Boggabri Coal

ASSESSMENT OF COAL MINE PARTICULATE MATTER CONTROL BEST PRACTICE POLLUTION REDUCTION PROGRAM

June 2012

Boggabri Coal Pty Limited

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Revision Control Chart

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Company	Position
Boggabri Coal	Environmental Coordinator
Downer EDI Mining	Project Manager
Lovton Coal	Project Manager

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ARA	Appropriate Regulatory Authority
BCPL	Boggabri Coal Pty Limited
DoPI	Department of Planning and Infrastructure
EA	Environmental Assessment
EMP's	Environmental Management Plans
EMS	Environmental Management System
EP&A Act	Environmental Planning and Assessment Act, 1979
EPA	Environment Protection Authority
EPL	Environmental Protection Licence
HRMS	Haul Road Management System
NoM	Notice of Modification
NPI	National Pollutant Inventory
OCE	Open Cut Examiner
OEH	NSW Office of Environment and Heritage
Part 3a	Part 3a of Environmental Planning and Assessment Act, 1979
POEO Act	Protection of the Environment (Operations) Act, 1997
PRP	Coal Mine Particulate Matter Best Practice Pollution Reduction Program
ROM	Run of Mine
TARPs	Trigger Action Response Plans

1. Introduction

1.1 Overview

In consultation with the NSW Minerals Council, the Environment Protection Authority (EPA) has developed a Pollution Reduction Program (PRP) that requires Boggabri Coal to prepare a report on the practicability of implementing best practice measures to reduce particle emissions.

The PRP was attached to the Boggabri Coal Environmental Protection Licence (EPL 12407). Best practice measures for the reduction of particulate matter that are identified in this PRP will be integrated into the Boggabri Coal Environmental Management System (EMS). The EMS has been developed to proactively manage environmental issues during construction and operation phases of the Boggabri Coal Mine.

The EMS consists of a Tier 1, Environmental Management Strategy document that details Boggabri Coal overall approach to environmental management, and a series of Tier 2 documents. These Tier 2 documents include:

- Mining Operations Plan (MOP);
- Overarching Project Construction Environmental Management Plan (CEMP); and
- Various Project Operational Environmental Management Plans (EMPs).

In addition, various contractor CEMPs have been prepared relevant to specific contractor construction activities.

The above documents will be utilised to ensure compliance with relevant consent conditions, legislation, regulations, conditions of any applicable licence, approval and/or permit associated with the construction and operation phases of the Boggabri Coal Mine.

1.2 Existing Operation

Boggabri Coal Pty Limited (Boggabri Coal), is a wholly owned subsidiary of Idemitsu Australia Resources Pty Limited.

The Boggabri Coal Mine is located 15km north-east of the township of Boggabri in north-western New South Wales.

The project is an open cut coal mine with potential underground reserves. The project is managed by Boggabri Coal utilising mining and coal transportation contractors.

Boggabri Coal Mine commenced mining operations in 2006.

Truck and shovel operations are undertaken to produce a crushed and screened run-of-mine (ROM) coal product. Coal is transported on a sealed private haul road to a rail loading facility, where coal is dispatched for overseas consumption via the Port of Newcastle.

Boggabri Coal's existing development consent was extended by Modification 2 on 19 October 2011 and will lapse on 19 October 2013.

1.3 Objectives

The objectives of this PRP are to report on the following:

- Estimate baseline emissions and determine the four mining activities that currently generate the most particulate matter
- Estimate the reduction in emissions that could be achieved by applying best practice measures;
- Assess the practicability of each of these measures
- Propose a timetable for the implementation of any practical measures.

2. PRP Environmental License Requirements

2.1.1 *Protection of the Environment Operations Act*

The *Protection of the Environment Operations Act, 1997* (POEO Act) is the key piece of environment protection legislation, which aims to protect, restore and enhance the quality of the environment in New South Wales by rationalising, simplifying and strengthening the regulatory framework for environment protection.

This Act ensures that during construction and operations, the operation of any plant or equipment is undertaken in a manner that does not cause pollution from those premises and that operations are also carried out in a competent manner.

Under the POEO Act, certain industrial activities (including the Project) require an EPL. Each EPL limits lawful pollution emissions to air, land and water to specific thresholds.

Boggabri Coal holds EPL No: 12407 under this Act. A copy is available at the following Office of Environment and Heritage (OEH) Website:

http://www.environment.nsw.gov.au/prpoeoapp/ViewPOEOLicence.aspx?DOCID=31130&SYSUID=1&LICID=12407

A summary of EPL conditions relating to the PRP at the Boggabri Coal Mine is provided in Table 2-1.

Table 2-1 PRP Conditions from EPL 12407

Applicable Condition	Requirement
U1.1	The Licensee must conduct a site specific Best Management Practice (BMP) determination to identify the most practicable means to reduce particle emissions.
U1.2	The Licensee must prepare a report which includes, but is not necessarily limited to, the following: - identification, quantification and justification of existing measures that are being used to minimise particle emissions; - identification, quantification and justification of best practice measures that could be used to minimise particle emissions; - evaluation of the practicability of implementing these best practice measures; and - a proposed timeframe for implementing all practicable best practice measures. In preparing the report, the Licensee must utilise the document entitled Coal Mine Particulate Matter Control Best Practice – Site Specific Determination Guideline - November 2011.
U1.3	All cost related information is to be included as Appendix 1 of the Report required by condition U1.2 above.
U1.4	The report required by condition U1.2 must be submitted by the Licensee to the Environment Protection Authority, Manager Armidale Region, at PO Box 494 Armidale NSW 2350 by 29 June 2012.
U1.5	The report required by condition U1.2 above, except for cost related information contained in Appendix 1 of the Report, must be made publicly available by the Licensee on the Licensee's website by 6 July 2012.

3. Estimated Baseline Particle Emissions

Baseline particle emissions have been estimated for all relevant mining activities that occurred during the period January 2011 to December 2011. Emissions were estimated in accordance with US EPA AP42 guidelines. Estimates for all activities before controls applied are provided in Table 3-1.

Table 3-1 Summary of estimated baseline emissions with no controls in place.

Activity	No Controls		
	TSP Emission Rate (t/yr)	PM10 Emission Rate (t/yr)	PM2.5 Emission Rate (t/yr)
Wheel generated dust - unpaved roads	21,645	7,350	735
Wheel generated dust – paved roads	8	1.5	0.4
Wind erosion - exposed areas[1],[2]	358	179	27
Wind erosion - coal stockpiles[2]	263	132	20
Load/unload coal - haul truck	452	58	8
Crush Coal	11	5	0
Loading coal to ROM Hopper	284	37	5
Loading coal to road train	1	0.5	0.1
Unloading coal from road train	284	37	5
Load coal to train	1	0.5	0.1
Load/unload overburden – haul truck	22	10	2
Graders	71	25	2
Blasting overburden	45	23	1
Drilling overburden	18	9	1
Bulldozing Overburden	51	11	5
Bulldozing Coal	358	102	8
TOTALS	**23,905**	**7,998**	**823**

[1] Wind erosion for exposed areas includes overburden emplacement

[2] Quarterly summary of surface areas for stockpiles and exposed areas used in surface area estimation

4. Estimated Baseline Particle Emissions with Current Controls

Table 4-1 Summary of estimated emissions with dust management controls in place.

Activity	Current Controls			Dust Management	
	TSP Emission Rate (t/yr)	PM10 Emission Rate (t/yr)	PM2.5 Emission Rate (t/yr)	Control Method	Emission Reduction[1]
Wheel generated dust -unpaved	10,932	3,712	371	Water Carts Permanent and temporary roads watered – Level 1 Road conditions are monitored and water carts directed to areas of high priority. If dust conditions persist then all equipment is instructed to reduce speed and if required stop work until dust is under control. Haul roads speed limited to 60km/hr and 40km/hr in work areas.	50%
Wheel generated dust - paved	8	1.5	0.4	Monitor meteorological conditions	-
Wind erosion - exposed areas	257	128	19	Planned progressive rehabilitation and seeding of topsoil stockpiles Overburden emplacements, windrows, other	99% -
Wind erosion - coal stockpiles	159	80	12	Primary barriers Windrows of 1-2m established on boundary for in pit storage Carry over wetting from load in at Train load out	30% 80%
Load/unload coal - haul truck	452	58	8	Monitor meteorological conditions	-
Crush Coal	49	17	-	Enclosed, Water Sprays	50%
Loading coal to ROM Hopper	143	18	3	Water Sprays	50%
Loading coal to road train	0.6	0.3	0.04	Choked Feed, Water Sprays	50%
Unloading coal from road train	86	11	2	Enclosed, Water Sprays	70%
Load coal to train	0.3	0.1	0.02	Enclosed, Water Sprays	70%
Load/unload overburden	22	10	2	Monitor meteorological conditions	-
Graders	71	25	2	Monitor meteorological conditions	-
Blasting overburden	45	23	1	Monitor meteorological conditions	-
Drilling overburden	5	3	0.2	Water Applied	70%[2]
Bulldozing Overburden	51	11	5	Monitor meteorological conditions	-
Bulldozing Coal	358	102	9	Monitor meteorological conditions	-
TOTALS	**12,630**	**4,204**	**437**		

[1] Control factors adopted from the Best Practice report (Katestone, 2011).
[1] NPI Emission Estimation Technique Manual

5. Highest Ranking Activities

Table 5-1 Activities ranked for each particulate matter emission size fraction

Activity	TSP	PM_{10}	$PM_{2.5}$
Blasting overburden	11	7	11
Bulldozing Coal	3	3	4
Bulldozing Overburden	9	11	6
Crush Coal	10	9	16
Drilling overburden	14	13	13
Graders	8	6	10
Load coal to train	16	16	15
Load/unload coal - haul truck	2	5	5
Load/unload overburden	12	12	9
Loading coal to road train	15	15	14
Loading coal to ROM Hopper	6	8	7
Unloading coal from road train	7	10	8
Wheel generated dust - paved	13	14	12
Wheel generated dust -unpaved	1	1	1
Wind erosion - coal stockpiles	5	4	3
Wind erosion - exposed areas	4	2	2

Table 5-2 Top 4 particulate matter generating activities

Rank	Mining Activity	Emission Rate (t/yr)
	TSP	
1	Wheel generated dust - unpaved	10,932
2	Load/unload coal – haul truck	452
3	Bulldozing coal	358
4	Wind erosion – exposed areas	257
	PM_{10}	
1	Wheel generated dust - unpaved	3712
2	Wind erosion – exposed areas	128
3	Bulldozing coal	102
4	Wind erosion – coal stockpiles	80
	$PM_{2.5}$	
1	Wheel generated dust - unpaved	371
2	Wind erosion - exposed areas	19
3	Wind erosion – coal stockpiles	12
4	Bulldozing coal	9

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6. Best Practice Controls

Best practice measures and potential reduction effectiveness are summarised in Table 6-1 for the four highest ranked activities under each size fraction. Emissions reduction estimated for implementing applicable best practice measures for each of the highest ranking activities is summarised in Table 6-2.

Table 6-1 Available Best Practice control measures

Activity	Best Practice	Reduction	Currently in Use
Wheel generated dust on unpaved roads	Watering Level 1	50%	Yes[3]
	Watering Level 2 and/or Optimum water application rate (moisture ratio of 2)	75%	No
	Watering Grader routes	50%	No
	Suppressants (Bitumen Emulsion & Polymers)	70-84%	Trials ongoing[4]
	Upgrade vehicles to larger fleet	20-45%	Partial[5]
	Vehicle speed restriction 40km/hr	50-80%	No
	Conveyors in place of haul roads	>95%	No
Wind erosion – coal stockpiles	Bypass stockpile	100%	No
	Water spray	50%	No
	Chemical wetting agent	80-99%	No
	Surface crusting agent	95%	No
	Carry over wetting from load in	80%	Yes[6]
	Cover storage pile with a tarp during high winds	99%	No
	Vegetative wind breaks, reduced pile height	30%	No
	Wind screens	75-80%	Partial[7]
	Pile shaping/ orientation	<60%	No
	3 sided enclosures	75%	No
Wind erosion – exposed areas	Minimise pre-strip	100%	Yes[8]
	Watering	50%	Partial[4]
	Chemical suppressants	70-84%	No
	Paving & cleaning	>95%	No
	Gravel application	84%	No
	Rehabilitation	100%	Yes[7]
	Wind speed reduction – bunding, fencing (height greater than erodible surface	70-80%	No
	Vegetative ground cover	70%	Partial[9]
Load/unload coal – haul truck	No controls identified	-	-
Bulldozing coal	Keep travel routes and materials moist	50%	Partial[10]

[3] Active haul routes kept moist by a fleet of water carts. Watering practices include spot or checkerboard spraying to minimise potential for uncontrolled movement of heavy equipment.
[4] Dust suppressant trials were scheduled to commence in December 2012 but have been continually delayed due to wet weather. Trial 1 was completed in March 2012 and Trial 2 completion scheduled for June 2012.
[5] Mine expansion is being serviced by the on-boarding of a larger vehicle sized fleet (Komatsu 930E's).
[6] Coal loaded to the stockpile at the train load is subject to water sprays throughout the conveyor system.
[7] ROM pads located within the open cut operations are bordered by windrows, however stockpiles height exceed the height of these barriers.
[8] Pre strip and Rehabilitation is carried out in accordance with the MOP and is planned to minimise disturbed areas where possible
[9] Long term topsoil stockpiles are seeded

[10] Areas are sprayed by water carts however spray application is not consistent to effectively maintain moisture content.

Table 6-2 Feasible & Practical Best Practice control measures to reduce particulate matter emission from the Top 4 ranked activities

Activity	Current Controls			Best Practice – Feasible & Practical Application			
	TSP Emission Rate (t/yr)	PM10 Emission Rate (t/yr)	PM2.5 Emission Rate (t/yr)	Best Practice Control	TSP Emission Rate (t/yr)	PM10 Emission Rate (t/yr)	PM2.5 Emission Rate (t/yr)
Wheel generated dust - unpaved	10,932	3,712	371	**KEY METHOD**			
				a) Optimum water application rate based on a Moisture Ratio of 2 (75%) b) Surface improvement (30%) Low silt aggregate Combined control efficiency (83%)	3,717	1,262	126
				ADDITIONAL OPTIONS SUBJECT TO FURTHER INVESTIGATION[1]			
				a) Surface stabilisation (70% - 84%) Bitumen Emulsion for permanent areas & other suppressant for temporary areas b) Surface improvement (30%) Low silt aggregate *Combined control efficiency (79-89%)*	2405-4591	817-1559	82-156
Wind erosion - coal stockpiles[2]	159	80	12	**KEY METHOD**			
				Wind speed reduction (75%) Stockpile heights to be no higher than surrounding enclosure/windrow/fence where feasible and practical Surface Stabilisation (50%) Watering *Combined control efficiency (87.5%)*	84	42	6
				ADDITIONAL OPTIONS SUBJECT TO FURTHER INVESTIGATION[1]			
				Surface Stabilisation (95%) Surface crusting agent applied to open cut area stockpiles	77	39	6
Load/unload coal - haul truck	452	58	8	Monitor meteorological conditions	452	58	8
Wind erosion - exposed areas	257	128	19	Surface Stabilisation (50%) Watering	129	64	10
Bulldozing Coal	358	102	9	Water sprays on stockpiles/work areas (50%)	181	52	4

[1]These options are currently being investigated for effectiveness and feasibility. Further details are presented in Section 7.1.

[2]Controls exclude ROM1 and train load out stockpiles except where watering is identified.

7. Practicability of Best Practice Measures

Wheel generated dust for unpaved roads contribute more than 80% of the total particulate matter emissions for site across all size fractions. Financial information provided for dust minimisation strategies outlined in Table 6-2 (refer attachment 1) are indicative only and will be further discussed in a feasibility study pending completion of the current dust suppressant trials. Costs associated with implementing best practice for other activities are not quantifiable as they form a change in process to existing site operations and can absorbed into daily processes. Further details of the dust suppressant trials are outlined in Appendix D.

7.1 Wheel Generated Dust – unpaved roads

In order to address the best practice control measures listed in Table 6-2 for wheel generated dust, a complete haul road management system (HRMS) is being developed. The HRMS will be specifically targeted at reducing particulate matter from wheel generated dust and will incorporate a watering regime developed around a Moisture Ratio of 2 (75% dust control efficiency). A site specific optimum water application rate based on maintaining a Moisture Ratio of 2 will be determined using the guideline provided in USEPA (2006), AP 42, chapter 13.2.2-11. Due to different evaporation rates the Moisture Ratio will be determined from samples collected at various times throughout the year. Seasonal variation requires that the moisture ratio be determined for the current weather conditions and will need to be determined for warmer conditions later in the year. The feasibility and practicality of implementing a watering regime based on maintaining a seasonal Moisture ratio of 2 with the existing water cart fleet will be evaluated in conjunction with other identified options.

Chemical and bitumen emulsion dust suppressant trials were scheduled to commence in December 2011. Trials were delayed due to wet weather events and did not commence onsite until March 2012. The purpose of the trials is to identify dust suppressant methods available and evaluate their applicability, feasibility and effectiveness on site. Trial 1 was completed in April 2012 and Trial 2 expected to complete in early July 2012. Proposals for Trial 3 are currently being received. Analysis of the dust trials monitoring data will help define an overarching haul road management system (HRMS). Additional benefits include increased tyre life, reduced water usage and an increase in energy efficiency.

Water availability has been identified as a potential limiting factor. An active water balance for site is currently being developed to address this issue. It is expected that the OPSIM water balance model can be utilised to determine demand on water and potential volume restrictions under the HRMS requirements. Water usage, spray head design/position and water spray as a function of ground speed will be considered and where required updated to achieve optimum dust suppressant application conditions.

Mine planning currently allows for a fleet of ten Caterpillar 785s, thirteen Caterpillar 789s and eight Komatsu 930Es. To allow for future mine expansion a further nine Komatsu 930s have been scheduled into the mine plan. The move to a larger sized fleet was instigated through mine planning; costs are not associated with the benefits of reduced particulate matter.

Current speed limits of 60km/hr are enforced for all haul roads and are reduced in response to observed dust or wet weather conditions as part of site general practice. Reducing haul road speed to 40km/hr would require additional haul trucks to meet production targets, negating the potential speed limit control efficiency.

7.2 Wind Erosion – coal stockpiles

Stockpiles that are continuously disturbed can be treated with water. Windrow structures that form boundaries to the coal stockpiles can be extended where possible and coal stockpiles maintained so as to maximise the time period whereby their height does not exceed existing barriers. Subject to the findings of the dust suppressant trial and feasibility study, surface crusting agents may be applied to stockpiles where minimum disturbance is expected.

7.3 Wind Erosion - exposed areas

Exposed areas include overburden emplacements, dig and dump faces, windrows, benches prepared for drill and blast, pre-strip and planned rehabilitation. Some of these areas are not accessible by water cart rear sprays but can be treated with water by utilising the water cannons attached to the water carts. Where possible, exposed areas are generally seeded or vegetated to improve soil stability and reduce dust propagation. Overburden emplacements are progressively rehabilitated in accordance with the MOP.

Trigger Action Response Plans (TARPs) for specific weather conditions will be developed and used to optimise water cart operations and minimise dust. A predictive meteorological warning system and the site TEOMS real time monitor will be consulted to ensure that weather predictions are communicated directly with the Open Cut Examiner (OCE). This system will provide short-medium term predictions on likely weather conditions for the site and will ensure that an appropriate dust mitigation response is enacted prior to the impact of adverse weather conditions. Capabilities of the predictive meteorological monitoring system are outlined below.

- Daily 6-hourly interval forecasts (one week timeframe) with weather commentary and details of wind direction, wind speed, likelihood of rainfall exceeding a site-specific threshold, and minimum and maximum temperatures.
- Three month seasonal outlook issued monthly and providing site-specific map-based and tabular rainfall and temperature data.
- Four to eight month long-term seasonal outlook issued monthly and providing longer term site specific map-based and tabular rainfall and temperature data.

7.4 Bulldoze Coal

The coal stockpile located at the train load-out facility maintains higher moisture content with carry over water from the sprays at transfer points. Moisture content will be maintained by further water application if required. Bulldozing of coal also occurs at the open cut stockpiles. Section 7.2 further outlines the dust mitigation methods employed at coal stockpiles.

7.5 Load/unload Coal – haul truck

There are no quantifiable controls identified for minimising particulate matter from the loading and unloading of coal from haul trucks. Minimising dust from this activity will form part of the Trigger Action Response Plans outlined in section 7.3.

8. Proposed Timeline for Implementation

Table 8-1 Proposed timeline for best practice control measures

Best Practice Measure	Date
Wheel Generated Dust	
• Cool season - Moisture ratio 2 watering and surface improvement (83%)	1 October 2012
• Implement Draft Trigger Action Response Plans (TARPs)	1 September 2012
• Warm season – Moisture ratio 2 watering	1 January 2013
• Dust Trial Completion	1 January 2013
• Dust Suppressant Feasibility Study	1 March 2013
Wind erosion – coal stockpiles	
• Surface Stabilisation (50%) - watering	1 September 2012
• Surface Stabilisation (95%) - surface crusting agent applied to open cut area stockpiles	Dependant on completion of dust suppressant trials and feasibility analysis
• Wind speed reduction (75%) - stockpile heights to be no higher than surrounding enclosure/windrow/fence, where feasible and practical	1 November 2012
Wind Erosion Exposed Areas	
• Surface Stabilisation (50%) - watering	1 September 2012
Bulldoze Coal	
• Water sprays on stockpiles/work areas (50%)	1 September 2012

9. Contacts

The names and contact details of key Boggabri Coal team members, including contractors, are outlined in **Table 9-1**.

Table 9-1 Site Contacts

Title	Company	Name	Contact No
General Manager	Boggabri Coal	Ken McLaren	0417 161 260
Environmental Coordinator	Boggabri Coal	Joe Rennick	0439 135 792
Operations Manager (Acting)	Boggabri Coal	Bill Archer	0427 391 612
Mining Contractor	Downer EDI Mining	Michael Williams	0477 306 279

10. Reporting

Various monitoring reports will be prepared at regular intervals for the management of issues associated with particulate matter at Boggabri Coal. These reports and reporting periods are discussed in detail below.

10.1 Annual Environmental Management Report (AEMR)

Boggabri Coal prepares and submits an annual environmental report in respect of the environmental performance of the development to the relevant agencies.

Generally the AEMR must be submitted within 28 days of the end of the reporting period.

The Annual Environmental Management Report will contain a section on the PRP.

10.2 National Pollutant Inventory Reporting (NPI)

The National Pollutant Inventory (NPI) tracks pollution across Australia and records the information in a database that is made available to the public. Legislative framework underpinning the NPI is the National Environment Protection (National Pollutant Inventory) Measure.

Under this legislation Boggabri Coal is required to report any emission to land, air or water inclusive of emissions for dust on an annual basis.

11. PRP Preparation and Review

The management of the PRP remains the responsibility of the BCPL's Environmental Coordinator.

11.1 PRP Review

This PRP, its operation and implementation, will be reviewed at least every twelve months by BCPL's Environmental Coordinator, to ensure that the system is conforming to the Boggabri Coal MOP, environmental policies, objectives and legal and other requirements.

This PRP will be revised on an as requested basis to incorporate comments and improvements developed by appropriate government agencies and/or Boggabri Coal and their contractors.

The outcomes of the management review process will be incorporated as improvements to the PRP, other EMPs, EWMS's and procedures to facilitate regulatory and policy compliance and continuous improvement.

12. References

DSEWPC (2011). Emission Estimation Technique Manual for Mining Version 3.0, Department of Sustainability, Environment, Water, Population and Communities, Canberra, Australia.

Katestone Environmental (2011). '*NSW Coal Mining Study: International best practice measures to prevent and/or minimise emissions of particulate matter from coal mining'*. Prepared by Katestone Environmental on behalf of NSW Office of Environment & Heritage.

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USEPA (2006), AP 42, Chapter 13.2.5, Industrial wind erosion, Technology Transfer Network − Clearinghouse for Inventories & Emissions Factors, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, USA. www.epa.gov/ttn/chief/ap42/ch13/final/c13s0205.pdf

Appendix A

Coal Mine Particulate Matter Control Best Practice
Site-specific determination guideline
November 2011

Purpose of this guideline

This guideline provides detail of the process to follow when conducting a site-specific determination of best practice measures to reduce emissions of particulate matter from coal mining activities.

It also provides the required content and format of the report required for the pollution-reduction program *Coal mine particulate matter best practice*.

The site-specific determination process

In preparing the report, as a minimum, the following steps must be followed:

1. Identify, quantify and justify existing measures that are being used to minimise particle emissions

1.1. Estimate baseline emissions of TSP, PM_{10} and $PM_{2.5}$ (tonne per year) from each mining activity. This estimate must:

- utilise USEPA AP42 emission estimation techniques (or other method as approved in writing by the EPA)
- calculate uncontrolled emissions (with no particulate matter controls in place), and
- calculate controlled emissions (with current particulate matter controls in place).

Note: These particulate matter controls must be clearly identified, quantified and justified with supporting information).

1.2. Using the results of the controlled emissions estimates generated from step 1.1, rank the mining activities according to the mass of TSP, PM_{10} and $PM_{2.5}$ emitted by each mining activity per year from highest to lowest.

1.3. Identify the top four mining activities from step 1.2 that contribute the highest emissions of TSP, PM_{10} and $PM_{2.5}$.

2. Identify, quantify and justify the measures that could be used to minimise particle emissions

2.1. For each of the top four activities identified in step 1.3, identify the measures that could be implemented to reduce emissions, taking into consideration:

- the findings of Katestone (June 2011) *NSW coal mining benchmarking study – international best practice measures to prevent and/or minimise emissions of particulate matter from coal mining* (see www.environment.nsw.gov.au/resources/air/KE1006953volumeI.pdf)
- any other relevant published information, and
- any relevant industry experience from either Australia or overseas.

2.2. For each of the top four activities identified in step 1.3, estimate the emissions of TSP, PM_{10} and $PM_{2.5}$ from each mining activity after applying the measures identified in step 2.1.

3. Evaluate the practicability of implementing these best practice measures

3.1. For each of the best practice measures identified in step 2.1, assess how practicable each one is to implement by taking into consideration:

- implementation costs
- regulatory requirements
- environmental impacts
- safety implications, and
- compatibility with current processes and proposed future developments.

3.2. Identify those best practice measures that will be implemented at the premises to reduce particle emissions.

4. Propose a timeframe for implementing all practicable best practice measures

4.1. For each of the practicable best practice measures identified in step 3.2, provide a timeframe for their implementation.

Report content

The report must clearly identify the methodologies utilised and all assumptions made. It must contain detailed information justifying and supporting all the information used in each step of the process. For example, in calculating the controlled emissions in step 1, current particulate matter controls being used at the mine must be clearly identified, quantified and justified. This means adding supporting information and evidence, including monitoring data, record keeping, management plans and/or operator training.

In evaluating practicability in step 3, the licensee must document the following specific information:

- estimated capital, labour, materials and other costs for each best practice measure on an annual basis for a 10-year period – this information must be set out in the format provided in Appendix A and included as an attachment to the report
- details of any restrictions on implementing each best practice measure due to an existing approval or licence
- quantify any new or additional environmental impacts that may arise from applying a particular best practice measure, such as increased noise or fresh-water use
- details of safety impacts that may result from applying a particular best practice measure
- details of any incompatibility with current operational practices on the premises, and
- details of any incompatibility with future development proposals on the premises.

Report format

The report must be structured according to the process outlined. It must be submitted as a pdf *and* hard copy in triplicate. All emission estimates, costs and supporting calculations must be in electronic format as an Excel spreadsheet.

Appendix B

Emission Factors

Activity	Units	TSP Emission Factor	PM_{10} Emission Factor	$PM_{2.5}$ Emission Factor	Source
Wheel generated particulates on unpaved roads	kg/VKT	$(0.4536/1.6093)*4.9*(s/12)^{0.7}*(W*1.1203/3)^{0.45}$	$(0.4536/1.6093)*1.5*(s/12)^{0.9}*(W*1.1203/3)^{0.45}$	$(0.4536/1.6093)*0.15*(s/12)^{0.9}*(W*1.1203/3)^{0.45}$	AP42 13.2.2
Wheel generated particulates on paved roads	g/VKT	$3.23*(sL)^{0.91}*(W)^{1.02}$	$0.62*(sL)^{0.91}*(W)^{1.02}$	$0.15*(sL)^{0.91}*(W)^{1.02}$	AP42 13.2.1
Blasting	kg/blast	$0.00022*A^{1.5}$	0.52*TSP	0.03*TSP	AP42 11.9 Table 11.9-2
Bulldozing overburden	kg/t	$2.6*(s^{1.2}/M^{1.3})$	$2.6*(s^{1.5}/M^{1.4})$	0.105*TSP	AP42 11.9 Table 11.9-2
Bulldozing coal	kg/t	$35.6*(s^{1.2}/M^{1.3})$	$35.6*(s^{1.4}/M^{1.4})$	0.022*TSP	AP42 11.9 Table 11.9-2
Loading overburden to trucks	kg/t	$0.74*0.0016*[(U/2.2)^{1.3}/(M/2)^{1.4}]$	$0.35*0.0016*[(U/2.2)^{1.3}/(M/2)^{1.4}]$	$0.053*0.0016*[(U/2.2)^{1.3}/(M/2)^{1.4}]$	AP42 11.9 13.2.4
Loading coal to trucks	kg/t	$0.580/M^{1.2}$	$0.0447/M^{0.9}$	0.019xTSP	AP42 11.9 Table 11.9-2
Trucks unloading overburden	kg/t	$0.74*0.0016*[(U/2.2)^{1.3}/(M/2)^{1.4}]$	$0.35*0.0016*[(U/2.2)^{1.3}/(M/2)^{1.4}]$	$0.053*0.0016*[(U/2.2)^{1.3}/(M/2)^{1.4}]$	AP42 11.9 13.2.4
Trucks unloading coal	kg/t	$0.580/M^{1.2}$	$0.0447/M^{0.9}$	0.019xTSP	AP42 11.9 Table 11.9-2
Loading from coal stockpiles	kg/t	$0.74*0.0016*[(U/2.2)^{1.3}/(M/2)^{1.4}]$	$0.35*0.0016*[(U/2.2)^{1.3}/(M/2)^{1.4}]$	$0.053*0.0016*[(U/2.2)^{1.3}/(M/2)^{1.4}]$	AP42 11.9 13.2.4
Wind erosion of exposed areas	kg/ha/h	Default Factor	0.5*TSP	0.075*TSP	AP42 11.9 Table 11.9-4 AP42 13.2.5
Wind erosion of coal stockpiles	kg/ha/h	Default Factor	0.5*TSP	0.075*TSP	AP42 11.9 Table 11.9-4 AP42 13.2.5
Unloading from coal stockpiles	kg/t	$0.580/M^{1.2}$	$0.0447/M^{0.9}$	0.019xTSP	AP42 11.9 Table 11.9-2
Graders	kg/VKT	$0.0034*S^{2.5}$	$0.0034*S^{2.0}$	$0.0034*S^{2.5}$	AP42 11.9 Table 11.9-2
Wind erosion of overburden	kg/ha/h	Default Factor	0.5*TSP	0.075*TSP	AP42 11.9 Table 11.9-4 AP42 13.2.5
Crush Coal	kg/t	0.0027	0.0012	No data	AP42 11.19 Table 11.19.2-2
Road Train & Train Loading	kg/t	$0.74*0.0016*[(U/2.2)^{1.3}/(M/2)^{1.4}]$	$0.35*0.0016*[(U/2.2)^{1.3}/(M/2)^{1.4}]$	$0.053*0.0016*[(U/2.2)^{1.3}/(M/2)^{1.4}]$	AP42 11.9 13.2.4

M = material moisture content (%), s = material silt content (%), u = wind speed (m/s), W = mean vehicle weight (t), S = mean vehicle speed (km/h), A = horizontal area (m^2), sL = silt loading (g/m^2)

Appendix C

Site Specific Data

Emission Calculation Site Specific Data		
Overburden Moisture Content	8.07%	Sampled on site
Haul Rd Moisture Content	20.15%	Sampled on site
Coal Moisture Content	5.64%	Sampled on site
Overburden Silt Content	10.5%	Sampled on site
Mean wind speed	2.22 m/s	Boggabri Coal weather station
Grader Speed average	8 km/hr	Estimation based on observation

Appendix D

Dust Suppressant Trials Synopsis

Dust Suppressant Trials Outline

Scope

Investigate feasibility and practicability of road dust suppressant solutions for permanent and temporary roads at the Boggabri Coal open cut operation with a view to trialling selected products.

Solutions Reviewed

Permanent haul roads (Trials approved by Management in October 2011)

- Two bitumen based emulsions selected for trial following referral and investigation

Temporary haul roads

- Further investigation required, proposals currently being received for further consideration

Monitoring

Monitoring during the dust suppressant trials captures the following data:

- Dust Track Monitor – PM10 for baseline and product treated areas
- Observations
- Photos
- Interviews with operational personnel
- Daily rainfall, evaporation, sun exposure
- Traffic activity (truck passes, truck weight and speed)
- Traction test

Deliverables

Feasibility study on utilising Dust Suppressants to reduce wheel generated dust.

Attachment 1

PRP Financial Analysis