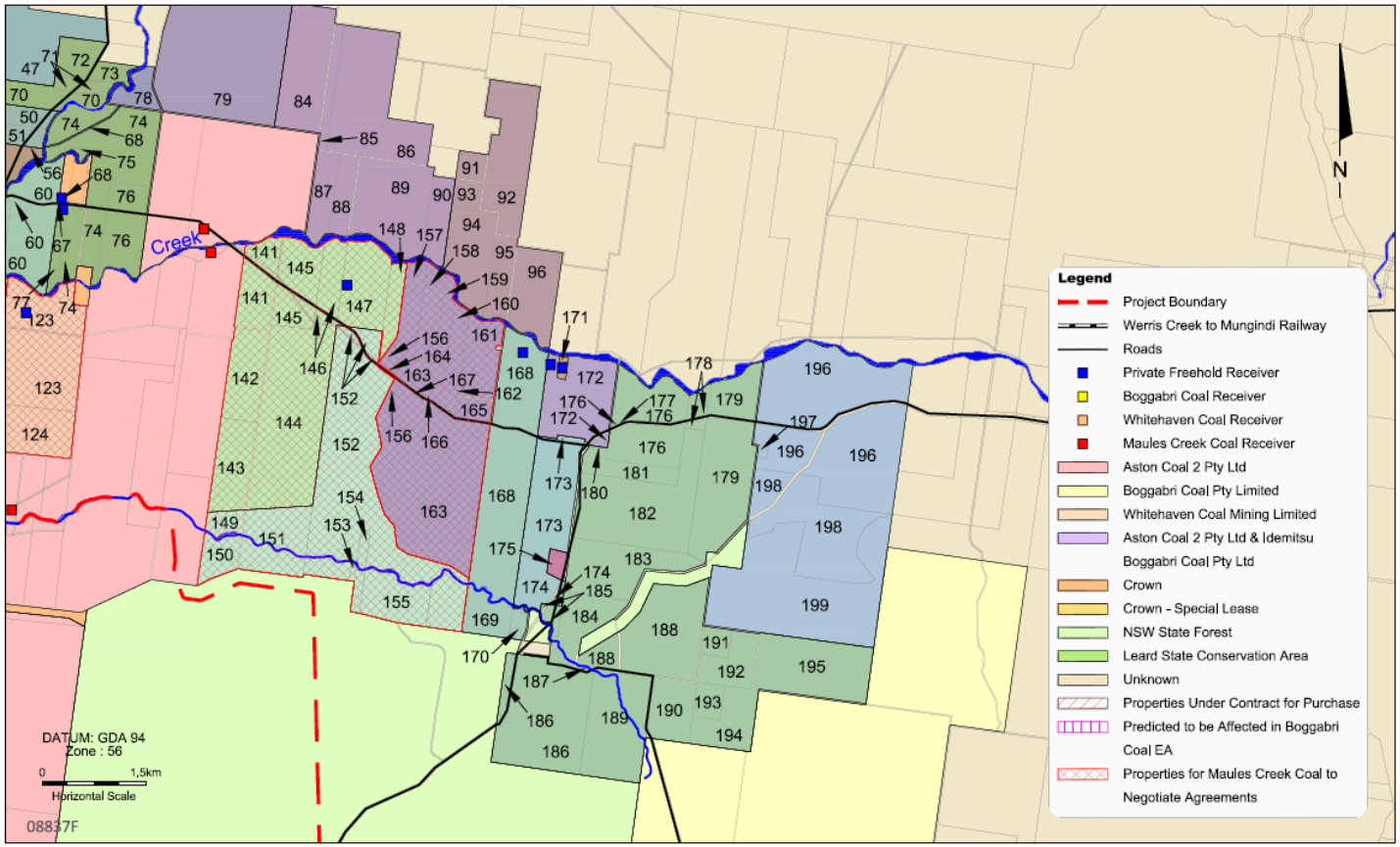


Figure 8: Land Ownership (Southeast)

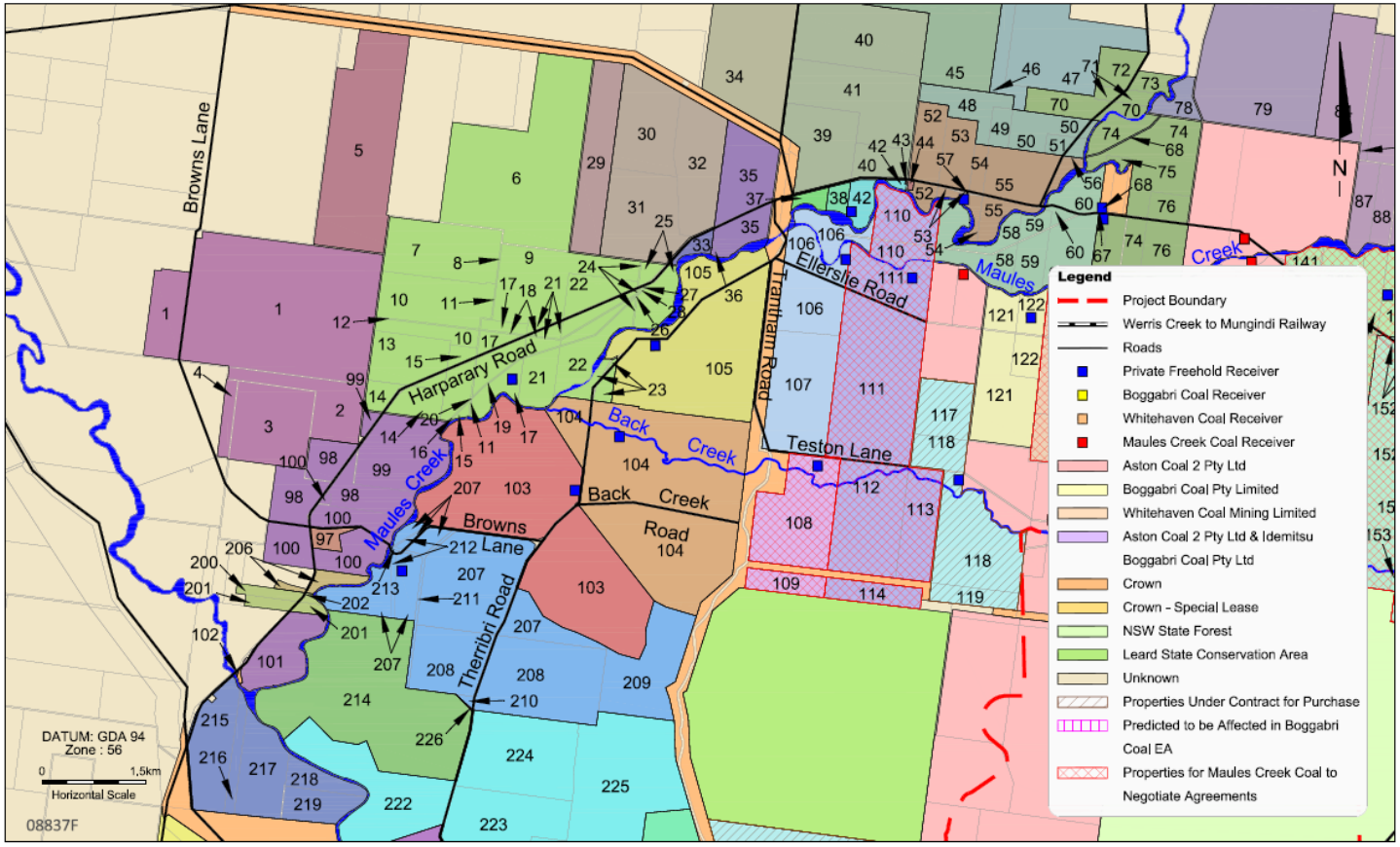


Figure 9: Land Ownership (Southwest)

1.4 Existing Environment

1.4.1 Meteorological 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 Project 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 location of the AWS will be reviewed following the establishment of site infrastructure and operational areas. The parameters measured are presented in **Table 1.1**.

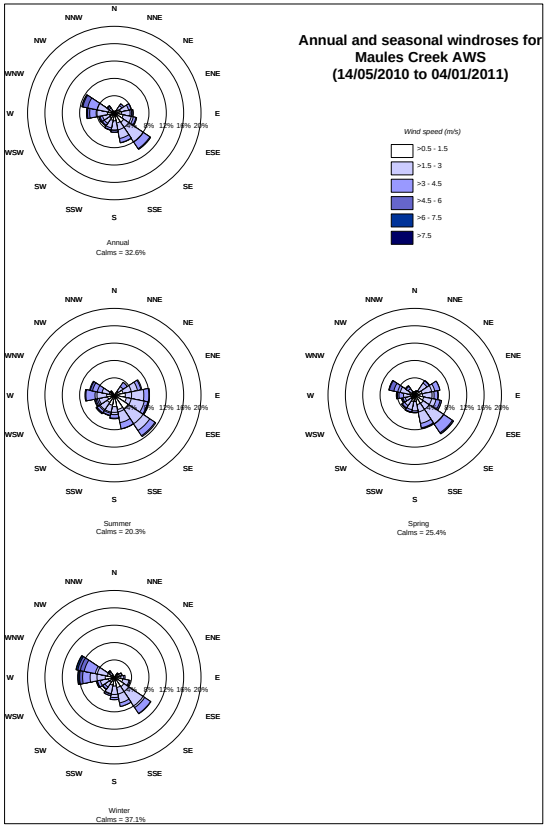
Table 1.1: Weather Station Parameters

Parameter	Unit	Frequency	Averaging Period
Rainfall	mm	Continuous	1 hour
Temperature @ 2m	OC		15 Minute
Temperature @ 10m	OC		
Wind Speed @ 10 m	m/s		
Wind Direction @ 10 m	Degrees		
Sigma Theta	Degrees		
Solar Radiation	W/m2		

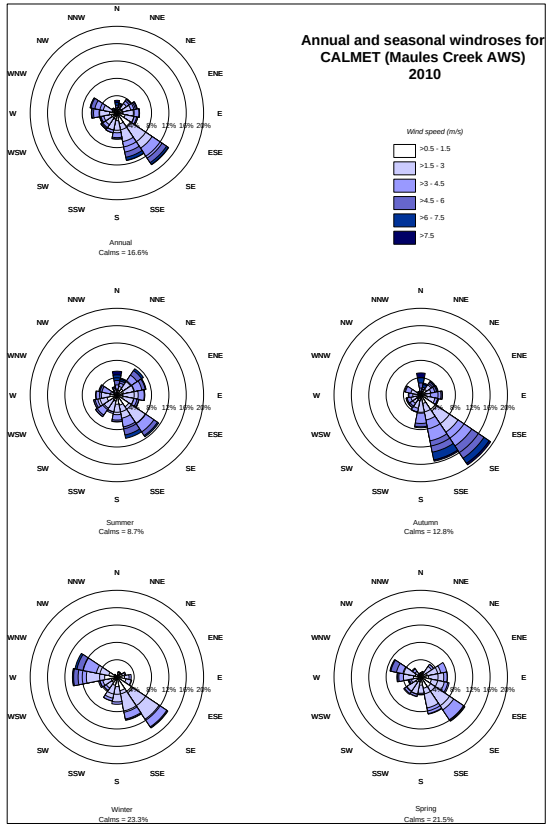
The existing weather station records sigma theta which can be subsequently used to derive stability class and inversion strength in accordance with the NSW Industrial Noise Policy (as required by condition 35 (b)). Daily reports of inversion strength will also be provided by the forecast meteorological system discussed in **Section 0**.

A wind rose for calendar year 2011 is presented in **Figure 10** and compared with the data available at the time and presented in the EA. Also presented in **Figure 10** and are wind roses for the CALMET meteorological model for the year 2010, which was used to predict dust concentrations in the EA. The meteorological data used in the EA are comparable with the dataset for 2011.

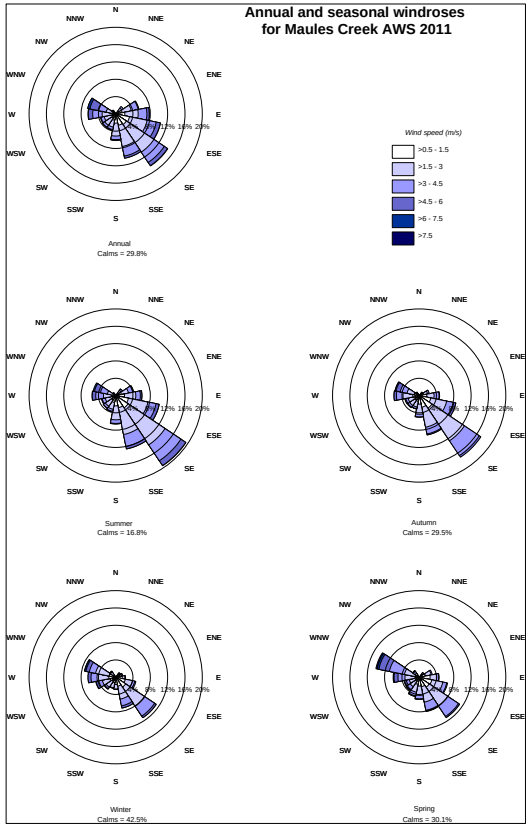
On an annual basis, the most common winds are from the southeast and northwest quadrants. During summer and autumn winds from the southeast dominate. During winter and spring, winds most commonly occur from the southeast and west-northwest.



Windrose of Maules Creek AWS data presented in EA



Windrose for CALMET model (2010) presented in EA



Windrose for Maules Creek AWS data for 2011

Figure 10: Windrose for Maules Creek AWS

1.4.2 Ambient Air Quality Criteria

Ambient air quality is assessed against NSW EPA impact assessment criteria (outlined in the NSW DECC (2005)) and the National Environment Protection Measure for Ambient Air Quality (referred to as the Ambient Air-NEPM (NEPC, 1998)). The NSW EPA criteria include annual averaging periods for PM_{10}, which are not included in the Ambient Air-NEPMs, and also references to other measures of air quality, namely dust deposition and total suspended particulate matter. In May 2003, NEPC released a variation to the NEPM (NEPC, 2003) to include advisory reporting standards for $PM_{2.5}$.

Table 1.2 summarises the air quality goals for concentrations of PM that are relevant to this plan.

Table 1.2: Air quality standards / goals for PM concentrations

Pollutant	Averaging period	Standard / Goal	Agency
Total suspended particulate matter (TSP)	Annual mean	90 μg/m3	NHMRC
Particulate matter with an equivalent aerodynamic diameter less than 10 μm (PM_{10})	24-hour maximum	50 μg/m3	NSW DECCW impact assessment criteria; NEPM reporting goal, allows five exceedances per year for bushfires and dust storms;
	Annual mean	30 μg/m3	NSW DECCW impact assessment criteria;
Particulate matter with an equivalent aerodynamic diameter less than 2.5 μm ($PM_{2.5}$)	24-hour maximum	25 μg/m3	NEPM advisory reporting standard
	Annual mean	8 μg/m3	

Notes: $\mu g/m^3$ – micrograms per cubic metre, μm – micrometre;

In addition to potential health impacts, airborne dust also has the potential to cause nuisance effects by depositing on surfaces. **Table 1.3** shows the maximum acceptable increase in dust deposition over the existing dust levels from an amenity perspective.

Table 1.3: Criteria for dust (insoluble solids) fallout

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
Deposited dust	Annual	2 g/m2/month	4 g/m2/month

The criteria in **Table 1.2** and **Table 1.3** are consistent with the Project Approval conditions outlined in **Section 2.1**.

1.4.3 Ambient Air Quality Data

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 **Figure 11**.

Baseline dust deposition monitoring is generally below the air quality goals. The exception is 2010 when MC03 recorded 4.6 g/m^2/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 PM_{10} High Volume Air Sampler (HVAS) commenced monitoring in October 2010, run on a one day in six cycle. The 24-hour PM10 concentrations are presented in **Figure 12**. Between November 2010 and September 2013 there have been three occasions when the ambient air quality is greater than the 24-hour PM_{10} concentration of 50 µg/m^3. The annual average PM_{10} are shown in **Table 1.4.**

Table 1.4: Annual Average PM_{10} (Tralee HiVol)

Year	PM_{10} Concentration (µg/m^3)
2010	9.9
2011	13.2
2012	11.3
2013	16.2

A TEOM was installed at the Maules Creek Public School in September 2011, used to measure both PM_{10} and $PM_{2.5}$. The available data from the TEOM is presented in **Figure 13**, showing 24-hour average PM_{10} and $PM_{2.5}$ concentrations. Between November 2011 and September 2013 there were no exceedances of the 24-hour PM_{10} impact assessment criterion or the $PM_{2.5}$ advisory reporting standard. The annual average $PM_{2.5}$ and PM_{10} concentration recorded by the TEOM are shown in **Table 1.5**.

Table 1.5: Annual Average $PM_{2.5}$ and PM_{10} (TEOM)

Year	$PM_{2.5}$ Concentration (µg/m^3)	PM_{10} Concentration (µg/m^3)
2011	3.7	7.4
2012	2.9	6.7
2013	2.0	5.7

The existing monitoring locations are shown in **Figure 14**.

1.4.4 Total Suspended Particulate Matter

The Project Approval conditions (outlined in **Section 2.1)** includes impact assessment criteria for Total Suspended Particulate Matter (TSP). This is not currently monitored at Maules Creek, however ambient TSP concentrations can be inferred from the measured PM_{10} data. Monitoring in other mining areas in the state indicates that where mining activities are a significant source of the particulate matter, then on an annual basis, approximately 40% of the TSP will be in the form PM10.

The derived annual average TSP can be therefore assumed as between 18 µg/m^3 to 33 µg/m^3 which is below the impact assessment criterion of 90 µg/m^3.

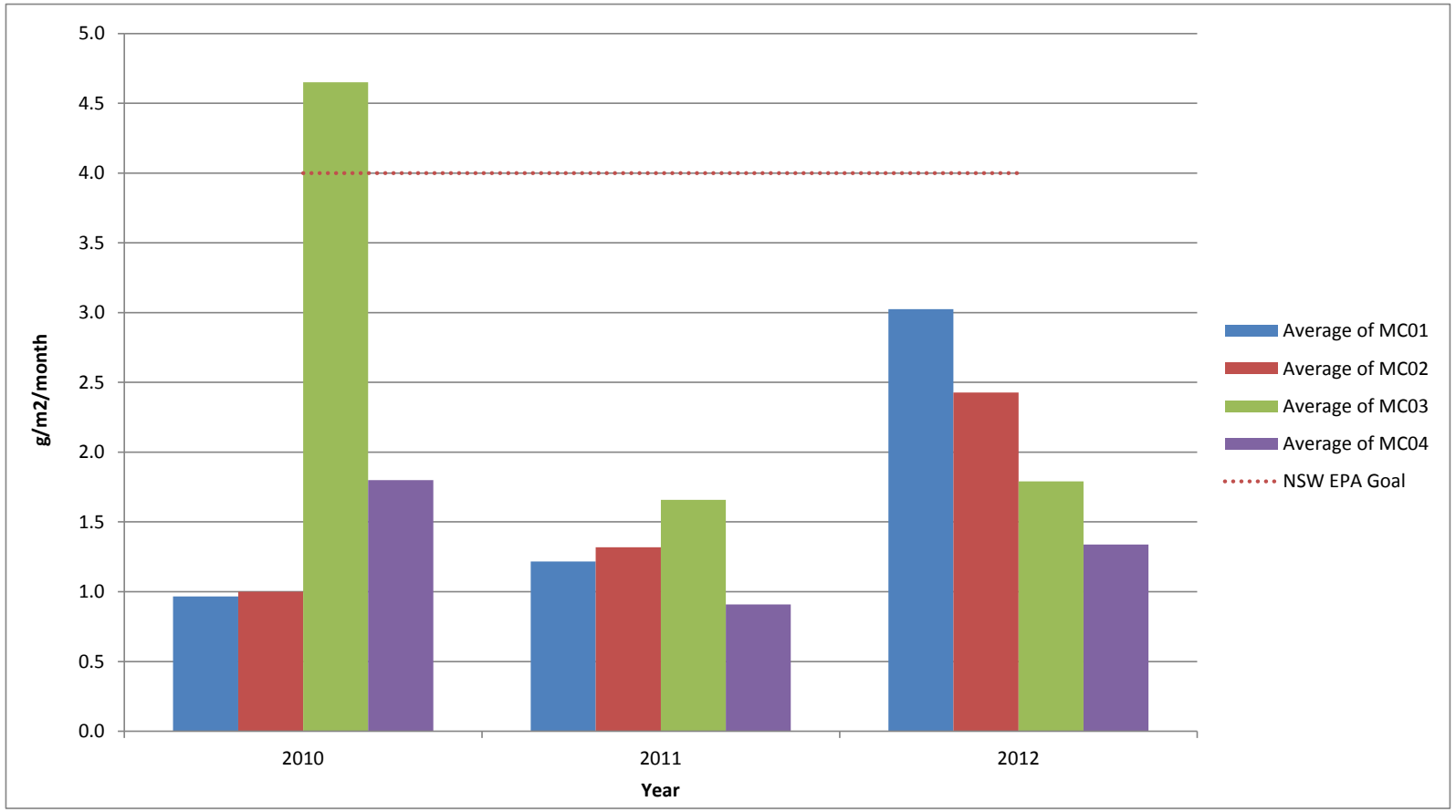


Figure 11: Dust Deposition Monitoring

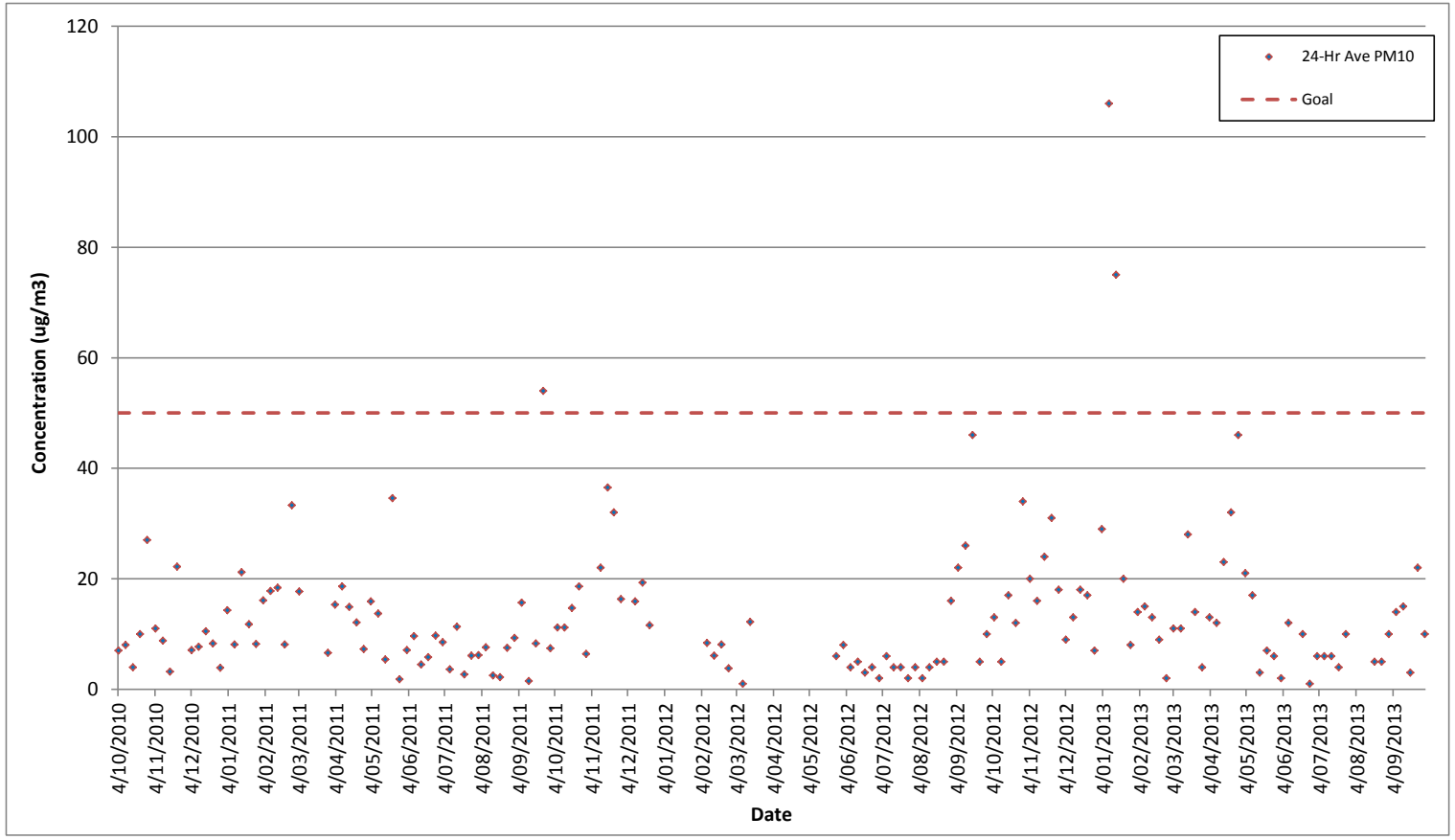


Figure 12: 24-Hour PM_{10} Concentrations – HVAS

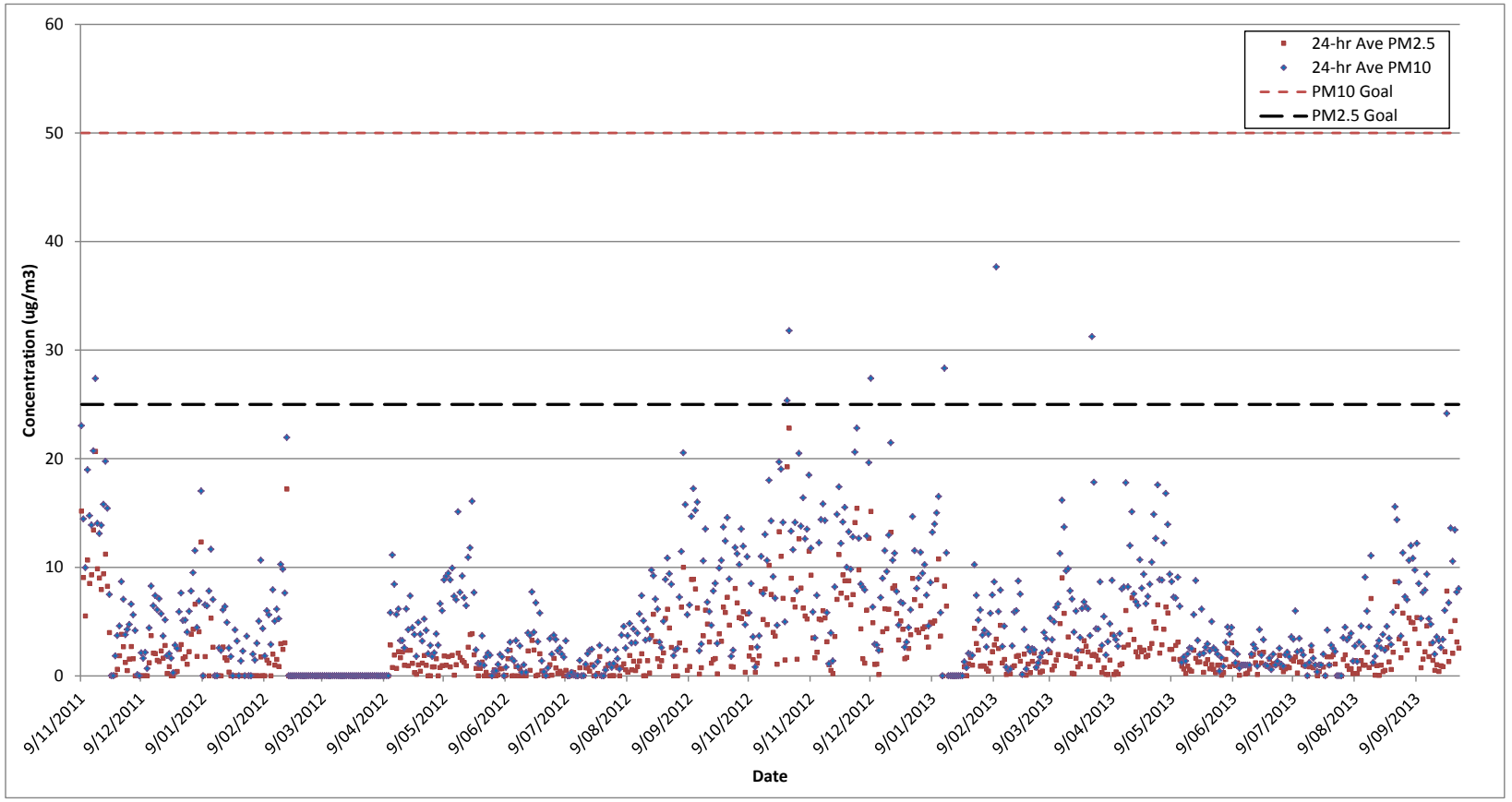


Figure 13: 24-Hour PM_{10} and $PM_{2.5}$ Concentrations – TEOM

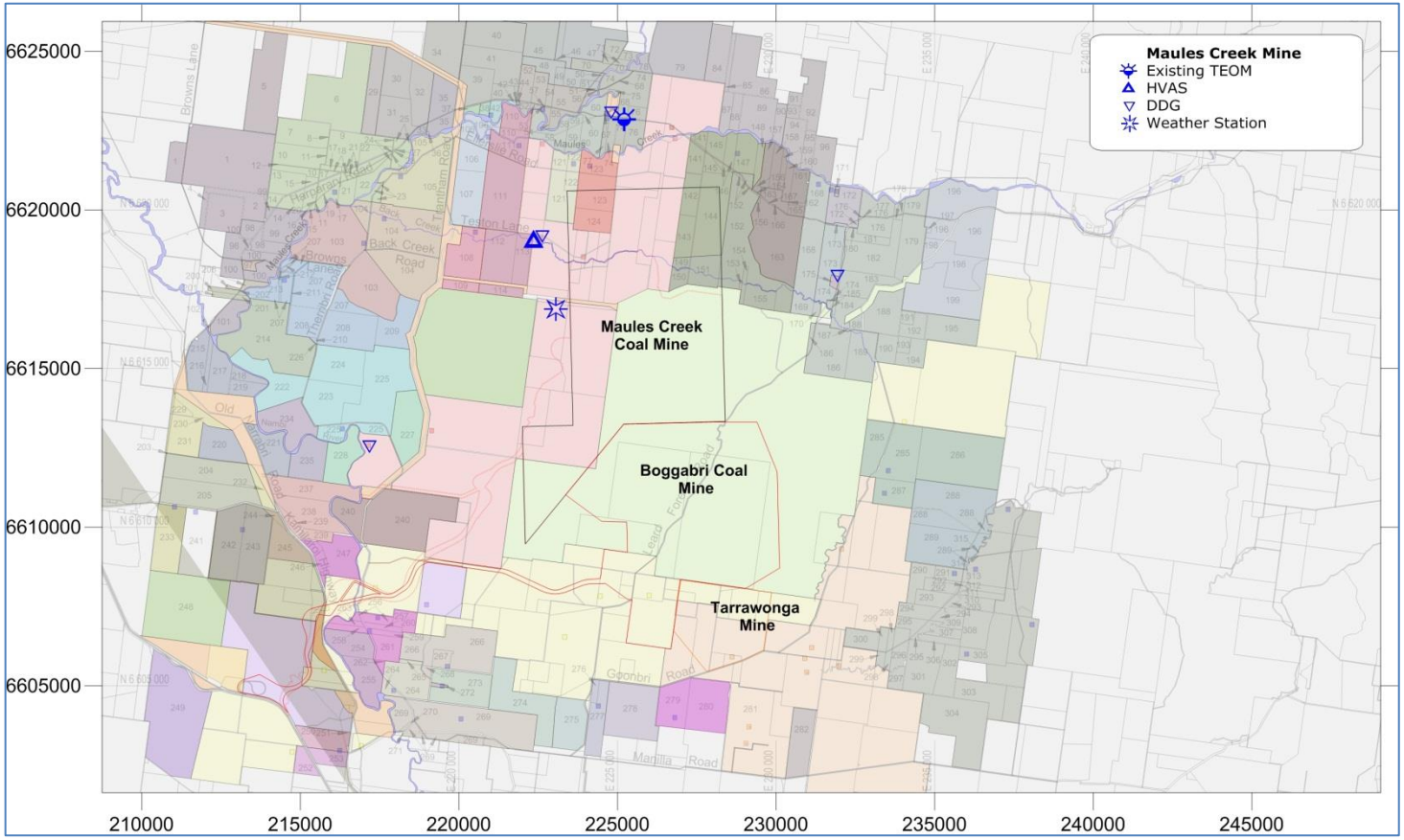


Figure 14: Location of Maules Creek existing air quality monitoring

1.5 Structure of the Air Quality Management Plan

Key areas of the AQGHG are outlined in **Table** .

Table 1.6: Key Areas of AQGHGMP

Key Information	Relevant Section
Approval Conditions and Compliance Criteria	Section 2.0
Dust Management Measures and Best Practice Determination	Section 3.1
Predictive and Real Time Air Quality Management System	Section 0
Blast Fume Management and Monitoring	Section 3.7 and 5.3
Monitoring Requirements	Section 5.0
Greenhouse Gas Emissions	Section 4.0
Reporting	Section 8.0
Roles and Responsibilities	Section 6.0 and Table 3.1

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 μm or less (PM_{10}) and particles with equivalent aerodynamic diameter of 2.5 μm 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, accessing the site for construction and operation;
- Clearing of vegetation;
- Topsoil and subsoil stripping and stockpiling;
- Spreading topsoil on rehabilitation areas;
- Drilling and blasting at the open cut;
- Loading and unloading of material at, as well as transportation of material between, the open cuts, waste rock emplacements, any temporary ROM coal stockpiles and CHPP;
- Loading, transporting and unloading of coal by truck or conveyor;
- Operation of the CHPP and associated product coal 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 waste rock 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. Blasting is limited to periods of favourable meteorology and between 9 am and 5 pm Monday to Saturday. 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 AQGHGMP also addresses GHG emissions that are able to be controlled or influenced by the Maules Creek Coal Project. GHG emissions not considered are those not under the mine's operational control (for example coal transportation off site or energy production from product coal).

The main sources of GHG emissions considered in the AQGHGMP are:

- Fuel consumption (diesel) during mining operations – Scope 1;
- Release of fugitive methane (CH_4) from the fracturing of coal seams – Scope 1; and
- Indirect emissions resulting from the Project'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. A Spontaneous Combustion Management Plan will be developed for the Maules Creek Coal Project prior to the stockpiling of coal. The plan will outline management and mitigation measures to reduce the potential for spontaneous combustion events, including:

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

1.6.4 Blast Fume

In addition to the generation of dust emissions, blasting can generate oxides of nitrogen (NO_x) as by-products of ammonium nitrate based explosives. NO_x fumes generated during blasting can manifest as yellow to dark red clouds, the colour depending on the concentration of the gas. Blast fume management is outlined in **Section 5.3** and addressed further in the Maules Creek Coal Project Blast Management Plan.

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), sulfur dioxide (SO2) and organic compounds.

2.0 STATUTORY REQUIREMENTS

2.1 Approval Conditions

Project Approval conditions for the Maules Creek Coal Project requires an AQGHGMP to be prepared for the Project. This AQGHGMP has been developed in accordance with the recommended Project Approval operating conditions, as follows:

Table 2.1: Maules Creek Coal Mine Approval Conditions (Operating Conditions)

Project Approval Requirement – Operating Conditions	Relevant Section of AQGHGMP
The Proponent shall	
(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.	**Section 3.0**
(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.	**Section 3.4**
(c) manage $PM_{2.5}$ levels in accordance with any requirements of the EPL.	**Section 3.4** **Section 5.0**
(d) minimise the air quality impacts of the project during adverse meteorological conditions and extraordinary events;	**Section 3.4.9**
(e) minimise any visible off-site air pollution;	**Section 3.2**
(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 Director-General.	**Section 5.1** **Section 5.1**

The requirements for the preparation of the AQGHGMP are outlined in **Table 2.2**.

Table 2.2: Maules Creek Coal Mine Approval Conditions (AQGHGMP)

Project Approval Requirement – Air Quality and Greenhouse Gas Management Plan	Relevant Section of AQGHGMP
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 be submitted to the Director-General for approval prior to the commencement of construction	**Appendix A**
(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 3.0**
(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 3.2**
(e) include commitments to provide summary reports and specific briefings at CCC meetings on issues arising from air quality monitoring	**Section 8.5**
(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, 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 • includes a protocol for determining any exceedances of the relevant conditions in this approval	**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 5.1** **Section 3.4**

Other general requirements in relation to Air Quality are outlined in Table 2.3

Table 2.3: Maules Creek Coal Mine Approval Conditions (General)

Project Approval - General Environmental Performance Conditions	Relevant Section of AQGHGMP
Schedule 3 Condition 26. Control of offensive odour	**Section 1.6.3**
Schedule 3 Condition 27. Minimising Greenhouse Gas emissions	**Section 4.0**
Schedule 3 Condition 35. Meteorological Monitoring	**Section 1.4.1**
Schedule 3 Condition 28. Additional air quality mitigation on request	**Section 3.6**
Schedule 4 Condition 1-3. Notification of Landowners/Tenants	**Section 3.7**
Schedule 5 Condition 13. Online reporting	**Section 8.1**

Correspondence with EPA and DP&I are provided in **Appendix A**.

2.2 Relevant Compliance Criteria

2.2.1 Air Quality Assessment Criteria

Project Approval requires that the Proponent shall ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the project do not exceed the criteria listed in **Table** , **Table** and **Table** at any residence on privately-owned land or on more than 25 percent of any privately-owned land. The criteria are also applicable at any occupied residence on mine owned land, subject to the conditions outlined in Schedule 3 Condition 31 of the Approval.

Table 2.4: Long Term criteria for particulate matter

Pollutant	Averaging period	[d] Criterion
Total suspended particulate (TSP) matter	Annual	[a] 90 µg/m^3
Particulate matter <10 µm (PM_{10})	Annual	[a] 30 µg/m^3

Table 2.5: Short Term criteria for particulate matter

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

Table 2.6: Long Term criteria for deposited dust

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

Notes to Tables 11-13:

[a] Total impact (i.e. incremental increase in concentrations due to the project plus background concentrations due to all other sources);

[b] Incremental impact (i.e. incremental increase in concentrations due to the project on its own);

[c] Deposited dust is 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, sea fog, fire incidents or any other activity agreed by the Director-General.

2.2.2 Air Quality Acquisition Criteria

If particulate matter emissions generated by the project exceed the criteria in **Table 7 , Table** and **Table ,** 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 Proponent shall acquire the land.

Table 2.7: Long Term acquisition criteria for particulate matter

Pollutant	Averaging period	[d] Criterion
Total suspended particulate (TSP) matter	Annual	[a] 90 µg/m^3
Particulate matter <10 µm (PM_{10})	Annual	[a] 30 µg/m^3

Table 2.8: Short Term criteria for particulate matter

Pollutant	Averaging period	[d] Criterion
Particulate matter <10 µm (PM_{10})	24 hour	[a] 150 µg/m^3
Particulate matter <10 µm (PM_{10})	24 hour	[b] 50 µg/m^3

Table 2.9: Long Term criteria for deposited dust

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

Notes to Tables 11-13:

[a] Total impact (i.e. incremental increase in concentrations due to the project plus background concentrations due to all other sources);

[b] Incremental impact (i.e. incremental increase in concentrations due to the project on its own);

[c] Deposited dust is 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, sea fog, fire incidents or any other activity agreed by the Director-General.

2.2.3 Environmental Protection Licence (EPL)

An Environment Protection Licence (EPL) will be issued by the NSW Environment Protection Authority (EPA) and will contain conditions related to air quality management which will be addressed as part of this AQGHGMP. The AQGHGMP will be updated as required, following issuing of the EPL.

2.3 Coordination with other Mines in the Leard Forest Mining Lease

Project 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 (refer **Section 0** of the AQGHGMP). The Precinct Air Quality Management Strategy is still being finalised and relevant sections of this plan will be updated as required following the staged implementation of the strategy. The Precinct Air Quality Management Strategy will be subject to ongoing review dependent upon the determination and commencement of other mining projects.

2.4 Objectives and Performance Indicators

The objectives of the AQGHGMP are in accordance with the Project Approval operating conditions and are presented in **Table** .

Table 2.10 Plan Objectives and Performance Indicators

Objectives	Requirement	Performance Indicator	Target
Implement best management practice to minimise the off-site odour, fume and dust emissions of the project	No offensive odours emitted from the site.	Number of odour complaints received.	Zero complaints
	No exceedence of the air quality impact assessment criteria listed in the Project Approval at any residence on privately-owned land or on more than 25% of any privately owned land.	Air quality monitoring data does not exceed impact assessment criteria.[1]	To comply with the relevant impact assessment criteria
	No exceedance of the land acquisition criteria listed in the Project Approval.	Air quality monitoring data does not exceed land acquisition criteria.	Zero
	Strategies within the AQGHGMP are comparable to established best practice.	Dust management measures in place.	Dust management measures meet or exceed best practice.
	Minimise air quality complaints from the community.	Number of air quality complaints from the community.	Decrease number of complaints received over time.
	Minimise visible off-site air pollution	Opacity determined by visual observation	Visible dust leaving site less than 20% opacity
	Minimise the surface disturbance	Actual surface disturbance in accordance with mine operation plan (MPO)	No additional disturbance as per MOP
Manage $PM_{2.5}$ levels in accordance with any requirements of the EPL.	No exceedence of the $PM_{2.5}$ criteria listed in the EPL.	Air quality monitoring data does not exceed the $PM_{2.5}$ criteria listed in the EPL.	To comply with the $PM_{2.5}$ criteria listed in the EPL.
Minimise the air quality impacts of the project during adverse meteorological conditions and extraordinary events.	Air quality management system including predictive meteorological forecasting	Preparatory measures are put in place for adverse meteorological conditions. Measures will include planning maintenance, booking additional water carts, relocating activities. Review of all onsite activities during extraordinary events.	Modify operations during adverse conditions, as required. The predictive management system will log and report all actions taken during adverse conditions
Continual improvement in	Introduce new/improved dust management measures as	New/improved measures	N/A

Objectives	Requirement	Performance Indicator	Target
dust management.	opportunities arise.	adopted.	
Implement all reasonable and feasible measures to minimise the release of greenhouse gas emissions.	Minimise release of greenhouse gas emissions.	Energy usage does not exceed targets. Targets will be developed following a baseline energy audit conducted after one year of mine operations. The audit will develop a benchmark performance indicator.	Ongoing reduction in energy use.

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

The relationships between this AQGHGMP and other environmental documentation are shown conceptually in **Figure 15**.

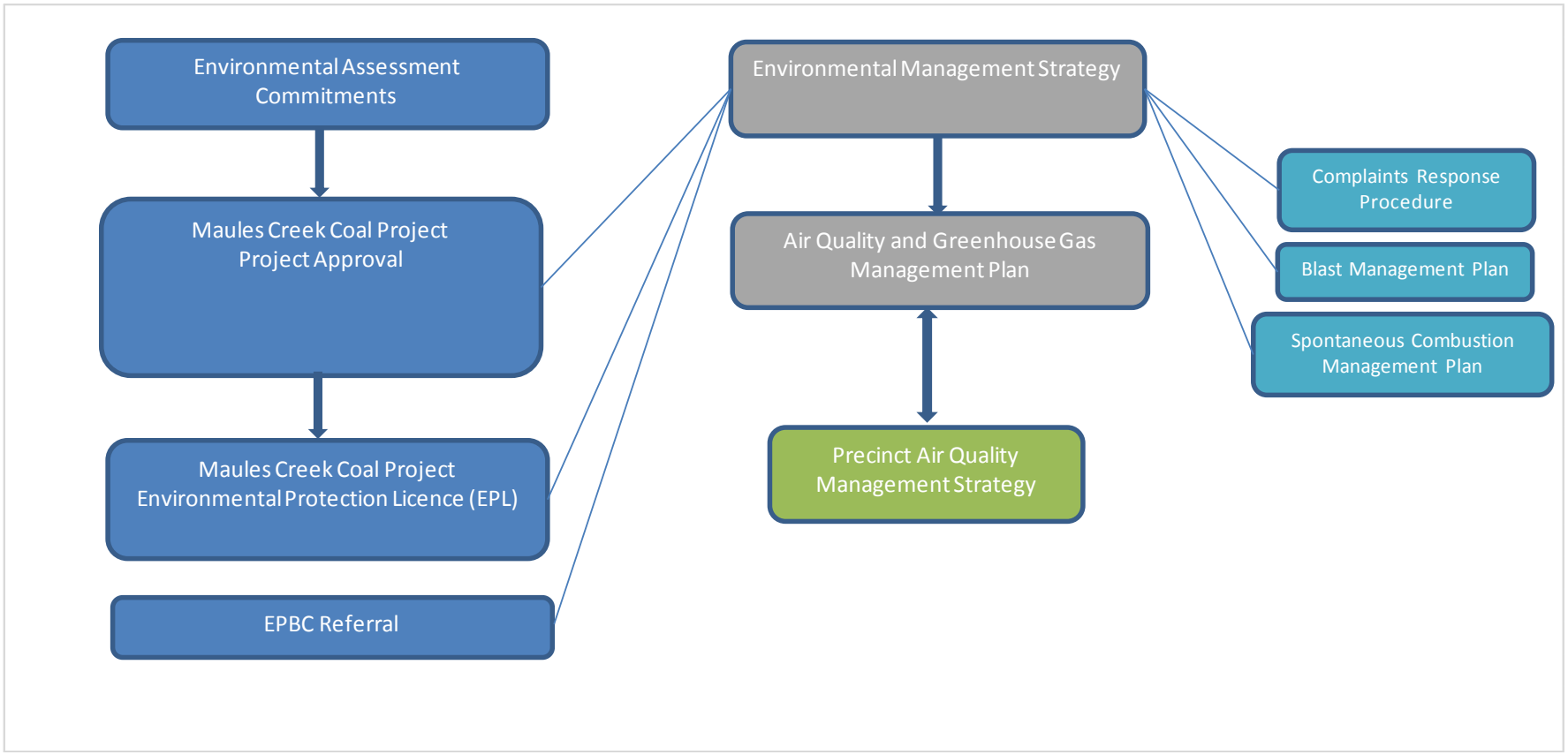


Figure 15: Relationship with other Environmental Documentation

3.0 AIR QUALITY MANAGEMENT ACTIONS

3.1 Construction Phase Dust Management

3.1.1 Overview

Construction of the Project is anticipated to occur over a period of approximately 15 months. The activities which would contribute to dust and particulate matter emissions include site clearing, heavy vehicle movements, earthworks, rail loop and haul road construction and material handling. Construction activities are shown in **Figure 3**.

Specific construction tasks include:

- Construction of a CHPP with a throughput of 13 Mtpa ROM coal;
- Construction of a tailings drying area to facilitate the drying of tailings prior to co-disposal within the mining area or reprocessing in the CHPP;
- Construction of the Maules Creek rail spur, rail loop, associated load out facility; Note: The shared portion of the rail spur and the construction of this will be managed under the Boggabri Coal approvals and construction environmental management plan
- Sealing of Therribri Road to the mine access point;
- Sealing of Manilla road between Leard State Forest Road and the Whitehaven - Tarrawonga Haul Road ;
- Construction of a Mine Access Road;
- Upgrade of the Northern Link Road and East Link Roads;
- Construction and operation of administration, workshop and related facilities.
- Construction and operation of a water pipeline, pumping station and associated infrastructure for access to water from the Namoi River;
- Installation of power transmission line and related infrastructure.; and
- Installation of communications, water management and reticulation infrastructure.

Principle Contractors will be appointed by MCC to undertake the construction activities for the Project. The Principle Contractors will be required to develop management plans, and submit them to MCC for approval prior to commencing any construction works on site. MCC will review the principle contractors' management plans for compliance with the MCC approved management plans and EPL conditions, MCC will also conduct regular reviews and audits of the Principle Contractor to ensure the effective implementation of the plans.

3.1.2 Construction Water

Construction water for the project will be primarily sourced from the Namoi River under a current WAL held by the Project. The project will install a pump, pipe line, storage tanks and a number of water truck fill stand pipes in the stages of construction to ensure there is adequate water supply for dust suppression requirements for the construction of the Project. MCC also holds water licences for the collection of surface water (a 30 ML allocation and a 6 ML allocation), which may be utilised during the construction period. There is a number of existing farm dams on the Velyama and Teston properties that are owned by MCC. MCC may also utilise water from these dams on an infrequent basis for dust suppression for construction activities according to their maximum allowable

harvestable rights. Should additional water be required for construction activities beyond these sources, water will be imported from an external water supplier.

3.1.3 Clearing / Excavation

Emissions from vegetation stripping, topsoil clearing and excavation can occur, particularly during dry and windy conditions. Emissions can be effectively controlled by increasing the moisture content of the soil / surface. Other controls that will be undertaken include:

- Modify working practices by limiting excavation during periods of high winds; and
- Limiting the extent of clearing of vegetation and topsoil to the designated footprint required for construction and appropriate staging of any clearing.

3.1.4 Mine Access Road Construction

The use of earth moving equipment will be significant sources of dust, and emissions will be controlled through the use of water sprays during road construction. Where conditions are excessively dusty and windy, and fugitive dust can be seen leaving the site, work practices will be modified by limiting scraper / grader activity, however there are no residences close to the proposed access road construction. The majority of the length of the mine access road is a considerable distance from occupied residential residences, with the closest section of the access route being approximately 500m to the closest occupied residence. Given the temporary nature of the access route construction and implementation of standard dust control measures, adverse dust impacts are expected to be controllable.

3.1.5 Vehicle, Trucks and Heavy Plant and Equipment Movement

Vehicles travelling over paved or unpaved surfaces tend to produce wheel generated dust. The following measures will be implemented during construction to minimise dust emissions from these activities:

- All vehicles on-site will be confined to designated routes outlined in the Traffic Management Plan with speed limits enforced in accordance with the Traffic Management Plan;
- Trips and trip distances will be controlled and reduced where possible, for example by coordinating delivery and removal of materials to avoid unnecessary trips;
- Trucks delivering material to site will have their loads covered;
- When conditions are excessively dusty and windy and dust can be seen leaving the work site, a water truck (for water spraying of travel routes) will be used;
- Wheel generated dust emissions due to construction employees travelling to and from the site will be minimised through the use of shuttle buses, which will be operated in accordance with the statement of commitments to ensure 90% of construction staff use this service;
- Trucks and plant on-site will be well maintained in accordance with the manufacturer's specification;
- Registered road vehicles with smoky exhausts (more than 10 seconds) shall be stood down for maintenance, in accordance with the POEO Clean Air Regulations; and
- Tracks from the Project out onto public roads will be managed using a wheel wash or shaker grid.

3.1.6 Wind Erosion

Wind erosion from exposed ground will be limited by avoiding unnecessary vegetation clearing and ensuring rehabilitation occurs as quickly as possible. Wind erosion from temporary stockpiles will be limited by minimising the number of stockpiles on-site and minimising the number of work faces on stockpiles. Permanent stockpiles will be stabilised or covered.

3.1.7 Railway Construction

The following measures will be implemented during the construction of the rail spur and loop:

- Modify working practices by limiting clearing and excavation during periods of high winds;
- Limiting the extent of clearing of vegetation and topsoil to the designated footprint required for the rail corridor; and
- Use of water sprays during rail construction for dusty activities such as ballast dumping and compacting.

3.1.8 Material Handling

Unloading of dusty material / loads will be minimised by reducing drop heights and application of water sprays where required.

3.1.9 Training

All construction staff and contractors will receive training in dust management as part of the OHS inductions and toolbox meetings.

3.1.10 Other

Under no circumstances will any material be burnt on-site.

3.2 Operations Phase Dust Management

3.2.1 Site Specific Best Practice Determination

The air quality management measures to be employed at the Maules Creek Coal 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.

All those BPM that are considered to be both reasonable and feasible have been implemented as part of the AQGHGMP. The BPM include, as a minimum, all the measures considered in the EA.

Table 3.1: Dust Emissions – Preventative Management Measures

Mining Activity	Management Action	Responsibility	Timing
Hauling on Unsealed Road	Use of wet suppression and / or chemical suppressant	Manager Mining	Daily
	Optimisation of fleet to reduce VKT where possible	General Manager – Maules Creek	Ongoing
	Haul roads clearly marked and vehicles restricted to these areas	Manager Mining	Ongoing
	All trafficked areas are maintained	Manager Mining	Daily
	Grader speed reduction to 8 km/h when working	Manager Mining	Daily
	Graders routes kept damp	Manager Mining	Daily
	Visual dust from haul trucks regularly assessed	Manager Mining	Daily
	Shuttle bus at shift change for construction and operation staff	Manager Mining	Daily
	Sealing of Therribri Road and Manilla Road	General Manager – Maules Creek	During Construction
Wind Erosion on Exposed Areas & Overburden Emplacements	Minimise pre-strip and disturbed areas by clearly marking areas for stripping	Manager Mining	As required
	Vegetative cover on topsoil stockpiles in place for longer than 3 months	Manager Mining	As required
	No topsoil stripping during high winds	Manager Mining	As required
	Vegetative ground cover on overburden dumps	Manager Mining	As required
	Permanent rehabilitation in line with targets	Manager Mining	Ongoing
Wind Erosion and Maintenance - Coal Stockpiles	Water sprays on product stockpiles	CHPP Manager	As required
Bulldozers on OB	Minimise travel speeds and distance	Dozer Operators	Ongoing
	Avoid operations on exposed areas during high dust periods	Manager Mining	As required

Mining Activity	Management Action	Responsibility	Timing
Blasting and drilling	Delay blast to avoid unfavourable weather conditions	Manager Mining	Daily
	Dust suppression while drilling - water sprays / collection	Drill operators	Ongoing
	Care taken not to disturb drill cuttings	Drill operators	Ongoing
	Operators can request water truck if drill bench is dusty	Manager Mining	As required
Loading and dumping overburden	Minimise drop height	Operators	Daily
	Modify activities in windy conditions	Manager Mining	As required
Loading and dumping ROM coal	Bypass ROM stockpiles and direct dump to hopper	Manager Mining	Ongoing
	Minimise drop height	Operators	Daily
	Water sprays on ROM bin	CHPP Manager	Daily
	Three sided and roofed enclosure of ROM bin	CHPP Manager	Ongoing
Conveyors and transfers	Application of water at transfers	Manager CHPP	As required
	Wind shielding on conveyors	Manager CHPP	Ongoing
	Belt cleaning and spillage minimisation	Manager Mining	As required
Stacking and reclaiming product coal	Variable height stack	Manager CHPP	Ongoing
	Water sprays on product stockpiles	Manager CHPP	As required
Train and truck load out and transportation	Limit load size to ensure coal is below sidewalls	Manager CHPP	Daily
	Maintain a consistent profile	Manager CHPP	Daily

Mining Activity	Management Action	Responsibility	Timing
Diesel exhaust from mining equipment	Trucks and plant on-site will be well maintained in accordance with the manufacturer's specification.	General Manager – Maules Creek	Ongoing
	Registered road vehicles with smoky exhausts (more than 10 seconds) shall be stood down for maintenance, in accordance with the POEO Clean Air Regulations	General Manager – Maules Creek	As required
	Unnecessary idling for trucks and plant will be avoided with engines turned off during periods of inactivity	Manager Mining	Daily
	Optimisation of fleet to reduce VKT where possible	General Manager – Maules Creek	Ongoing

Preventative dust management measures employed at the Maules Creek Coal Project are outlined in **Table 3.1,** with corrective measures outlined in **Table 3.2**. Corrective measures aim to minimise environmental impact in the event of an incident occurring by instigating an appropriate operational response. Corrective measures are instigated in response to visual inspection and when alerts are triggered by the predictive and real-time dust management system (refer **Section 3.3**). Both preventative and corrective measures will help ensure any visible off-site dust is minimised to the greatest possible extent, in accordance with Project Approval condition 33 (e).

A risk response matrix is provided in **Figure 16**, which provides both predictive and reactive triggers and the actions taken in response to these triggers (based on the preventative and corrective measures). The risk response matrix provides an overview of response actions for the site, however specific risk response reports will be generated daily, providing meteorological and dust risk forecasts and specific management actions or responses.

Table 3.2: Dust Emissions - Corrective Measures

Timing/Trigger	Measure	Responsibility
Visible dust from haul roads	Relocate water cart operations to control haul road dust	All personnel
High winds (to be defined during monitoring program under Dust Stop PRP)	Relocate overburden emplacement operations away from elevated levels	Manager Mining
Dust emissions are above the height of drill rig wheel arch	Ensure water application is adequate during drilling.	Drill Operators
Excessive dust generation from exposed material stockpiles or other exposed areas	Increase watering Temporarily rehabilitate exposed material that is not being utilised for extended periods of time.	Manager Mining
Excessive/prolonged generation of exhaust fumes	Ensure equipment is maintained to manufacturers specifications Avoid exposure of equipment to sensitive receivers Turn equipment engines off when not required	Manager Mining
Air quality complaints received from the public	Investigation into activities occurring at the time with reference to meteorological conditions and dust levels measured by monitoring equipment. Where the investigation can identify the activity which results in the complaints, modified or additional mitigation measures will be developed or campaign monitoring instigated.	Manager Environment

3.3 Predictive and Real Time Air Quality Management

PAEHolmes was commissioned by Boggabri Coal Mine, Tarrawonga Coal Mine and Maules Creek Coal Mine (referred to hereafter as B-T-M) to develop a Precinct Air Quality Management Strategy that outlines how the B-T-M complex will undertake and achieve management of cumulative air quality outcomes (**PAEHolmes, 2012**). The Precinct Air Quality Management Strategy is a staged process and this plan will be updated according to the staged implementation of the strategy.

Condition 34 (d) of the Approval requires a risk response matrix to be developed, linked to meteorological conditions and operating conditions.

The risk response matrix in **Figure 16** provides both predictive (meteorological) and reactive (monitoring) triggers and the proposed actions taken in response to these triggers.

The risk response matrix provides an overview of response actions for the site.

Specific risk response reports will be generated daily in the predictive and real-time air quality management system. An example risk response report is provided in Figure 4.4 of the BTM cumulative strategy.

The daily risk response report will:

- Provide forecast meteorological conditions for coming day
- Daily dust risk forecasts.
- Identify the level of risk (low, medium, high)
- Outline specific management actions or response.

The meteorology and real-time triggers will also be continuous reviewed as part of the predicted and real-time air quality management system.

	Increasing Risk Level		
	Level 1 - Information	Level 2 - Prepare	Level 3 - Action
Predictive (meteorological) Triggers	e.g. hourly wind speed >5 m/s	e.g. hourly wind speed >6 m/s	eg. hourly wind speed >8 m/s
Real-time (monitoring) Triggers	e.g.rolling 24-hour average PM_{10} above 40 µg/m3	e.g. rolling 24-hour average PM_{10} above 45 µg/m3	e.g. rolling 24-hour average PM_{10} above 50 µg/m3
	Action / Response		
Activity	ongoing controls - watch and see	review/identify/prepare additional controls	action/implement additional controls
Blasting and drilling	Blast scheduling to avoid unfavourable weather conditions Use water sprays for dust suppression while drilling Care taken not to disturb drill cuttings	Plan for water truck to operate on drill bench if dusty	1. Relocate water truck to dill bench 2. Limit drilling to in-pit 3. Avoid and blasting
Loading and dumping overburden	Minimise drop heights	Plan for relocationg to lower dump areas	1. Increase material moisture with water spraying 2. Limit to in-pit loading and dumping
Loading and dumping ROM coal	Bypass ROM stockpiles and direct dump to hopper where possible Minimise drop heights Water sprays on ROM bin Three sided and roofed enclosure of ROM bin	Plan for increase in water spraying and operational changes including limits on unloading	1. Increase material moisture with water spraying 2. Limit to in-pit loading
Hauling on Unsealed Roads	Use of wet suppression and / or chemical suppressant Optimisation of fleet to reduce VKT Vehicles restricted to marked haul roads Maintenance of all trafficked areas using graders Grader routes kept damp and speed limited to 8 km/h when working Visual dust from haul trucks regularly assessed	Visually monitor dust from haul trucks and plan for water cart relocation to high risk areas. Plan for other operational changes to hauling such as speed reduction.	1. Water application rates increased 2. Truck speeds reduced 3. Scale back or cease hauling
Bulldozers on OB	Minimise travel speeds and distance travelled	Plan for relocation of dozers away from elevated areas	1. Relocate dozers from elevated /high risk areas 2. Cease all dozer activity on overburden
Wind Erosion on Exposed Areas & Overburden Emplacements	Minimise pre-strip and disturbed areas by clearly marking areas for stripping Vegetative cover on topsoil stockpiles in place for longer than 3 months Temporarily rehabilitate exposed material that is not being utilised for extended periods of time. Vegetative ground cover on overburden dumps Permanent rehabilitation in line with targets	Plan for relocation of overburden emplacement away from elevated levels and other operational changes such as ceasing topsoil stripping.	1. Watering of active exposed areas 2. Cease topsoil stripping 3. Cease all activity on exposed areas 4. Watering of active exposed areas

	Increasing Risk Level		
	Level 1 - Information	Level 2 - Prepare	Level 3 - Action
Predictive (meteorological) Triggers	e.g. hourly wind speed >5 m/s	e.g. hourly wind speed >6 m/s	eg. hourly wind speed >8 m/s
Real-time (monitoring) Triggers	e.g.rolling 24-hour average PM_{10} above 40 µg/m3	e.g. rolling 24-hour average PM_{10} above 45 µg/m3	e.g. rolling 24-hour average PM_{10} above 50 µg/m3
	Action / Response		
Activity	ongoing controls - watch and see	review/identify/prepare additional controls	action/implement additional controls
Conveyors and transfers	Application of water at transfer points Wind shielding on conveyors Belt cleaning and spillage minimisation	Plan for increased watering rates or reducing throughput	1. Additional watering rates 2. Reduce throughput
Wind Erosion and Maintenance - Coal Stockpiles	Water sprays on product stockpiles	Plan for water sprays on product stockpiles	1. Stand down dozer 2. Cease stockpile loading 3. Water sprays on product stockpiles
Stacking and reclaiming product coal	Variable height stack Water sprays on product stockpiles	Plan for changes to operations	1. Cease stockpile loading
Train and truck load out and transportation	Limit load size to ensure coal is below sidewalls Maintain a consistent profile	Plan for reduction in coal transportation	1. Avoild transportation

Figure 16: Generalised predictive and reactive triggers with risk response matrix

3.4 Predictive and Real Time Air Quality Management System

The implementation of the Predictive and Real Time Air Quality Management System will commence once the BTM strategy has been finalised and approved by DPI, expected mid-2014. The implementation of the system will be staged as follows, but will be fully operational prior to the commencement of mining operations:

- System planning, including equipment mobilisation/ordering (8-12 weeks);
- Equipment installation (1-2 weeks);
- System configuration (2-4 weeks);
- System testing (1-2 weeks); and
- System “Go-live".

An overview of the predictive and real-time air quality management system is provided below.

3.4.1 Central data repository

Air quality monitoring data from the three sites will be stored in a central repository. The data will be available for use by each site and can be viewed in various formats on a web server which will be accessed via the internet to display the data in real-time.

Non validated air quality data will be updated daily to a publically accessible website, including a summary of the operational response to elevated levels.

3.4.2 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.

A predictive and reactive air quality management system will be implemented for B-T-M that personnel will use to:

- Assess potential offsite impacts and evaluate community risk in advance and subsequently in real-time;
- Perform scenario modelling under predicted adverse or other operating conditions;
- Develop a history / library of community impacts and air quality incidents and events;
- Evaluate community complaints and determine if B-T-M activities may have caused an impact;
- Accept information and data inputs from various instruments and data sources (eg. web services, real-time monitoring, and/or emissions estimates based on activity data); and
- Provide recommendations with respect to abatement or avoidance of potential issues and operational requirements based on outputs of the system.

3.4.3 Components

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; and
- A daily forecast report: providing information on temperature inversions, wind conditions at various heights, dust risk, and recommended control actions.

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 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; and
- Accurate emission source parameters, i.e. updated as the mine plan evolves.

3.4.4 Forecast meteorology

A predictive forecast meteorology system will be implemented based on the *Weather Research & Forecasting* (WRF) model and CALMET, specifically for B-T-M, and a website will be developed to make data immediately available for sites, with half hourly forecasts up to 48 hours in advance. This system will download global meteorological data and forecasts on a daily basis and process and run the 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 would provide more confidence in predictions for the day ahead and how weather may affect operations.

Once this meteorological system is configured and operating, the outcomes will be evaluated by a competent meteorologist or atmospheric science professional against actual meteorological and dust measurements and the meteorological system will be validated and improved, where possible.

3.4.5 Local observed meteorology

Weather forecasting model predictions are prone to some uncertainty. Meteorological monitoring data will be used to validate predictive modelling performance over time.

Data from local automatic weather stations will be used to validate the predictive meteorological forecast data as time elapses.

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

3.4.6 Integrated real-time monitoring data

To enable real-time reactive feedback from the system, a connection will be established to receive a data feed from weather stations in the B-T-M network. A connection will also be established to monitoring equipment located upwind and downwind of dust sources.

These data feeds will be connected to the system from a central data repository, however an alternative approach is to connect to loggers on permanent in-field samplers and weather stations using a variety of technologies (GPRS, radio modems, SMS, LAN etc). The choice of communication will depend of the availability of networks and power at each site.

As required, the system will be connected with operational and other environmental data and management information systems such as SCADA, laboratory data, field monitoring and continuous systems.

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. Protocols will be put in place to immediately 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.

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

3.4.7 Air quality dispersion model

The dispersion model will:

- Be a non-steady state model;
- Accommodate reliable, rapid-update data feed;
- Assimilate multiple data sources;
- Be accessible – for integration to a system; and
- Be validated.

The B-T-M 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 and a forecast meteorology prediction. CALMET would then be configured to use these weather data.

The CALPUFF model will be configured to use the CALMET data and a connection to ambient monitoring station data would also be established. Source emissions data will also be configured to be processed and modelled in CALPUFF. Source emissions data could 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.

3.4.8 Predictive and reactive triggers

Predictive and 'real-time' reactive triggers will be built into the system. These triggers will be initially set based on analysis of the available monitoring data. The nature of any trigger from a predictive system may vary from simple indicators of tomorrow's risk of impacts, through to a specific forecast value and list of actions needed to limit impacts to criteria (or a fair share of total criteria for cumulative impact control systems).

Initially 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.

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 breached at areas of relevant exposure. The real-time dust monitoring system will be used to trigger when controls need to be instigated. The real-time air quality monitoring allows relevant personnel to react when short term trigger levels are breached which are set at a level that allows proactive dust management (to control 24-hour and ultimately annual average impacts).

The monitoring data collected at compliance sites would be assessed in real-time to determine if pre-defined trigger levels have been breached and when action is required. 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.

Associated with each trigger level (i.e. low, medium, high) is a response which will inform the course of action taken by the relevant personnel. Preliminary predictive and reactive triggers are outlined in the risk response matrix (refer **Figure 16**), along with the actions/response associated with increasing risk levels. These triggers and responses will be built into the real-time dust management system.

It is important to note that once the real-time air quality management system is operational, trigger levels would be reviewed, updated and refined following a review of the data and calibration of the system. If the trigger levels are not appropriate to site operations (too many or too few investigation or action responses) they would be reviewed and updated. Trigger levels will also be regularly assessed as part of the ongoing review of this plan. 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.

3.4.9 System outputs

Once the predictive and reactive system is implemented and configured as described above, a range of user interfaces or simple reports or templates can be generated and used as part of standard operating procedure.

Some system outputs that will be required include:

- A daily forecast report 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 it may have travelled. This functionality is critical in apportioning responsibility to operations for mitigating emissions.
- Automated alerts for relevant operations personnel so that the agreed protocol for reacting to a potential dust issue can be activated. These alerts may be generated as SMS or email messages, or by other systems integrated into operating processes (depending on needs). Alerts would be stored in the system for analysis, which would assist in refining trigger criteria over time.

Daily forecast reports will provide information on temperature lapse rate, in accordance with Condition 35 (b) of the Project Approval.

Daily forecast reports will also allow for planning for adverse meteorological conditions, in accordance with Condition 33 (d) of the Project Approval. Predictive triggers would provide an indicator of tomorrow's risk of impacts during these adverse conditions, allowing appropriate plans and measures to be put in place.

3.5 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 Project Approval provides a written request to MCC for additional air quality mitigation measures to be implemented to their property, MCC will implement those additional air quality mitigation measures at the residence in consultation with the owner. MCC will implement measures that are reasonable and feasible and directed towards reducing air quality impacts from the Project.

3.6 Notification of Landholders or Tenants

MCC has been in consultation with the owners of land listed within Table 1 of the Project Approval throughout the preparation of the Maules Creek EA during the assessment and following the determination of Project Approval. A majority of these landholders have taken their acquisition rights and have been purchased by MCC.

MCC has notified the remaining landholders within Table 1 that they have rights to acquisition upon written request. MCC has notified those landholders within Table 1 and Table 2 of the Project Approval that they have the right to request additional air quality or noise mitigation measures to be installed at their residence at any time of the Project. There is no privately owned land within 2 km of the approved open cut mining pit/s that require an inspection of buildings or structures.

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 advice 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 Director-General. 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 the Project has demonstrated compliance 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.

3.7 Blast Fume Management

Fume generation from blasting would be managed in accordance with *Code of Good Practice: Prevention and Management of Blast Generated NO_x Gases in Surface Blasting* (**Australian Explosives Industry and Safety Group Inc., 2011**). Impacts from blast events (dust and NO_x fume) will be managed using the predictive and real-time air quality management system described in **Section 3.4** as follows:

- The predictive meteorological component will be used to schedule daily blasts under the most favourable meteorological conditions (for example wind conditions that would transport fumes away from receptors). This is limited in its ability for cumulative scheduling across all three sites.
- The system will also be developed to provide daily predictions of blast fume and blast overpressure based on specific information for each blast.
    - Predicted blast fume pathway, ground level concentrations (glc) and exclusion zones (based on glc).
    - Predicted blast over pressure impacts.

A Blast Management Plan has been developed (**Maules Creek, 2013**) and provides detailed management measures related to:

- Blast design
- Drill and blast practices
- Fume control
- Blast scheduling
- Cumulative blasts
- Monitoring, notification, complaint response, reporting and roles and responsibilities.

3.8 Coal Transportation

An industry wide approach to evaluating management options for fugitive emissions from coal transportation is currently underway. Prior to commencement of coal transportation, Maules Creek Coal will review recommendations from this study. Within a two year time frame from when coal transportation commences, Maules Creek Coal will instigate investigations into the feasibility of the recommended management measures.

4.0 GREENHOUSE GAS MANAGEMENT

Greenhouse Gas management for the Maules Creek Coal 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

Reductions in electricity use during operations will be achieved as follows:

- The energy efficiency of all new electrical equipment will be considered 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.

Ongoing reduction in electricity usage will be investigated based on energy saving projects in accordance with requirements of the Commonwealth *Energy Efficiency Opportunity Act, 2006*.

4.2 Diesel Consumption

Reductions in diesel use during operations will be achieved as follows:

- The fuel efficiency of all mobile and fixed equipment will be considered 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 greenhouse gas emissions and energy consumption at the Maules Creek Coal Mine would be achieved through participation in the Commonwealth Government's National Greenhouse and Energy Report Scheme (NGERS). Under NGERS requirements, relevant sources of greenhouse gas 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.

Whitehaven Coal Limited (WHC) is also a participant in the Commonwealth Government's Energy Efficiency Opportunities (EEO) Program. As such, WHC will assess energy usage from all aspects of its operations, including the Maules Creek Coal Mine, and publicly report the results of energy efficiency assessments, and the opportunities that exist for energy efficiency projects with a financial payback of up to four years. As part of its obligations under the EEO Program, WHC has set up an internal steering committee with the objective of identifying and implementing GHG mitigation initiatives.

Greenhouse Gas emissions and performance will be reported within the Annual Review, including any energy savings projects that have been implemented or plan to be implemented in the following year.

5.0 AIR QUALITY MONITORING PROGRAM

The existing Maules Creek Coal Project air quality monitoring network was established to determine the baseline air quality conditions along with adjacent mines monitoring networks. The existing monitoring network has been upgraded to reflect the following objectives:

- To assess operational compliance with the criteria outlined in the Project Approval;
- To integrate with the predictive and real-time dust management system; and
- To form part of a cumulative air quality monitoring network for B-T-M.

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

5.1 Cooperative Real Time Monitoring

A cumulative Air Quality Management Strategy has been prepared for all three sites that comprise the Leard Forest Mining Precinct (BTM Complex) (**PAEHolmes, 2012**). A review of the local meteorology, terrain and the most recent dispersion model predictions was used to determine appropriate zones for an air quality monitoring network, including provisions for real time monitoring which is critical to the BTM Air Quality Management Strategy.

The cumulative strategy defines Zones 1 through Zone 10, nominated for cumulative air quality monitoring. These zones allow for the analysis of upwind concentrations along the north/south and southeast/northwest axis that correspond to the prevailing wind directions. This layout ensures that upwind/downwind PM_{10} concentrations are measured for management purposes and correspond to areas that are predicted to be impacted by B-T-M operations. Zones 1 through Zone 4 are recommended in the cumulative strategy as approximate locations of real-time PM_{10} / $PM_{2.5}$ monitors.

Continuous real-time instruments (TEOMs) have been installed at location representative of these zones. The locations are summarised in **Table 5.1** and shown in **Figure 17**.

The TEOM monitors are used to demonstrate compliance with air quality criteria also used to determine (in real time) if pre-defined trigger levels have been breached and when additional dust control is required (refer **Section** 3.3).

In accordance with condition 34 (f), the proposed monitoring locations include the properties / land identified in Table 1 of the Project Approval, as follows:

- Land ID 110 – 114 – assessed by monitoring equipment installed at “Murphy” and Fairfax Public School. Representative of Zones 3, 4 and 8.
- Land ID 279 – 280 - assessed by monitoring equipment installed at “Tarrawonga”. Representative of Zone 1.

Table 5.1: Overview of real-time compliance monitoring

Site	Instrument and Parameter	Comment
Fairfax Public School	TEOM - PM_{10} and $PM_{2.5}$	Existing location representative of cumulative monitoring Zone 4.
”Murphy” 110/114	TEOM - PM_{10} and $PM_{2.5}$	Proposed location representative of cumulative monitoring Zone 3.
“Flixton” -	TEOM - PM_{10} and $PM_{2.5}$	Existing location representative of (close to) cumulative monitoring Zone 2.
“Tarrawonga” – 279	TEOM - PM_{10} and $PM_{2.5}$	Existing location representative of cumulative monitoring Zone 1.
Mobile Site	Real-time portable instrument for PM_{10}	Trailer mounted mobile air quality monitoring station used for campaign monitoring at receptors such as “Compton” – 122 or mine owned occupied residences.

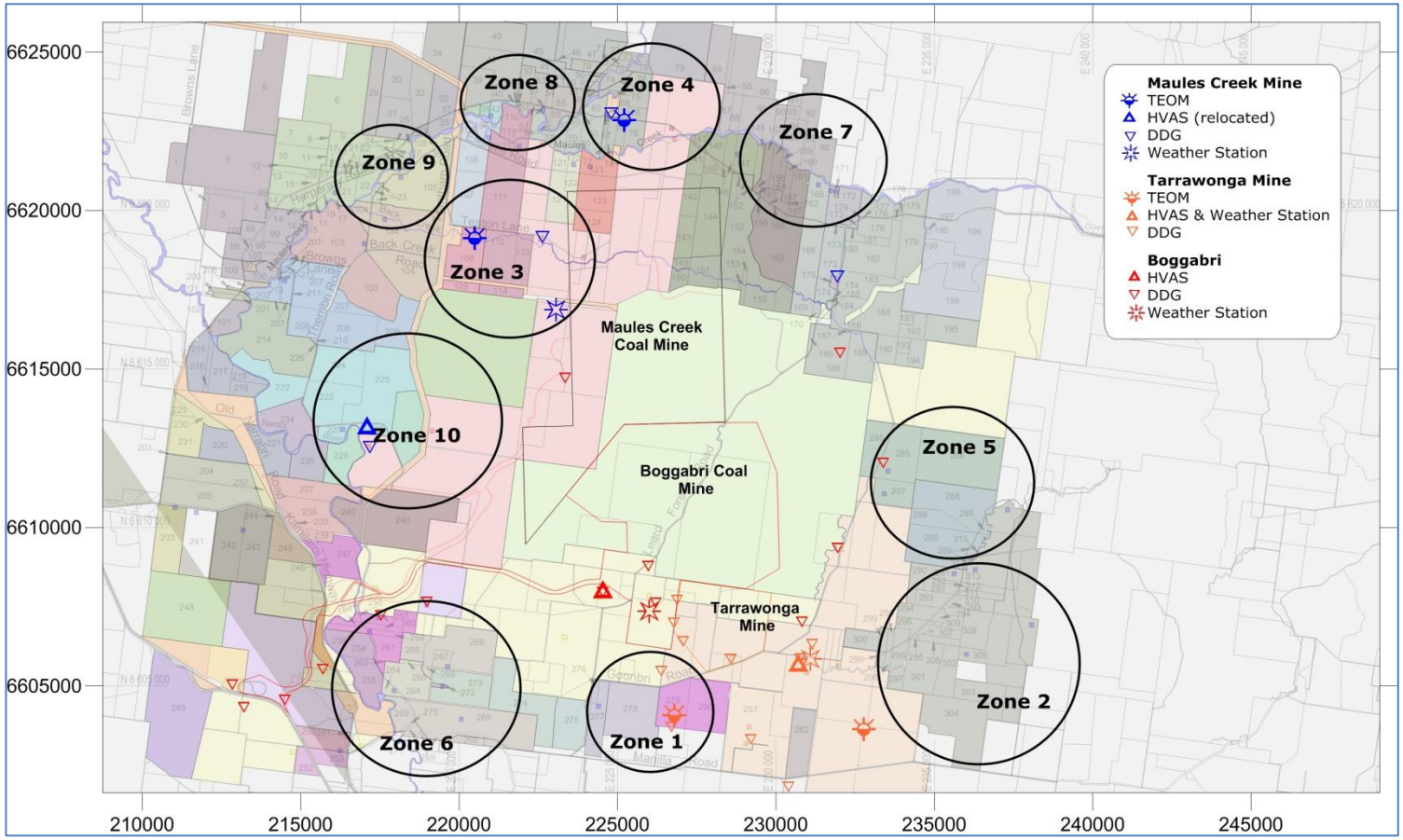


Figure 17: BTM cumulative air quality monitoring zones

5.2 Other Monitoring Requirements

The following additional equipment is installed / consolidated for B-T-M:

- Additional or consolidation of three dust gauges to monitor dust deposition;
- The Maules Creek HVAS would be relocated to property ID 225 (Zone 10);
- Installation of portable real-time PM_{10} monitors for day to day operational dust management (e.g. e-samplers);

5.2.1 $PM_{2.5}$ Monitoring

Table provides details of the TEOMs that are capable of monitoring PM_{10} and $PM_{2.5}$.

5.2.2 Dust Deposition

The existing four (4) Maules Creek dust deposition monitoring locations will be retained for the operational monitoring. As part of the Cumulative Air Quality Monitoring Plan, data sharing agreements would allow the Maules Creek Coal mine to access dust deposition monitoring from other locations for management and compliance reporting purposes. The existing Boggabri and Tarrawonga DDGs may be relocated to provide better overall coverage for the cumulative network.

5.2.3 Portable Boundary Real Time Monitoring

B-T-M will also install portable real-time PM_{10} monitors (i.e. e-samplers) for day to day dust management. It is intended that the e-samplers will be placed at appropriate locations closer to mining operations. The e-sampler locations will move periodically as B-T-M mining operations progress. Their locations will take account of a number of factors, such as seasonally predominant daily wind patterns, the relative locations of each mines highest controllable dust generating sources, and practicality of locating monitoring equipment close to the mining operations.

5.2.4 Regional Monitoring (control site)

Approval conditions require control monitoring sites to provide real time data on background air quality levels that are not influenced by mining from the Leard Forest Mining Precinct.

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.

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

The control site will be further detailed in the Precinct Air Quality Management Strategy and this AQGHGMP will be updated where required.

5.3 Blast Monitoring

Condition 25 (g) of the Project Approval includes a requirement for evaluating the performance of the Project in terms of minimising blast fume emissions. Monitoring requirements for blasting are outlined in the Blast Monitoring Plan (**Maules Creek 2013**). Assessment of visual NO_x fume will be undertaken as per Appendices 2 and 3 of the Code of Good Practice (**Australian Explosives Industry and Safety Group Inc., 2011**), including video recording of blasts and reviewing for formation and transport of blast fume. A blast fume rating scale will be logged for each blast using procedures outlined in the Code of Good Practice (**Australian Explosives Industry and Safety Group Inc. 2011**).

5.4 EPL Special Condition E1 and E2

The MCC EPL includes special conditions related to particulate matter controls, including

- E1: Particulate Matter Control Best Practice Implementation - Wheel Generated Dust
- E2: Particulate Matter Control Best Practice Implementation - Disturbing and Handling Overburden under Adverse Weather Conditions

In accordance with Condition E1 and E2, MCC has developed a detailed monitoring programs related to these conditions.

5.4.1 Particulate Matter Control Best Practice Implementation - Wheel Generated Dust

Condition E1 (Particulate Matter Control Best Practice Implementation - Wheel Generated) requires that MCC must achieve and maintain a dust control efficiency of 85% or more on all active haul roads and requires the licensee to prepare a Monitoring Program to assess compliance with this condition.

The monitoring plan developed by MCC for E1 is summarised as follows:

Table 5.2: Overview of monitoring program for E1

Task	Description
Planning and information gathering	• Analyse meteorological data to determine suitable periods for monitoring • Identify representative haul roads for monitoring (controlled and uncontrolled)
Haul road monitoring	• PM emissions from haul roads will be measured using a mobile sampling system on controlled and uncontrolled sections of road
Data analysis and presentation	Determine control efficiency using the formula: $Control\ Efficiency = \frac{Emissions_{uncontrolled} - Emissions_{controlled}}{Emissions_{uncontrolled}} \times 100$
Key Performance Indicators (KPIs)	• Primary KPI (PM-control efficiency of 85%) determined directly through haul road monitoring. • Secondary KPI (water rate) based on a correlation between PM-control efficiency and the watering application rate.

5.4.2 Particulate Matter Control Best Practice Implementation - Disturbing and Handling Overburden under Adverse Weather Conditions

Condition E2 (Particulate Matter Control Best Practice Implementation - Disturbing and Handling Overburden under Adverse Weather Conditions) states that MCC must alter or cease the use of equipment on overburden and loading dumping overburden during adverse weather conditions. and requires the licensee to prepare a Monitoring Program to assess compliance with this condition.

The monitoring plan developed by MCC for E2 is summarised as follows:

Table 5.3: Overview of monitoring program for E2

Actions
• Identify adverse meteorological conditions based on modelling of overburden activities and off-site impacts • Use the on-site meteorological station to measure for adverse meteorological conditions • Develop a Trigger Action Response Plan (TARP) for periods of adverse conditions • Minimisation of dust emissions by altering overburden handling activities during adverse conditions • KPIs included measurements of off-site dust concentrations and observations of visual dust.

5.5 Relevant Standards

The Maules Creek Monitoring Network will be installed and operated in accordance with the standards outlined in **Table** .

Table 5.4: Relevant Standards

Parameter	Standard
General	NSW EPA "Approved methods for the sampling and analysis of air pollutants in NSW". - AM-1 – Guide for the siting of sampling equipment. - AM-2 – Guide for measurement of horizontal wind for air quality applications. - AM-18 - Particulate matter – PM_{10} – HVAS. - AM-19 – Particulates – deposited matter – gravimetric method. - AM-22 – Particulate matter – PM_{10} – TEOM.
Siting	**AM-1** - Australian Standard (AS) 2922 – 1987, superseded by - Australian Standard (AS/NZS) 3580.1.1:2007 "Methods for sampling and analysis of ambient air – Guide to siting air monitoring equipment".
Meteorological Monitoring	**AM-2** AS 2923 – 1987: Ambient Air Guide for the measurement of horizontal wind for air quality applications **AM-4** USEPA (2000) - Meteorological Monitoring Guidance for Regulatory Modelling Applications (EPA 454/R-99-005)
PM_{10}	**AM-22** AS/NZS 3580.9.8 – 2008 Methods for sampling and analysis of ambient air – Method 9.8 Determination of suspended particulate matter –PM10 continuous direct mass method using a tapered element oscillating microbalance analyser. ***AM-18*** 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.
$PM_{2.5}$	No applicable approved method - to be conducted in general accordance with AM-22
Dust Deposition	**AM-19** AS/NZS 3580.10.1:2003 Methods for sampling and analysis of ambient air - Determination of particulate matter - Deposited matter - Gravimetric method.

6.0 ROLES AND RESPONSIBILITIES

In addition to the specific responsibilities for dust management outlined in **Table 3.1**, general roles and responsibilities for the implementation of the AQGHGMP are presented in **Table 6.1**.

Table 6.1: Roles and Responsibilities

Role	Responsibilities
General Manager – Maules Creek	• Provide required resources and support to implement these procedures. • Undertake training in relevant management plans and procedures as required. • Optimisation of mining fleet to reduce VKT • Specific Dust Management responsibilities outlined in **Table 3.1**
Environment Manager – Maules Creek	• Authorise the AQGHGMP and future amendments. • Ensure induction and training relevant to the AQGHGMP is implemented. • Act as the interface for environmental matters between government authorities, private industry, contractors, community groups and the wider community. • Notify the relevant regulatory agencies of any incidents or non-compliances. • Specific Dust Management responsibilities outlined in **Table 3.1**
Environment Officer	• Inform the relevant managers of unexpected or serious environmental impact issues. • Assess the implementation of this AQGHGMP. • Ensure training relevant to the AQGHGMP is implemented. • Maintain a high level of understanding of the AQGHGMP. • Ensure the AQGHGMP is implemented in daily operations of the site. • Review this AQGHGMP if any significant changes to mine plans or operations occur. • Support the Environment Manager to act as the interface for environmental matters between government authorities, private industry, contractors, community groups and the wider community (where appropriate). • Support the Environmental Manager to gather the required information and ensure reportable incidents are reported to relevant authorities. • Maintain an environmental monitoring program to gauge the effects of the mining operations on air quality. • Conduct required monitoring to the standard and frequency outlined in this AQGHGMP, and as per requirements of the EPL and Project Approval. • Prepare an annual environmental report (Annual Review) detailing the results of key performance indicators developed for each monitoring location. • Respond to any unplanned events that may potentially result in, or cause, negative

Role	Responsibilities
	environmental impacts • Ensure inspections are undertaken in accordance with the AQGHGMP. • Check that persons conducting the inspection are appropriately trained, understand their obligations and the specific requirements of this AQGHGMP. • Review and assess monitoring results and inspection checklists. • Promptly notify the Environment Manager of any identified environmental issue. • Carry out all required notifications. Specific Dust Management responsibilities outlined in **Table 3.1**
Manager Mining / Manager CHPP	• Maintain accountability for the overall environmental performance, including the procedures and outcomes of this AQGHGMP. • Respond to any unplanned events that may potentially result in negative environmental impacts. • Ensure reportable incidents are investigated and reported to the Environmental Department. Ensure inspections are undertaken in accordance with the AQGHGMP. • Check that persons conducting the inspection are appropriately trained and understand their obligations and the specific requirements of this AQGHGMP. • Specific Dust Management responsibilities outlined in **Table 3.1**
All personnel	• Adhere to the requirements of this AQGHGMP. • Report any events that may potentially result in negative environmental impacts immediately to their Supervisor. • Specific Dust Management responsibilities outlined in **Table 3.1**

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 Environmental Management Strategy.

As a minimum, records of the complaint will include:

- Date and time the complaint was logged;
- Personal details provided by the complainant;
- Nature of the complaint;
- Action taken regarding the complaint, or if no action was taken, the reason why; and
- Follow-up contact with the complainant.

8.0 REPORTING

8.1 Online Reporting

In accordance with Schedule 5 Condition 13, daily updates will be provided on a publically available website, including:

- Daily weather forecasts.
- Planned operational responses to daily forecasts.
- Real-time(Dailynon-validated air quality monitoring data from compliance sites.
- Actual operational responses to elevated dust levels.

Full validated summary reports will be made available on a monthly basis.

8.2 Protocol for Determining Exceedances

The following section outlines how compliance against the 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 Impact Assessment Criterion, no further action is required and results are reported with no additional analysis.

Where results are above the levels indicated for the Impact Assessment Criterion, the following additional analysis will be used to determine if the project exceeded the criteria or contributed to an exceedance of the criteria.

- Investigate if any potential contamination of sample may have occurred and if the monitoring results are validated.

- Investigate the meteorological data for the relevant period to determine dominant wind direction, average wind speeds, percentage calm conditions (< 0.5 m/s) and significant periods of moderate winds (> 5.4 m/s).

- 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 Impact Assessment Criteria.

The real time air quality management will provide a data repository for all data required for the compliance evaluation, including monitoring data, meteorological data and activity and operational response logs.

8.3 Annual Review

By the end of March each year, the proponent shall review the environmental performance of the project (including air quality) for the previous calendar year. The air quality component of the annual review and annual environmental monitoring report (AEMR) would include:

- A comprehensive review of the air quality monitoring results and complaints and comparison against:
  - relevant statutory requirements, limits or performance measures/criteria;
  - monitoring results of previous years; and
  - relevant predictions in the EA;
- Any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;
- Any trends in the monitoring data over the life of the project;
- Any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and
- Measures will be implemented over the next year to improve the air quality performance of the project.

Annual Review and AEMR will be sent to the relevant agencies for review.

8.4 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 Director General and all relevant agencies will be immediately informed of any incident that has caused, or threatens to cause, material harm to the environment.

In accordance with Schedule 4 Condition 3 (a), any affected received will be notified and provided with a summary of the monitoring data.

8.5 Community Consultation

A Community Consultative Committee (CCC) must be operated for the duration of the project. Regular briefings to the CCC would be provided, including a summary of results from all air quality monitoring for the project.

8.6 Auditing

By the end of 2015 and every 3 years thereafter an Independent Environmental Audit of the project would be conducted. The audit would assess the air quality performance of the project, assess compliance with the requirements in this plan, and whether the Proponent is implementing best air quality management.

8.7 Review

Within 3 months of the submission of an annual review, incident report, audit or any modification to the conditions of this approval, the AQGHGMP would be reviewed and if necessary revised.

9.0 REFERENCES

Australian Explosives Industry and Safety Group Inc. (2011). "Code of Practice: Prevention and Management of Blast Generated NOx Gases in Surface Blasting".

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".

Donnelly, S.J., Balch, A., Wiebe, A., Shaw, N., Welchman, S., Schloss, A., Castillo, E., Henville, K., Vernon, A., Planner, J. (2011). "NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and / or Minimise Emissions of Particulate Matter from Coal Mining" Prepared by Katestone Environmental Pty Ltd for Office of Environment and Heritage June 2011.
NSW DEC, 2005: "Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales" New South Wales EPA 59-61 Goulburn Street, Sydney, NSW August 2005.

NEPC, 1998: "*National Environmental Protection Measure for Ambient Air Quality*". National Environment Protection Council Service Corporation, Level 5, 81 Flinders Street, Adelaide SA 5000.

NSW DEC, 2005: "*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*" New South Wales EPA 59-61 Goulburn Street, Sydney, NSW August 2005.

NSW DECC, 2005a "*Approved methods for the sampling and analysis of air pollutants in NSW"* New South Wales EPA 59-61 Goulburn Street, Sydney, NSW August 2005.

PAEHolmes (2011) "Report: Review and Recommendations for Boggabri/Tarrawonga/Maules Creek Cumulative Air Quality Monitoring" Prepared for Boggabri Coal Pty Ltd, Tarrawonga Coal Pty Ltd and Maules Creek Project by PAEHolmes, August 2011.

PAEHolmes (2012) "Report: Cumulative Air Quality Management Protocol" Prepared for Boggabri Coal Pty Ltd, Tarrawonga Coal Pty Ltd and Maules Creek Project by PAEHolmes, July 2012.

SPCC (1986)"Particle size distributions in dust from open cut coal mines in the Hunter Valley", Report Number 10636-002-71, Prepared for the State Pollution Control Commission of NSW (now EPA) by Dames & Moore, 41 McLaren Street, North Sydney, NSW 2060.

10.0 TERMS AND ABBREVIATIONS

Approved Methods	Approved Methods for the Sampling and Analysis of Air Pollutants in NSW
AQGHGMP	Air Quality and Greenhouse Gas Management Plan
AQMP	Cumulative Air Quality Monitoring Plan
AWS	Automatic weather station
BPM	Best Practice Measures
Best Practice Determination / Report	NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining
B-T-M	Boggabri Coal Mine & Tarrawonga Coal Mine & Maules Creek Coal Mine
CCC	Community Consultation Committee
CHPP	Coal Handling and Preparation Plant
CH_4	Methane
DDG	Dust Deposition Gauge
EEO	Energy Efficiency Opportunities
EPA	Environment Protection Agency
EPL	Environment Protection Licence
GHG	Greenhouse Gas
GLC/s	Ground level concentration/s
HVAS	High Volume Air Sampler
km/hr	Kilometers per hour
MCC	Maules Creek Coal
Mtpa	Million Tonnes Per Annum
NGERS	National Greenhouse and Energy Report Scheme
NO_x	Oxides of nitrogen
NSW	New South Wales
$PM_{2.5}$	Particulate matter with equivalent aerodynamic diameter 2.5 microns or less
PM_{10}	Particulate matter with equivalent aerodynamic diameter 10 microns or less
The Project	Maules Creek Coal Project
ROM Coal	Run of Mine Coal
TEOM	Tapered Element Oscillating Microbalance
TSP	total suspended particulate matter
VKT	Vehicle Kilometers Travelled
WHC	Whitehaven Coal Limited

Appendix A
Land Ownership

Appendix B
Regulatory Correspondence

Appendix C
Comparison with EPA Best Practice

OEH best practice Section	OEH best practice Table	Mining Activity	Best Practice Control		Used for the Maules Creek Project (Y/N/Other)
9.2	66	Hauling on Unsealed Roads	Vehicle restrictions	Speed reduction from 75 km/h to 50 km/h	Y
				Speed reduction from 65 km/h to 30 km/h	N
				Grader speed reduction from 16 km/h to 8 km/h	Y
			Surface improvements	Pave the surface	N/A
				Low silt aggregate	N
				Oil and double chip surface	N/A
			Surface treatments	Watering (standard procedure)	Y
				Watering Level 1 (2 L/m2/h)	Y
				Watering Level 2 (>2 L/m2/h)	Y
				Watering grader routes	Y
				Watering twice a day for industrial unpaved road	N/A
				Dust suppressants (please specify)	Y
			Other	Use of larger vehicles	Y
				Conveyors	N/A
9.3	71	Wind Erosion on Exposed Areas & Overburden Emplacements	Avoidance	Minimise pre-strip	Y
			Surface stabilisation	Watering	N
				Chemical suppressants	N
				Paving and cleaning	N/A
				Application of gravel to stabilise disturbed open areas	N/A
				Rehabilitation goals	Y
			Wind speed reduction	Fencing, bunding, shelterbelts or in-pit dump	N
				Vegetative ground cover	Y
9.3	72	Wind Erosion and Maintenance - Coal Stockpiles	Avoidance	Bypassing stockpiles	N
			Surface stabilisation	Water sprays	Y
				Chemical wetting agents	N
				Surface crusting agent	N
				Carry over wetting from load in	N
			Enclosure	Silo with bag house	N/A
				Cover storage pile with a tarp during high winds	N/A
			Wind speed reduction	Vegetative windbreaks	N
				Reduced pile height	N
				Wind screens/fences	N
				Pile shaping/orientation	N
				Erect 3-sided enclosure around storage piles	N
9.4	76	Bulldozers on OB	Minimise travel speeds and distance		Y
			Travel routes and material kept moist		Y

OEH best practice		Mining Activity	Best Practice Control		Used for the Maules Creek Project (Y/N/Other)
Section	Table				
9.5	81	Blasting and drilling	Blasting	Delay shot to avoid unfavourable weather conditions	Y
				Minimise area blasted	Y
	82		Drilling	Fabric filters	N
				Cyclone	N
				Water injection while drilling	Y
9.6	85	Draglines	Minimise drop height		N/A
			Minimising drop height		N/A
			Modify activities in windy conditions		N/A
			Water sprays		N/A
			Minimise side casting		N/A
9.7	90	Loading and dumping overburden	Excavator	Minimise drop height	Y
			Truck dumping	Minimise drop height	Y
				Water application	N
				Modify activities in windy conditions	Y
9.8	95	Loading and dumping ROM coal	Avoidance	Bypass ROM stockpiles	Y
			Truck or loader dumping coal	Minimise drop height	Y
				Water sprays on ROM pad	Y
			Truck or loader dumping to ROM bin	Water sprays on ROM bin or ROM pad	N
				Three sided and roofed enclosure of ROM bin	Y
				Three sided and roofed enclosure of ROM bin + water sprays	N
				Enclosure with control device	N
9.9	96	Conveyors and transfers	Conveyors	Applicaton of water at transfers	N
				Wind shielding - roof OR side wall	Y
				Wind shielding - roof AND side wall	N
				Belt cleaning and spillage minimisation	Y
			Transfers	Enclosure	Y
9.10	97	Stacking and reclaiming product coal	Avoidance	Bypass coal stockpiles	N
			Loading coal stockpiles	Variable height stack	N
				Boom tip water sprays	N
				Telescopic chute with water sprays	N
			Unloading coal	Bucket-wheel, portal or bridge reclaimer with water application	N/A
9.11	-	Train and truck load out and transportation	Limit load size to ensue coal is below sidewalls		Y
			Maintain a consisten profile		Y
			Use bedliners to minimise seepage		N
			Cover load with tarpaulin		N
			Utilise truck wheel wash		N

Appendix D
Precinct Air Quality Management Strategy

(To be provided as part of the Leard Forest Precinct B-T-M consultation with EPA)