RAV SD PLN 0046

CUMNOCK NO.1 COLLIERY – COAL MINE PARTICULATE MATTER CONTROL BEST MANAGEMENT PRACTICE DETERMINATION

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EXECUTIVE SUMMARY

Cumnock No.1 Colliery Pty Ltd (hereafter 'Cumnock') is a part of Ravensworth Surface Operations. It is located near the townships of Muswellbrook and Singleton in the Upper Hunter Valley region of New South Wales (NSW).

During 2011, the NSW Office of Environment and Heritage (OEH) included Pollution Reduction Programs (PRPs) in the Environmental Protection Licences of Ravensworth Operations and Cumnock No.1 Colliery (EPL 2652 and EPL 37 respectively), requiring site-specific Best Management Practice (BMP) Reviews to be conducted to identify the most practicable means to reduce particle emissions. This report details the Best Management Practice Review undertaken for Cumnock, with the review for Ravensworth Operations documented in a separate report.

In line with EPA's PRP requirement and the OEH's *Coal Mine Particulate Matter Control Best Practice – Site Specific Determination Guideline (November 2011)*, this report has been prepared to address the following for Cumnock:

- Identification of the top four mining activities that currently generate the most particulate matter emissions;
- Reduction in emissions that could be achieved by applying best practice measures;
- Practicability of each of these measures; and
- Timetable for the implementation of any practical measures.

Mine Activities with Potential Air Emissions

All coal mining activities came to an end at Cumnock in 2011. Current and planned activities at Cumnock are limited to the following:

- Pumping of wet tailings from Ravensworth Coal Handling and Processing Plant to voids and pits approved for tailings emplacement.
- On-going progressive rehabilitation works.

Based on the current activities at Cumnock, operations that have the potential to result in particulate matter emissions were concluded to be limited to:

- Wind erosion of general exposed areas at Cumnock. Exposed areas include tailing emplacement areas, recently rehabilitated areas (areas rehabilitated for less than 12 months), and other exposed areas.
- Infrequent light vehicle movement for undertaking rehabilitation inspections.

Infrequent light vehicle movement activity along the unpaved surfaces at Cumnock represents a negligible source of dust. Quantification of this source was therefore not undertaken.

Emission Estimation and Source Ranking

TSP, PM_{10} and $PM_{2.5}$ emission estimates (tonne per year) were quantified for wind erosion of exposed areas using USEPA AP42 emission factors, as specified by the OEH's *Coal Mine Particulate Matter Control Best Practice – Site Specific Determination Guideline – November 2011.*

Annual TSP, PM_{10} and $PM_{2.5}$ emissions were estimated to be 122 tonnes/year, 61 tonnes/year and 9 tonnes/year respectively.

Given that there is only one significant dust generating mining activity being undertaken at the site, no ranking of mining activities and identification of 'top activities' was necessary.

Additional Controls Identified

Cumnock has well established rehabilitation programs which include progressive permanent rehabilitation and provision for temporary rehabilitation. Taking existing programs into account opportunities have been sought for realising further improvements. The following additional measures were identified to optimise current temporary rehabilitation efforts:

- Establishment of a procedure for on-going, periodic identification of exposed areas for interim stabilisation.
- Extend existing rehabilitation monitoring program to include monitoring of the effectiveness of interim stabilisation.

A reduction in particulate matter emissions is expected to occur due to the optimisation of temporary rehabilitation efforts. The robust quantification of TSP, PM_{10} and $PM_{2.5}$ emission reductions achievable due to this operational measure was however not possible.

Practicability of Additional Controls

The additional measures identified were considered to be practicable taking into account anticipated costs, application of such measures at other mines, compatibility with current and future operational practices, and regulatory requirements pertaining to the site.

Implementation Schedule

The implementation plan for Cumnock is given in the table below.

Mine Activity	Tasks for Additional Measure Implementation	Timeline
Wind Erosion of Exposed Areas	Revise the existing rehabilitation procedures to include: identification of exposed areas suitable for interim stabilisation, and a monitoring method for assessing the effectiveness of interim stabilisation efforts.	July 2012 – Dec 2012 (revise procedures) Jan 2013 onwards (implement procedures)

1. INTRODUCTION

1.1 Background

Cumnock No.1 Colliery Pty Ltd (Cumnock) is a part of Ravensworth Surface Operations. It is located near the townships of Muswellbrook and Singleton in the Upper Hunter Valley region of New South Wales (NSW) (**Figure 1**).

Ravensworth Surface Operations holds the below mentioned Environmental Protection Licences (EPLs) for its mining operations.

Ravensworth Operations EPL (covers operations at Ravensworth North and West and Narama):

- Licence Number: 2652
- Licence Anniversary: 12 January
- Licence Review Due Date: 03 November 2014

Cumnock EPL:

- Licence Number: 37
- Licence Anniversary: 26 June
- Licence Review Due Date: 02 September 2014

During 2011, the NSW Office of Environment and Heritage (OEH) included Pollution Reduction Programs (PRPs) in the EPL licence of Ravensworth Operations and Cumnock (EPL 2652 and EPL 37 respectively), requiring site-specific Best Management Practice (BMP) Reviews to be conducted to identify the most practicable means to reduce particle emissions.

The BMP Reviews for Ravensworth Operations and Cumnock are documented in separate reports, with the current report detailing the review undertaken for the Cumnock.

1.2 PRP Requirements

On 2 December 2011, OEH issued Cumnock, with a notice of variation to its licence EPL 37, in respect of the *Coal Mine Particulate Matter – Best Management Practice Pollution Reduction Program* having been included in their EPL under Section 58 of the *Protection of the Environment Operations Act* 1997. The requirements of the aforementioned PRP are outlined below.

U1 Coal Mine Particulate Matter Control Best Practice

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 – August 2011.*

U1.3 All cost related information is to be included as Appendix A 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 Office of Environment and Heritage's Regional Manager Hunter, at PO Box 488G, NEWCASTLE WEST 2302 by 29 June 2012.

U1.5 The report required by condition U1.2 above, except for cost related information contained in Appendix A of the Report, must be made publicly available by the Licensee on the Licensee's website by 06 July 2012.

1.21 Scope of Assessment

The BMP review for Cumnock followed the process outlined in the OEH's *Coal Mine Particulate Matter Control Best Practice – Site Specific Determination Guideline* (hereafter referred to as the 'OEH Guideline'). This process requires that the following steps be followed, as a minimum:

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:*
     - *1.1.1. Utilise USEPA AP42 emission estimation techniques (or other method as approved in writing by the EPA)*
     - *1.1.2. Calculate uncontrolled emissions (with no particulate matter controls in place); and*
     - *1.1.3. 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:*
     - *2.1.1. 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, Katestone Environmental Pty Ltd, Terrace 5 , 249 Coronation Drive, PO Box 2217, Milton 4064, Queensland, Australia.*
     - *2.1.2. Any other relevant published information; and*
     - *2.1.3. Any relevant industry experience from either Australia or overseas.*
   - *2.2. For each of the top four activities identified in Step 1.3, estimate emissions of TSP, PM_{10} and $PM_{2.5}$ from each mining activity following the application of 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 the practicability associated with their implementation, by taking into consideration:*
     - *3.1.1. Implementation costs;*
     - *3.1.2. Regulatory requirements;*
     - *3.1.3. Environmental impacts;*

3.1.4. Safety implications; and
3.1.5. 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 best practice measures identified as being practicable in Step 3.2, provide a timeframe for their implementation.

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 ten year period. This information must be set out in the format provided in Appendix A and included as an attachment to the report;*
- *The details of any restrictions on the implementation of each best practice measure due to an existing approval or licence;*
- *Quantification of any new or additional environmental impacts that may arise from the application of a particular best practice measure, such as increased noise or fresh water use;*
- *The details of safety impacts that may result from the application of a particular best practice measure;*
- *The details of any incompatibility with current operational practices on the premises; and*
- *The details of any incompatibility with future development proposals on the premises.*

1.22 Costing of Measures

The cost information referenced in the OEH Guideline is required to allow the NSW Environmental Protection Authority (EPA) to verify that a particular best practice measure is not practicable at a particular site.

In subsequent advice provided, the EPA has indicated that any licensee may choose not to submit cost information for best practice measures that are either currently being implemented, or that are considered by the licensee to be practicable (*personal communication*, Mitchell Bennett, Head, Regional Operational Unit – Hunter, NSW EPA, 27 January 2012) (refer to Appendix A).

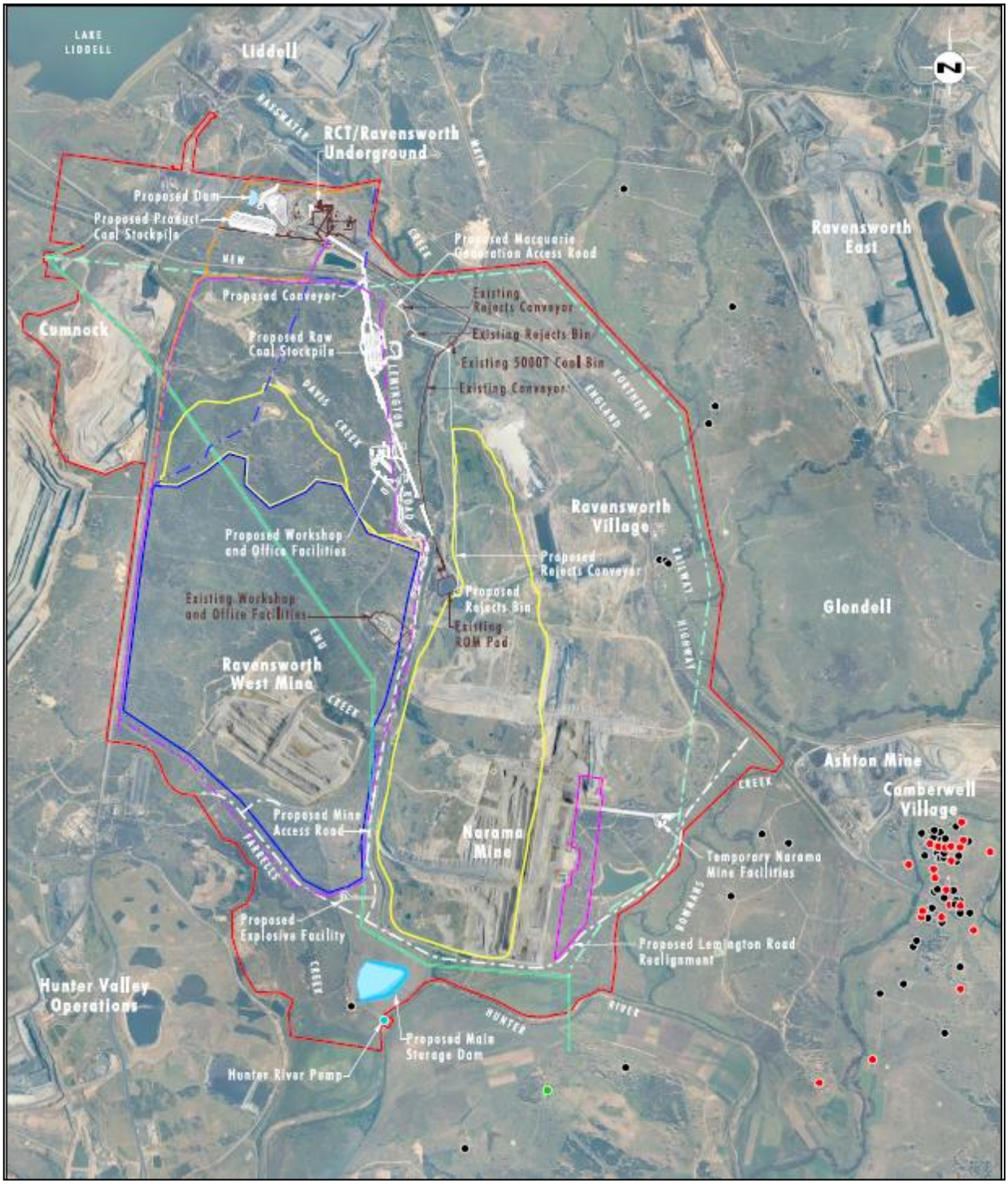

Figure 1. Ravensworth Surface Operations (including Cumnock) Locality Map

Source: Ravensworth Surface Operations, Mining Operations Plan

2. OVERVIEW OF OPERATIONS

2.1 Operations

Mining operations, both open-cut and underground have been undertaken at Cumnock since the 1950s. Following completion of underground and open cut mining at Cumnock in 2008, a small open cut coal reserve (known as the Wash Plant Pit) was identified beneath the Cumnock Coal Handling and Preparation Plant (CHPP), with an extraction limit of 1 million tonne per annum (Mtpa). Approval for mining this reserve was obtained. Prior to commencement of mining at the Wash Plant Pit, the Cumnock CHPP site was decommissioned and the extracted ROM coal from the Wash Plant Pit was hauled by truck to the Ravensworth Coal Handling and Preparation Plant (RCHPP) for processing and transporting. Mining of the Wash Plant Pit was completed in 2011.

All coal mining activities thus came to an end at Cumnock in 2011. Current and planned activities at Cumnock are limited to the following:

- Pumping of wet tailings from Ravensworth Coal Handling and Processing Plant to voids and pits approved for tailings emplacement, specifically:
  - Cumnock 1/2 voids;
  - Cumnock Stage 3 mine void; and
  - Cumnock Wash Plant Pit.
- On-going progressive rehabilitation works.

Current and proposed tailings emplacement areas at Ravensworth Surface Operations, which include designated areas for Cumnock, are shown in **Figure 2**.

2.2 Mine Activities with Potential Air Emissions

Based on the current activities at Cumnock, operations that have the potential to result in particulate matter emissions include:

- Wind erosion of general exposed areas at Cumnock. Exposed areas include:
  - Tailing emplacement areas;
  - Recently rehabilitated areas (areas rehabilitated for less than 12 months); and
  - Other exposed areas.
- Infrequent light vehicle movement for undertaking rehabilitation inspections.

Infrequent light vehicle movement activity along the unpaved surfaces at Cumnock represents a negligible source of dust. Quantification of this source was therefore not undertaken.

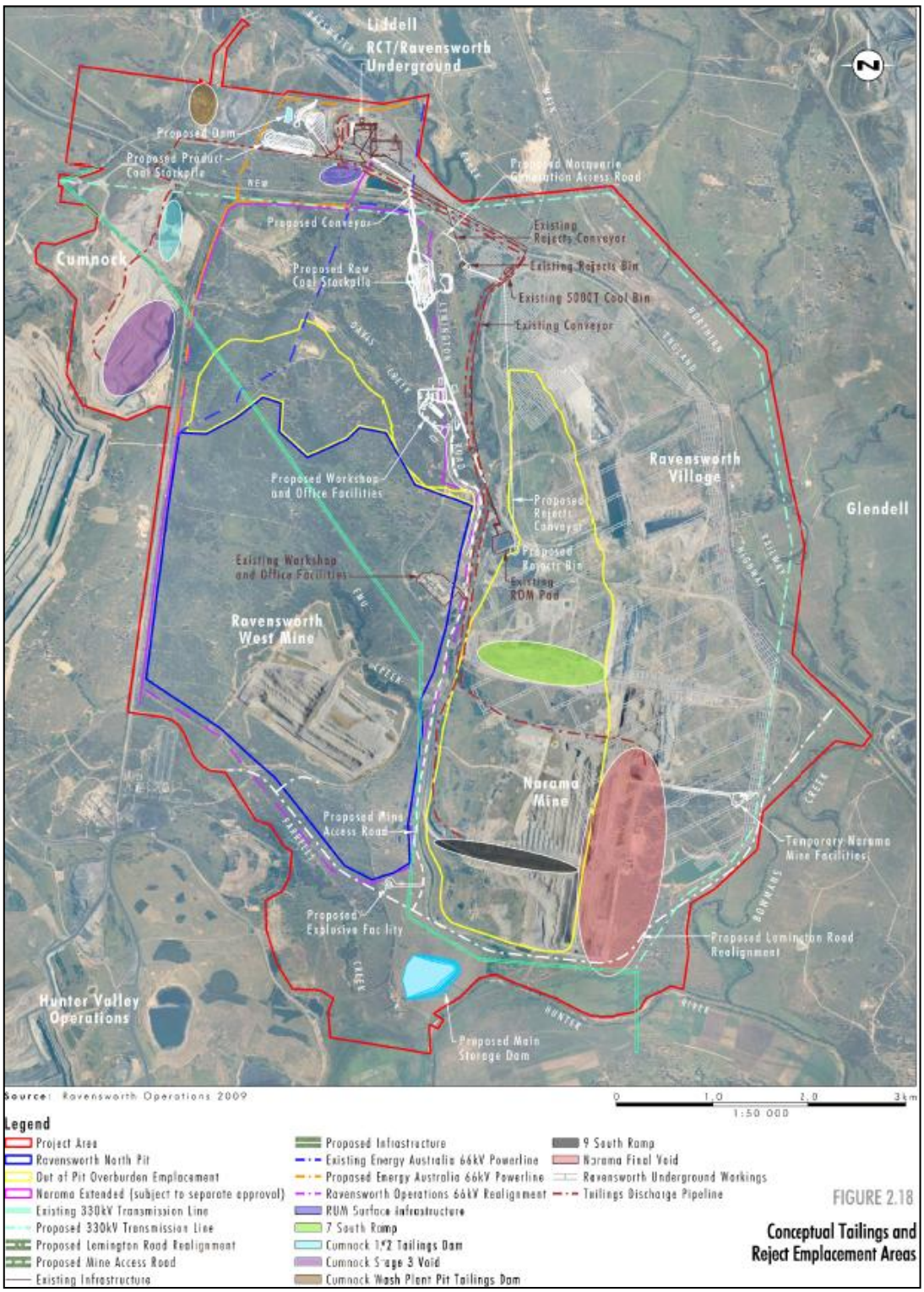

Figure 2. Current and Future Tailings Emplacement Areas

Source: Ravensworth Surface Operations, Mining Operations Plan

3. EXISTING EMISSIONS AND CONTROL MEASURES

3.1 Introduction

TSP, PM_{10} and $PM_{2.5}$ emissions (tonne per year) arising due to wind erosion of general exposed areas at Cumnock were estimated taking into account existing control measures applied. Such control measures are discussed below, with emission estimates provided in a subsequent section.

3.2 Current Measures and Control Efficiencies

Existing particulate matter control measures are documented in this section, with control efficiencies associated with such measures (where quantifiable) provided. Measures documented within operating procedures for Ravensworth Surface Operations are applicable to all areas, including Cumnock.

3.21 Rehabilitation of Exposed Areas

Rehabilitation works have been undertaken at Cumnock, since the completion of mining activities. The rehabilitation activities at Cumnock have included:

- Extensive rehabilitation work at the former Cumnock open pit area completed over a number of years.
- Progressive rehabilitation at the Wash Plant Pit.

Plans are in place for temporarily rehabilitating the void areas pending tailings emplacement.

Rehabilitation monitoring is undertaken and maintenance strategies are defined based on the results of monitoring. The implementation, monitoring and maintenance of rehabilitation areas across Cumnock, is undertaken with the aim of meeting legal and statutory requirements with regards to the rehabilitation process, decommissioning and closure of the rehabilitation areas.

Rehabilitation monitoring is currently undertaken as per the *Ravensworth Complex Monitoring and Review Program*, under the approved Biodiversity Management System and is conducted in accordance with the following procedures:

- *XCN SD ANN 0039 - 10.2 Closure Criteria Development and Rehabilitation Monitoring;*
- *RAV SD STD 0020 – Land Management – Topsoil Stripping and Management, and*
- *RAV STD 0018 – Land Management – Revegetation.*

As a part of the monitoring program, Cumnock implements an annual rehabilitation inspection to evaluate the success and progress of rehabilitation works. The program is scoped to include all existing and recently completed rehabilitation areas on site. The annual inspection is undertaken by a Visual Monitoring technique. Visual monitoring is a field based rapid assessment tool that provides a quantitative assessment to various landscape contributors.

Monitoring program also includes Long Term Rehabilitation Monitoring. The objective of this component is to evaluate the progress of rehabilitation. Monitoring frequency of rehabilitation areas will depend on the rehabilitation progress, but must be undertaken three yearly as a minimum. As a minimum, the long term rehabilitation monitoring will:

- Compare monitoring results against rehabilitation objectives and targets.
- Identify possible trends and areas for improvement.
- Link to records of rehabilitation to determine causes and explain results.
- Assess effectiveness of environmental controls implemented.
- Where necessary, identify modifications required for the monitoring program, rehabilitation practices or areas requiring research.
- Compare flora species present against original seed mix and / or analogue sites.
- Assess vegetation health.
- Assess vegetation structure.
- Where applicable, assess native fauna species diversity and the effectiveness of habitat creation for the target fauna species.

The rehabilitation monitoring program is used to establish and identify particular rehabilitation components that may not be tracking towards specific criteria. This allows the Environment and Community Coordinator to prioritise specific management actions to address this deficiency or amend rehabilitation procedures to prevent future failures. Outcomes of the annual rehabilitation inspection are recorded and any required management actions that are identified as a part of the inspection implemented as soon as practical.

Where necessary, rehabilitation procedures are amended accordingly with the aim of continually improving rehabilitation standards and programs.

Temporary rehabilitation and annual rehabilitation targets for Year 2012 are shown in **Figure 3** and **Figure 4** respectively. **Figure 5** shows rehabilitation undertaken at the Wash Plant Pit.

3.22 Allocation of Control Efficiencies

According to Section 2.2, the main activity at Cumnock capable of generating airborne particulate matter emissions is windblown dust from exposed areas, including tailings emplacement areas, recently rehabilitated areas and other exposed areas.

A control efficiency of 0% was applied for the aforementioned areas. No emissions were estimated for permanently rehabilitated areas, where such rehabilitation has been undertaken over 12 months previously.

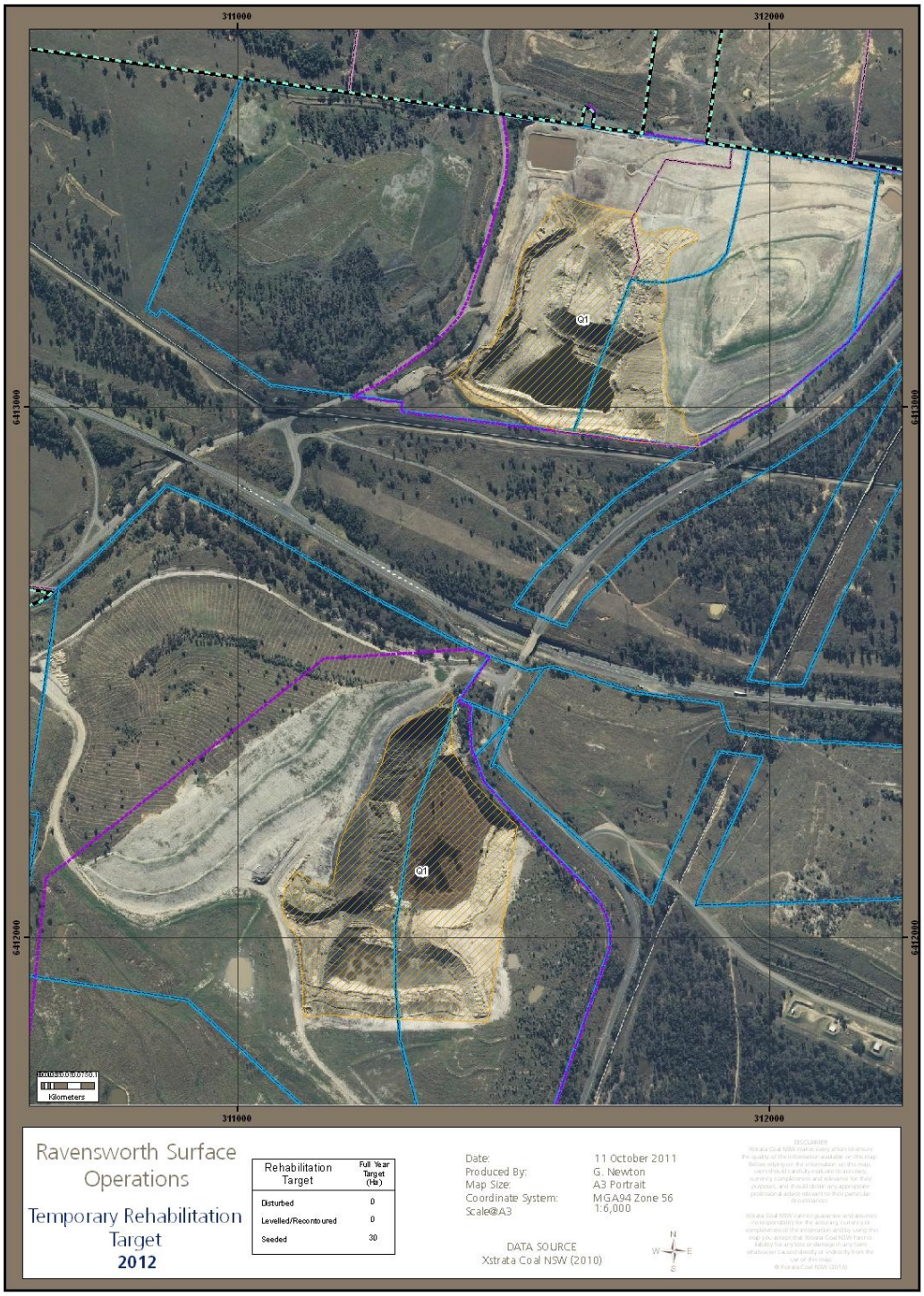

Figure 3. Cumnock 2012 Temporary Rehabilitation Plan and Targets

Source: Ravensworth Surface Operations, Annual Rehabilitation Plan

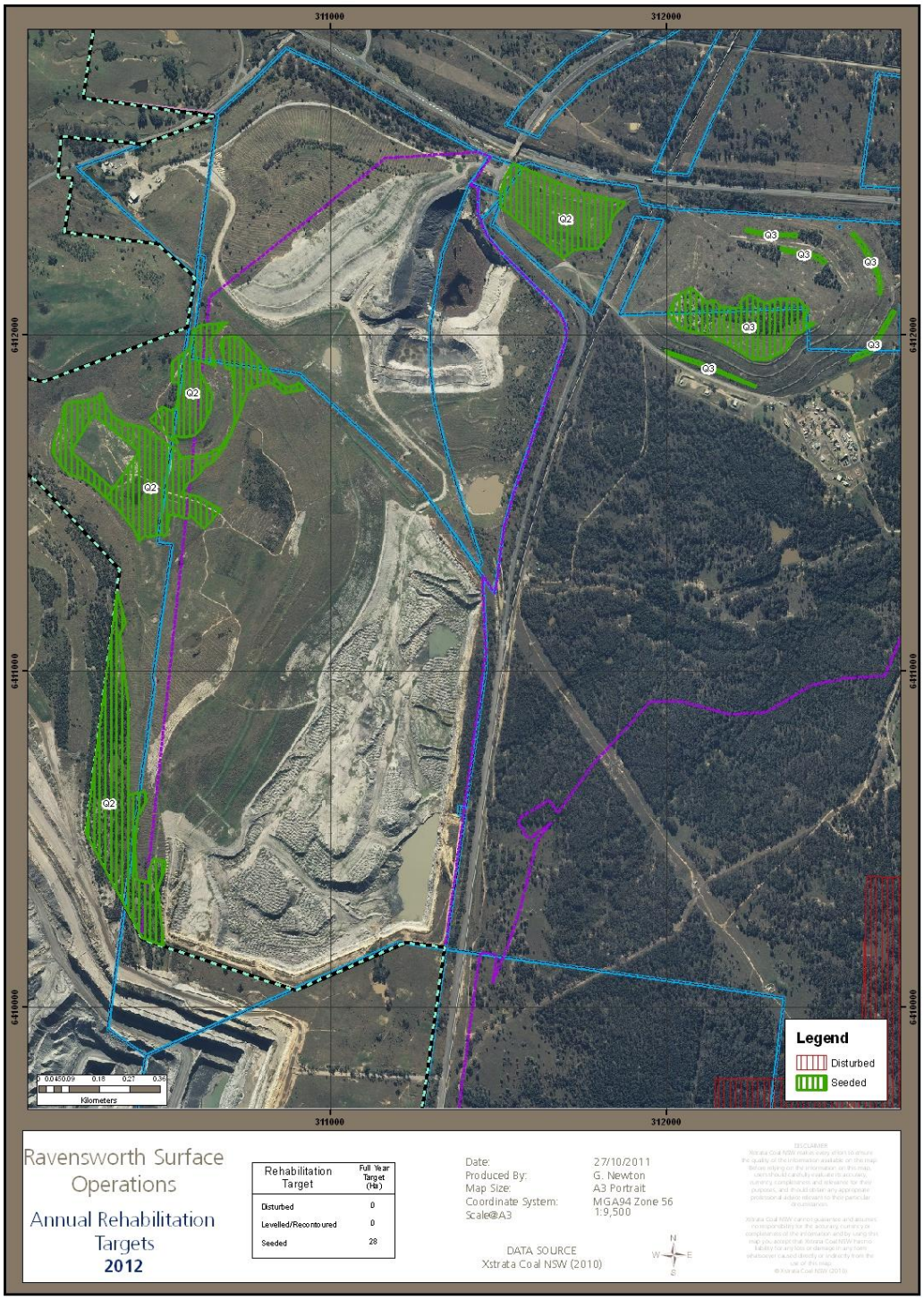

Figure 4. Cumnock 2012 Annual Rehabilitation Plan and Targets

Source: Ravensworth Surface Operations, Annual Rehabilitation Plan

Figure 5. Progressive Rehabilitation at Cumnock Wash Plant Pit

3.3 Particulate Matter Emissions

Annual TSP, PM_{10} and $PM_{2.5}$ emissions (tpa) estimated by applying USEPA AP42 emission factors are presented in **Table 1** (Refer to Appendix B).

Table 1: Annual Particulate Matter Emissions for Cumnock

Mine Activity Categories	Annual Emissions (tonnes/year)		
	TSP	PM_{10}	$PM_{2.5}$
Wind Erosion - General Exposed Areas	122	61	9
TOTAL	**122**	**61**	**9**

Given that there is only one significant dust generating mining activity being undertaken at Cumnock, no ranking of mining activities and identification of 'top activities' is necessary.

4. POTENTIAL ADDITIONAL PARTICULATE MATTER CONTROLS

4.1 Introduction

Best practice measures applicable for managing particulate matter emissions were reviewed based on a detailed review of the literature and taking into account measures being implemented by mining operations locally and internationally (ENVIRON, 2011). In identifying measures implementable at coal mining operations, attention was paid to technically and economically viable (or potentially viable) measures. This approach is consistent with the EU's definition of Best Available Techniques (BAT), the US definition of Best Demonstrated Technologies (BDT), Western Australia's definition of 'Best Practicable Measures' (BPM) and the approach adopted by the Victorian government (EPA Victoria, 2007; WA DEC, 2003; EC, 2009; US Regulation 40 CFR Part 60).

Based on the inventoried best practice control measures, a gap analysis was undertaken of Cumnock's current control measures, and potential additional controls identified for consideration. The practicability of Cumnock implementing the additional measures inventoried, taking local factors into account, is addressed in Section 5.

4.2 Potential Additional Controls

Best practice measures, current controls and potential additional control measures for wind exposed areas at Cumnock are documented in **Table 2**. In undertaking the identification of best practice measures, Ravensworth Operations drew on information collated during the XCN Air Quality Improvement Project (AQIP) (ENVIRON, 2011). Reference was also made to the findings of Katestone (2011) *NSW Coal Mining Benchmarking Study – International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining*

General exposed areas at Cumnock comprise the tailings emplacement areas, recently rehabilitated areas and any other exposed areas. According to Katestone (2011) best practice measures to reduce wind induced entrainment include aerial seeding to establish vegetative cover over large areas and areas that cannot be accessed, and development of a green belt area using trees or shrubbery as a natural barrier to particulate matter emissions.

Cumnock has well established rehabilitation programs which include progressive permanent rehabilitation and provision for temporary rehabilitation. Taking existing programs into account opportunities have been sought for realising further improvements as specified in **Table 2**.

4.3 Emission Reductions Achievable due to Additional Controls

A reduction in particulate matter emissions is expected to occur due to the optimisation of temporary rehabilitation efforts. The robust quantification of TSP, PM_{10} and $PM_{2.5}$ emission reductions achievable due to this operational measure is however not possible.

Table 2: Wind Erosion of Exposed Areas – Comparison of Current and Best Practice Controls and Identification of Additional Measures

Current Controls	Best Practice Controls	Additional Measures
• Application of Permanent Rehabilitation for exposed areas which are to be in place for over three years. Permanent rehabilitation includes top soiling and planting with selected species. • Extensive progressive rehabilitation at Cumnock open cut mine, Wash Plant Pit and decommissioned CHPP. • Implementation of temporary rehabilitation is planned for the near term to address wind exposed areas not suitable for permanent rehabilitation. Such rehabilitation is applicable for exposed areas which will not be disturbed for a period of twelve months or more. • Vehicular and pedestrian access to rehabilitated areas is restricted to prevent disturbance.	• Minimising disturbed areas and undertake timely rehabilitation of disturbed areas in accordance with the Annual Rehabilitation Plan. • Fencing, bunding or shelter belting where possible to reduce ambient wind speeds. • Aerial seeding to establish vegetative cover over broad and inaccessible areas.	• Revision of Rehabilitation Procedures to make provision for: (i) on-going, periodic identification of exposed areas for interim stabilisation; and (ii) monitoring of areas subject to interim stabilisation to track the effectiveness of this measure.
Control effectiveness of Permanent Rehabilitation integrated within emission estimates. **Control efficiency of Temporary Rehabilitation not quantifiable; 0% assumed.**	**Not quantifiable or site-specific (Refer to Appendix C)**	**Control efficiency achievable by maximising temporary rehabilitation still to be determined.**

5. PRACTICABILITY OF BEST PRACTICE MEASURES

The practicability associated with the implementation of the additional control measures identified at Cumnock was evaluated taking into consideration:

- Implementation costs.
- Regulatory requirements.
- Environmental impacts.
- Safety implications; and
- Compatibility with current processes and proposed future developments.

The additional control measures identified were considered to be practicable taking into account anticipated costs, application of such measures at other mines, compatibility with current and future operational practices, and regulatory requirements pertaining to the site.

6. IMPLEMENTATION PLAN

The implementation plan for Cumnock is given in **Table 3**.

Table 3: Implementation Plan for Additional Control Measures at Cumnock

Mine Activity	Tasks for Additional Measure Implementation	Timeline
Wind Erosion of Exposed Areas	Revise the existing rehabilitation procedures to include: identification of exposed areas suitable for interim stabilisation, and a monitoring method for assessing the effectiveness of interim stabilisation efforts.	July 2012 – Dec 2012 (revise procedures) Jan 2013 onwards (implement procedures)

7. APPENDICES

7.1 Appendix A: Presentation of Information on Cost of Implementation

According to the OEH Guideline, licensees are required to provide estimated capital, labour, materials and other costs for each best practice measure on an annual basis for a ten year period. The cost information is required to allow the NSW Environmental Protection Authority (EPA) to verify that a particular best practice measure is not practicable at a particular site.

The EPA considers however that any licensee may choose not to submit cost information for best practice measures that are either currently being implemented, or that are considered by the licensee to be practicable (*personal communication*, Mitchell Bennett, Head, Regional Operational Unit – Hunter, NSW EPA, 27 January 2012). A copy of this correspondence is provided overleaf.

Given that Ravensworth Surface Operations has either already implemented best management practice measures, or has agreed to implement identified additional control measures, no cost information is provided.

NSW EPA
ENVIRONMENT PROTECTION AUTHORITY

Your reference: 1427
Our reference: DOC12/763 FIL11/4862
Contact: Mitchell Bennett 0249086906

Yvonne Scorgie
Environ Australia Pty Ltd
PO Box 560
NORTH SYDNEY NSW 2060

27 JAN 2012

Dear Ms Scorgie

COAL MINE PARTICULATE MATTER – BEST MANAGEMENT PRACTICE POLLUTION REDUCTION PROGRAM

I refer to your letter dated 10 January 2012 regarding the submission of cost information as part of the site specific determination of best practice particulate matter control required by a series of Pollution Reduction Programs (PRP) that have now been incorporated into the Environment Protection Licences held by all NSW coal mines.

The PRPs require the preparation of a report on the practicability of implementing best practice measures to reduce particle emissions by each coal mine. A four step assessment process: is outlined in the Guideline (http://www.environment.nsw.gov.au/resources/air/20110813coalmineparticulate.pdf) that is referenced in the PRP:

1. Identify, quantify and justify existing measures that are being used to minimise particle emissions;
2. Identify, quantify and justify the measures that could be used to minimise particle emissions;
3. Evaluate the practicability of implementing these best practice measures; and
4. Propose a timeframe for implementing all practicable best practice measures

As part of the assessment of the practicability (step 3), the Guideline requires the estimation of costs associated with the implementation of each best practice measure. The Guideline then requires the submission of all of this cost information.

The EPA requires this information to allow it to verify that a particular best practice measure is not practicable at a particular site. However, the EPA agrees that any licensee may choose not to submit cost information for best practice measures that are either currently being implemented, or that are considered by the licensee to be practicable.

Please contact me on 02 49 086806 if you wish to discuss this matter.

Yours sincerely

Mitchell Bennett
Head, Regional Operations Unit - Hunter
Environment Protection Authority

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7.2 Appendix B: Emission Estimation

7.21 US-EPA AP42 Emission Factor for Wind Erosion of Exposed Areas

The TSP emissions factor taken from the *USEPA AP42 Chapter 11.9 Western Surface Coal Mining (October 1998)* was applied in the quantification of wind-blown dust from general exposed areas. In designating PM_{10} and $PM_{2.5}$ emission factors, reference was made to the PM_{10}/TSP and $PM_{2.5}$/TSP ratios specified within *USEPA AP42 Chapter 13.2.5 Industrial Wind Erosion* (November 2006). Emission factors, expressed in metric tonnes per hectare of exposed area per year (Mg/ha/yr), are given in the table below.

TSP	PM_{10}	$PM_{2.5}$	Units
0.85	TSP x 0.5	TSP x 0.075	Mg/ha/yr

The TSP emission factor is specified for seeded land, stripped overburden and graded overburden. This factor was derived based on upwind downwind sampling of exposed areas at coal mines in the US. Pitts (2005) noted that these coal mines, documented within the background document to *USEPA AP42 Chapter 11.9 Western Surface Coal Mining (October 1998)*, are located within reasonably dry areas (rainfall in the range of 280 to 430 mm/year) characterised by relatively high wind speeds (four sites with average wind speeds of 4.8 to 6 m/s, and one with 2.3 m/s). Pitts (2005) therefore concluded that the equation appears to be based on reasonably dry and windy sites.

7.22 Extent of Exposed Areas

The extent of exposed areas at Cumnock is of the order of 143 ha. This area was referenced within the *Air Quality Impact Assessment – Ravensworth Operations Project* (EA 09_0176, PAE Holmes, 2010).

7.23 Emission Estimate

Annual TSP, PM_{10} and $PM_{2.5}$ emissions (tpa) estimated by applying USEPA AP42 emission factors are given in the table below.

Mine Activity Category	Annual Emissions (tonnes/year)		
	TSP	PM_{10}	$PM_{2.5}$
Wind Erosion - General Exposed Areas	122	61	9
TOTAL	**122**	**61**	**9**

7.24 Activity Ranking

Given that there is only one significant dust generating mining activity being undertaken at Cumnock, no ranking of mining activities and identification of 'top activities' is necessary.

7.3 Appendix C: Control Efficiencies

A summary of control measures and associated control efficiencies from the literature is provided for measures addressing wind erosion of exposed areas.

7.31 Wind Erosion of General Exposed Areas

Type of Measure	Control Measure	PM Control Efficiency	References
Rehabilitation	Fully rehabilitated (release) vegetation	100%	NPI EETM Mining (2011)
	Rehabilitation	99%	Katestone (2011) citing NPI EETM Mining (2001)
	'Secondary rehabilitation'	60%	NPI EETM Mining (2011)
	'Primary rehabilitation'	30%	NPI EETM Mining (2011)
Interim stabilisation	Chemical suppression	84%	CARB (2002)
	Revegetation	90%	NPI EETM Mining (2011)
	Chemical suppression	70%	Bohn *et al.* (1978)
	Wet suppression (watering)	50%	Bohn *et al.* (1978)
Avoid disturbance	Restrict vehicle access	Not quantifiable	
	Emplacement of dustier material in more sheltered areas	Not quantifiable	

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9. CONTROL AND REVISION HISTORY

9.1 Document information

Property	Value
Approved by	Environment and Community Manager
Document Owner	Environment and Community Coordinator
Effective Date	29/06/2012
Keywords	Dust, Pollution Reduction Program, Best Management Practice

For a complete list of document properties, select **View Properties** from the document's context menu on the intranet.

9.2 Revisions

Version	Date reviewed	Review team (consultation)	Nature of the amendment
1	27/06/2012	Environ S. Pigott G. Newton S. Kelly	Document review and finalisation