PINE DALE
MINE

ANNUAL ENVIRONMENTAL MANAGEMENT REPORT 2012

TITLE

Name of Mine:	Pine Dale Mine
Titles/Mining Leases:	ML1569, ML1578, ML1664
Project Approval Number:	10_0041
MOP Commencement Date	24 February 2011
MOP Completion Date	24 February 2014
AEMR Commencement Date:	1 January 2012
AEMR Completion Date:	31 December 2012
Name of Leaseholder:	Enhance Place Pty Limited
Reporting Officer:	Mr Graham Goodwin
Title:	Manager of Mining Engineering

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EXECUTIVE SUMMARY

Energy Australia (EA) owns Enhance Place Pty Ltd (Enhance Place) which operates the Pine Dale Mine near Lithgow in the Western Coalfields of New South Wales. Project Approval 10_0041 for the Yarraboldy Extension at the Pine Dale Mine was granted by the Minister for Planning and Infrastructure on 20 February 2011 for the extraction of up to 800,000 tonnes of Run of Mine coal from the project. Mining operations are approved on the site until 31st December 2014.

The Pine Dale Mine Annual Environmental Management Report has been prepared pursuant to Schedule 5, Condition 3 of the Project Approval 10_0041 and in accordance with the Department of Trade and Investment - Division of Resources and Energy Guidelines to the Mining, Rehabilitation and Environmental Management Process (EDG03).

The focus on these key environmental aspects and the commitment to best practice environmental management resulted in Pine Dale Mine achieving an acceptable standard of environmental performance during the reporting period as evidenced by the following:

- Air quality monitoring results recorded during the reporting period for depositional dust and fine particulate matter (PM_{10}) were well below the Environmental Protection Authority assessment criteria in Blackmans Flat and other privately owned properties adjacent to the Mining Leases;
- There were no noise exceedances from mining activities recorded at privately owned properties recorded during the reporting period;
- Blasting impacts were managed within the assessment criteria limits for overpressure and ground vibration with no exceedences recorded during the reporting period; and
- There were no surface water discharge events during the reporting period and monitoring was conducted in accordance with EPL 4911.

Rehabilitation areas are generally stable in Areas B and C, it has been identified that Area A will require additional maintenance works to improve rehabilitation efforts in this area. Ongoing maintenance will be required to ensure a stable landform is established. A flora assessment was conducted in Area 8 during November 2012. The flora monitoring found that Area 8 is progressing towards a self-sustainable area with up to 95% living ground cover over the survey site. In accordance with Project Approval 10_0041, Flora assessments will be undertaken in areas A, B, C and 8 to assist in identifying additional management strategies required to ensure rehabilitated land is progressing towards meeting its target levels. The target levels for species diversity and density will be obtained from surrounding State Forest lands and to the satisfaction of the Executive Director, Mineral Resources in DRE.

1 INTRODUCTION AND GENERAL OBJECTIVES

Energy Australia (EA) owns Enhance Place Pty Ltd (Enhance Place) which operates the Pine Dale Mine near Lithgow in the Western Coalfields of New South Wales. EA acquired the Gentrader rights to the Mt. Piper and Wallerawang Power Stations effective from 1 March 2011 and took on the ownership and responsibility the Pine Dale Mine on the 1 June 2012. Pine Dale Mine is located at Blackmans Flat, 16km north of Lithgow on the Castlereagh Highway. The site is approximately 3km by road from the Mt. Piper Power Station (MPPS) and immediately across the Highway from the Springvale Joint Venture Coal Preparation & Handling Facility.

This Annual Environmental Management Report (AEMR) refers to the environment and community performance of the Pine Dale Mine from 1 January 2012 to 31 December 2012 (Reporting period). This report has been prepared in accordance with the Department of Trade and Investment - Division of Resources and Energy (DRE) Guidelines to the Mining, Rehabilitation and Environmental Management Process (EDG03). This AEMR has been prepared pursuant to Schedule 5, Condition 3 of Project Approval (PA) 10_0041 granted by the Department of Planning and Infrastructure (DP&I) under section 75J of the *Environmental Planning & Assessment Act 1979* (EP&A Act) on the 20 February 2011.

The approval for the Yarraboldy Extension at the Pine Dale Mine was granted by the Minister of the Department of Sustainability, Environment, Water, Populations and Communities (SEWPaC) on 26 October 2011. The Yarraboldy Extension provides approval for the extraction of up to 800,000 tonnes (t) of Run of Mine (ROM) coal over the life of the project at a maximum rate of 350,000 tonnes per annum (tpa), see **Plan 1**. It also allows for export of up to 350,000 tpa of coal from the site to the MPPS via the Private Haul Road (Coal>Link Road). Coal deliveries from the Yarraboldy Extension to the MPPS commenced in February 2012.

This AEMR is distributed to the following stakeholders:

- DP&I;
- DRE;
- Environment Protection Authority (EPA);
- NSW Office of Environment and Heritage (OEH);
- NSW Office of Water (NOW);
- Forest Corporation NSW;
- Sydney Catchment Authority (SCA);
- Lithgow City Council (LCC); and

1.1 Consents, Leases and Licences

Pine Dale Mine operates in accordance with relevant licenses and approvals which are summarised in **Table 1**. During the reporting period Mining Lease (ML) 1664 was granted by DRE on the 10 January 2012 and incorporates 4.1 ha of land for the continuation of mining activities at Pine Dale Mine. A modification to PA 10_0041 was granted by DP&I on 4 April 2012.

The modification to PA 10_0041 was required to extend the approval period until 31 December 2014 to allow for the continuation of already approved mining activities.

Table 1
Status of Consents, Leases and Licences

Permit Type	Permit Number	Relevant Dates	Description
Project Approval	PA 10_0041	Granted 20 February 2012 Expires 31 December 2014	Granted by Minister of DP&I, Section 75J of the EP&A Act. A modification to PA 10_0041 was granted in March 2012.
Environmental Protection Licence	EPL 4911	Review Due Date 9 July 2013	EPL held by Enhance Place Pty Ltd
Mining Lease	ML1578 (Act 1992)	Granted 15 March 2006	ML 1578 incorporates 69.4ha of land within the boundary of the Pine Dale Mine site.
Mining Lease	ML 1569 (Act 1992)	Granted 4 July 2007	ML1569 incorporates 161 ha
Mining Lease	ML1664 (Act 1992)	Granted 10 January 2012	ML 1664 incorporates 4.1 Hectares of land within the boundary of the Pine Dale Mine site.
Consolidated Coal Lease	CCL770	Expires 2025	CCL770 covered 432 ha of land, approximately 40 ha of which is now owned by Enhance Place. The remainder is NSW State Forest land.
Bore Licence	10BL165933	Granted 22 December 2005	Issued by the Department of Natural Resources (DNR) under Part 5 of the Water Act 1912 for the use of six piezometers for monitoring groundwater levels and quality.
Bore Licence	10BL604181	Dated 23 November 2010	This licence was issued by DECCW – NOW under Part 5 of the *Water Act 1912* for interception and use of up to 200ML of groundwater per year.
Flood Control Works Licence	10CW801601	Dated 23 December 2005	Issued by the DNR under Part 8 of the *Water Act 1912* for the construction of noise/flood bunding along the boundaries of Mining Areas A, B and C.

1.2 Actions Required from Previous AEMR Review

A letter of acceptance for the 2011 AEMR was received from DRE on the 22 June 2012. Three actions were noted by DRE following their review of the 2011 AEMR. These Actions and where they have been addressed in the AEMR are included in **Table 2**.

Table 2
Actions Required from Previous AEMR Review

Item	Action Required (2011 AEMR)	AEMR Section
1	Summary of rehabilitation monitoring results to be provided and monitoring reports appended to the AEMR. Rehabilitation monitoring locations to be shown on an appropriate plan.	**Section 5.2 Appendix C**
2	Poor re-vegetation of rehabilitation Area A. Rehabilitation monitoring of this area to be reported. Investigation as to why re-vegetation of this area has been poor and develop a plan to rectify. Review sediment and erosion control measures for this area. Implement remediation works.	**Section 5.2**
3	Loss/ movement of topsoil in rehabilitation Area C. Review sediment and erosion control measures for this area. Implement remediation works.	**Section 5.2**

1.3 Mine Contacts

The Contact details for Pine Dale Mine are listed in **Table 3**.

Table 3
Mine Contacts

Contact Person	Position	Telephone	Facsimile
Mr Graham Goodwin	Manager of Mining Engineering	(02) 6355 7893	(02) 6355 7894
Mr John Delicato	Operations Manager	0402 822 887	-

2 SUMMARY OF OPERATIONS

2.1 Exploration

There were no exploration drilling activities carried out at the Pine Dale Mine during the reporting period.

2.2 Land Preparation

Land preparation, which occurs directly in advance of open cut mining, involves the clearing of generally remnant vegetation, stripping and removal of topsoil, subsoil and clay, and the removal of overburden by trucks. The waste rock is loaded by an excavator into the haul trucks where it is transported to previously mined areas waiting to be backfilled.

During the reporting period, 3.1 ha of the Yarraboldy Extension was cleared and mined. This involved the clearing and stripping of vegetation, topsoil, subsoil, clay and overburden. Mining and land clearing activities during the reporting period are discussed in more detail in **Section 2.4**.

2.3 Construction

Construction of an amenity bund was completed during the reporting period (see **Plate 1**). The amenity bund is located parallel to the Private Haul Road and has been constructed using overburden and interburden material. The amenity bund was constructed to minimise operational noise and visual impacts to private landowners and travellers on the Castlereagh Highway. Following completion of the Yarraboldy Extension mining area, the amenity bund will be reshaped, landscaped and incorporated into the final rehabilitation landform.

A coal crushing facility and stockpiling pad were constructed in the south-western corner of the Yarraboldy Extension area during the reporting period (see **Plan 6**). The previous coal crusher has been decommissioned and is stored at the fitters pad.

Plate 1

Amenity Bund

2.4 Mining

Pine Dale Mine uses an excavator and fleet of trucks for the extraction of coal from multiple seams and the removal of overburden. Mining commenced north of the Private Haul Road in the western section of the Yarraboldy Extension area and progressed east for the first six months of the reporting period. Mining then progressed to the north during the second half of the reporting period (see **Plan 5**).

The overburden and interburden waste rock is removed using a combination of rip, push and blasting methods. Blasted and ripped waste rock is loaded by an excavator into the haul trucks where it is transported to previously mined areas waiting to be backfilled.

During the reporting period 245,320 t of ROM coal was extracted at Pine Dale Mine which is within the approved 350,000 tpa of ROM coal permissible under PA 10_0041. The production and waste volumes during the reporting period are summarised in **Table 4**.

Table 4
Production and Waste Summary

	Cumulative Production		
	Start of Reporting Period	**End of Reporting Period**	**End of Next Reporting Period (estimated)**
Topsoil Stripped	16,262 m^3	28,862 m^3	35,162 m^3
Topsoil used/spread	24,126 m^3	24,126 m^3	31,926 m^3
Waste Rock	9,721,736 m^3	11,391,620 m^3	13,262,000 m^3
Ore	n/a	n/a	n/a
Processing Waste	n/a	n/a	n/a
Product	953,674 t	1,198,993 t	1,474,000 t

Pine Dale Mine continues to utilise the Minex mining software package to assist in improving production and overburden estimates. It is anticipated that all recoverable open cut coal reserves within the approved mining area will be exhausted by October 2013.

2.5 Coal Processing

During the reporting period, 245,320 t of ROM coal was extracted from the Pine Dale Mine and exported directly to the MPPS. A summary of the production figures, mining activity for 2012 and the forecast production expectations for 2013 are summarised in **Table 4**. It should be noted that there is no Coal Preparation Plant at the Pine Dale Mine and as such no processing waste is produced. All ROM coal extracted from the open cut is transported by haul trucks to the onsite coal crushing plant where it is sized and screened into product coal with a top size ≤50 mm (see **Plan 6**). The screened coal is either temporarily stockpiled or transported, in covered road trucks, directly to the MPPS via the Coal>Link Road.

COAL TRANSPORTING

Product coal is delivered to the MPPS by covered road trucks via the Coal>Link Road. In accordance with PA 10_0014, coal transport activities occur between the hours of 7:00am to 8:00pm, Monday to Saturday, and at no time on Sundays or public holidays. Pursuant to Schedule 3, Condition 35 of PA 10_0041, no product coal was transported on the Castlereagh Highway during the reporting period.

2.6 Waste Management

During the reporting period the amenity bund was constructed using overburden and interburden (see **Section 2.3**). Overburden and interburden is placed in waste dumps until shaping of the final land formation is required. No overburden or interburden was removed from site during the reporting period.

Hydrocarbons from equipment maintenance undertaken on the site were collected in drums and removed from site by the Mining Contractor. All hydrocarbon products are securely stored within a bund to prevent any land or water contamination. There were no areas of land contamination identified during the reporting period.

All general wastes originating from the office, amenities, ablutions and first-aid facilities, together with routine maintenance consumables from the servicing of mobile equipment (e.g. air filters) are disposed of in closed garbage bins located adjacent to the amenities building. The bins are collected weekly by licensed waste contractors (SITA Lithgow) and the contents disposed of at Council's Waste Depot. All recyclables are placed in separate bins for collection and recycling.

2.7 Product Stockpiles

The capacity of the ROM stockpile is 20,000 t whilst the capacity of the product stockpile is limited to 5,000 t. The ROM stockpile or product stockpile was not enlarged during the reporting period outside of the capacity approved under PA 10_0041.

2.8 Water Management

On a regional scale, the Pine Dale Mine lies within the Neubeck's Creek catchment which is a sub-catchment of the Upper Cox's River catchment. The runoff from the surrounding area reports to the Cox's River via Neubeck's Creek (a perennial tributary) which runs into Blue Lake, a former open cut mining void. Neubeck's Creek is understood to flow intermittently (noting that many of its tributaries are temporary), with flows influenced by water discharges from other upstream industrial land uses in addition to the existing Pine Dale Mine.

The water management system at Pine Dale Mine has been designed as a closed loop system, with all clean water diverted around the mining site. The water management system is designed not to discharge any water from the site into Neubeck's Creek unless required to under an emergency. Drainage of surface water within the current mining area is generally to the south and southeast following the natural topography toward the receiving waters of Neubeck's Creek (see **Plan 4**). The runoff from the north is captured in temporary sumps and used as dust suppression when required.

STORED WATER

During the reporting period all clean water dams within the proposed Yarraboldy Extension were removed. Alternative clean water diversion structures were constructed to replace those removed (see **Plan 4).** There are no permanent storage structures at the Pine Dale Mine. Temporary sediment ponds are constructed downslope of disturbed areas to ensure the capture of 'dirty' water and treatment prior to discharge into the underground workings.

GROUND WATER

There was no measurable groundwater intercepted during the reporting period. More details and results of groundwater monitoring are discussed in **Section 3.5**.

SURFACE WATER

During the reporting period, all surface water monitoring at the Pine Dale Mine was undertaken in accordance with EPL 4911. **Table 5** details the locations, frequency and sampling methods for surface water monitoring. The parameters analysed were consistent with the requirements of EPL 4911, namely pH, EC, oil and grease, turbidity, total suspended solids, filterable iron and sulphate. More details and results of groundwater monitoring are discussed in **Section 3.4**.

The water management system (groundwater, floodplain and surface water) is described in sections in Sections 11.4 and 11.5 of the currently approved MOP. Potable Water for use in the offices and amenities is sourced from town water and delivered to the site by truck.

Table 5
Surface Water Monitoring Locations and Frequency

Monitoring Location	Type of Monitoring Point	Frequency	Sampling Method
Point 2	Baseline and discharge monitoring	*Quarterly during discharge* *Daily during discharge for pH, EC and turbidity*	Grab sample for oil & grease, TSS, turbidity, iron and sulphate concentrations. Probe for pH and electrical conductivity measurements.
Point 3	Baseline and discharge monitoring	*Quarterly during discharge* *Daily during discharge for pH, EC and Turbidity*	
LDP 4	Discharge monitoring (to underground)	*Quarterly during discharge*	
LDP 5	Discharge monitoring (to underground)	*Quarterly during discharge*	
LDP 13	Discharge monitoring (to surface water)	*Quarterly during discharge* *Daily during discharge for pH and EC*	
Point 14	Baseline and discharge monitoring	*Daily during discharge for pH, EC and Turbidity*	

2.9 Hazardous Materials Management

Hazardous materials stored on site are limited to bulk storage of diesel fuel and small quantities of miscellaneous chemicals for vehicle maintenance (i.e. oils and lubricants). The diesel storage capacity at the Pine Dale Mine is 30,000L and is stored in a tank located within a bunded steel container with lockable doors. It is located together with the associated bowser in the fuel bay in the northern corner of the maintenance area. Diesel fuel is delivered to site by a mobile diesel tanker as required. There are no bulk oils stored on site. Oils are brought onto site as required by the Mining Contractor. Waste oil and oil drums are removed from site by the Mining Contractor for disposal. Material Safety Data Sheets (MSDS) accompany the materials on site and are kept in a folder with the Hazardous Materials Register, located in the main office.

2.10 Other Infrastructure Management

There is no other infrastructure outside that described above at the Pine Dale Mine.

3 ENVIRONMENTAL MANAGEMENT

The Pine Dale Mine regards sound environmental performance and community liaison as integral components of its operations. The Pine Dale Mine seeks to:

- Minimise the impact of its operations on the environment through effective environmental management;
- Communicate with the community, consider its concerns and expectations and move to a solution;
- Ensure that employees and contractors recognise they are accountable for their actions;
- Comply with applicable environmental laws and other obligations;
- Use effective environmental management, adopting the principles of ISO 14001, to comply with all environmental laws and minimise adverse environmental impacts;
- Provide awareness training for employees;
- Monitor, audit, and review performance;
- Communicate with key stakeholders including shareholders, the community and government;
- Promote active employee participation to continuously improve environmental management and performance;
- Reduce and reuse waste where practicable; and
- Undertake appropriate decommissioning and rehabilitation.

Environmental Monitoring

The monitoring program in the MOP provides a reference for all the environmental monitoring procedures and timing for monitoring to be undertaken during the construction and operation of the Pine Dale Mine. More detailed information can be found in the following monitoring sections of the MOP:

- Noise Monitoring Program
- Air Quality Monitoring Program
- Groundwater Monitoring Program
- Surface Water Monitoring Program

Locations of monitoring sites are shown in **Plan 1A** in **Attachment A**.

Risk Assessment

In order to identify areas where mining and mining related activities have the potential to place the natural environment at risk, the risk matrix shown in **Table 6** has been developed for the Pine Dale Mine. The identification and assessment of environmental risks at the mine has allowed appropriate management plans and procedures to be developed to minimise the potential risk to the environment.

Table 6
Environmental and Rehabilitation Risk Matrix

	Issue	Land preparation, vegetation and topsoil stripping.	All construction activities including earth moving.	Mine development and mining, surface and underground.	Use/maintenance of roads, tracks and equipment.	Waste rock emplacement management.	Mineral processing facilities and infrastructure.	Ore/product stockpiling and handling.	Water management including term event contingencies.	Hazardous materials and fuel, handling/spills management.	Sewerage.	Rubbish disposal.	Rehabilitation activities.	Rehabilitated land and remaining features.
Air Quality	Air pollution – dust/other	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	
Water	Erosion / sediment minimisation	✓	✓		✓		✓	✓					✓	
	Surface water pollution[1]	✓	✓		✓		✓	✓		✓	✓	✓	✓	
	Ground water pollution			✓					✓					
Soil	Contaminated or polluted land	✓	✓	✓	✓								✓	
Flora	Threatened flora protection	✓	✓											
Fauna	Threatened fauna protection	✓	✓											
Flora	Weed control and management	✓	✓		✓								✓	✓
Noise	Operational noise	✓	✓	✓	✓		✓	✓					✓	
	Vibration / air blast				✓									
Visual Amenity	Visual amenity, stray light[2]	✓	✓	✓	✓		✓	✓				✓	✓	
Heritage	Aboriginal heritage[3]													
	Natural heritage conservation[4]													
Fire Mgt	Spontaneous combustion			✓				✓						
	Bushfire	✓			✓								✓	
	Mine subsidence													
Soil and Water	Hydrocarbon contamination						✓			✓				
	Methane drainage / venting													
Public Safety	Public safety[5]	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	

1 - Off site pollution only.
2 - Construction and production activities will occur between 7:00am and 6:00pm and hence stray light is not likely to affect visual amenity. Transport and maintenance activities are permitted at later times each day.
3 - No items of Aboriginal heritage significance have been identified within the site.
4 - The site is highly disturbed and does not contain items / areas of natural heritage significance.
5 - All activities carry some form of risk to public safety; however, there will be no public access to areas where these activities are undertaken.

Environmental Management

Environmental management is reflected in operating procedures outlined in the MOP. Also included in the MOP are specific management plans for:

- Blast Management
- Flora and Fauna Management
- Bushfire Management
- Soil and Erosion Management
- Complaints Management

3.1 Meteorological Monitoring

In accordance with Schedule 3, Condition 22 of PA 10_0041, Pine Dale Mine operates a meteorological monitoring station. A summary of monthly meteorological monitoring results are presented in the following sections.

RAINFALL

Pine Dale Mine received 776.4mm of rainfall and experienced 149 rainfall days during the reporting period, which was greater than 2011 (690.0mm). The monthly rainfall data for 2012 is summarised in **Table 7**.

TEMPERATURE

Temperature is monitored at two heights (2 metres and 10 metres respectively) to account for temperature inversions. The maximum temperature recorded during the reporting period was 35.2°C at 2m during January and 33.3°C at 10m during November. The lowest temperature occurred in August, with a recording of -6.1°C at 2m and -5.9°C at 10m. A summary of monthly temperatures for 2012 is included in **Table 7**.

Table 7
Pine Dale Mine Meteorological Station Summary

Month	Rainfall (mm)	Cumulative Rainfall (mm)	No of Rain days/ Month	Air Temp. @ 2m (°C)			Air Temp. @ 10m (°C)		
				Mean	Min	Max	Mean	Min	Max
January	53.2	53.2	16	18.2	3.0	35.2	17.6	3.3	32.9
February	234.2	287.4	23	17.2	7.1	30.0	16.7	6.9	28.2
March	122.0	409.4	16	15.4	2.0	27.7	15.0	1.9	25.9
April	37.2	446.6	12	12.8	-0.2	29.9	12.4	-0.3	27.3
May	37.2	483.8	8	6.6	-4.7	22.5	6.4	-4.4	21.2
June	67.2	551.0	16	6.3	-4.4	15.7	6.2	-4.4	14.8
July	45.4	596.4	14	5.0	-5.5	16.6	5.0	-5.2	15.8
August	21.8	618.2	10	5.4	-6.1	18.2	5.3	-5.9	17.3
September	34.6	652.8	8	9.4	-5.7	25.8	9.1	-5.6	24.5
October	14.4	667.2	4	12.5	-0.8	28.1	12.0	-0.8	26.2
November	45.8	713.0	13	16.7	1.4	35.0	16.0	1.5	33.3
December	63.4	776.4	9	18.5	2.7	33.2	17.8	2.9	31.4
TOTAL	**776.4**	**776.4**	**149**	-	-	-	-	-	-

3.2 Air Quality

Air quality management is a priority at the Pine Dale Mine. Onsite dust suppression is performed using a 50,000L tanker from water accumulated in the in-pit sumps and from the abandoned Wallerawang Colliery underground workings. The tanker will typically make four trips on dry days targeting the active haul roads, and only if necessary on wet days.

Air quality is monitored at seven locations including six depositional dust gauges (DDG) and one high volume air sampler (HVAS) which monitors total suspended particulates (**Plan 1A**). Continual monitoring is performed by RCA Laboratories and a Summary Report on data collected throughout the reporting period is available in **Appendix A**.

DEPOSTIONAL DUST

Depositional Dust results for the period January – December 2012 show an average insoluble solids range of 0.5 g/m² per month to 1.0 g/m² per month for dust gauges D1, D2, D3, D4, D5 and D6 for the 12-month period. These results fall well below the nominated assessment criteria of an annual average of 4.0 g/m² per month, as stipulated in EPL 4911.

Table 8
Depositional Dust Monitoring Results

Date	Total Insoluble Solids (g/m²/month)					
	Gauge Location					
	D1	D2	D3	D4	D5	D6
Jan-12	0.4	0.4	0.5	0.5	0.2	3.4
Feb-12	0.9	0.2	0.7	0.3	ND	1.4
Mar-12	0.7	0.5	1.2	0.4	0.3	0.5
Apr-12	1.0	0.7	1.0	0.6	0.4	0.3
May-12	0.7	0.6	0.9	0.4	0.4	0.4
Jun-12	0.3	0.2	0.5	0.2	0.1	<0.05
Jul-12	0.6	0.7	0.7	0.3	0.6	0.3
Aug-12	0.8	0.8	1.1	0.4	0.3	0.4
Sep-12	1.1	0.8	1.3	0.4	0.4	ND
Oct-12	1.0	0.8	1.4	0.5	0.3	0.3
Nov-12	1.4	0.9	1.4	0.6	3.6	0.7
Dec-12	2.4	1.0	1.3	1.0	0.9	1.4
Annual Averages						
2011	0.7	0.4	0.9	0.3	0.3	0.5
2012	0.9	0.6	1.0	0.5	0.7	0.8
OEH Licence Limit Annual Average	4.0					

Notes: ND – No Data due to broken funnel found during field sampling.

HIGH VOLUME AIR SAMPLES

Annual average PM_{10} and TSP monitoring results are summarised in **Table 9** and presented in **Appendix A**. All PM_{10} results recorded 24-hour averages below the 50µg/m³ Impact Assessment Criteria (IAC) for 2012. The highest PM_{10} result recorded was 33µg/m³ on 8 May 2012 which is 2µg/m³ less than the peak result for 2011. The annual average PM_{10} result recorded was 11.1µg/m³ which is well below the long term 30µg/m³ IAC for 2012. The annual average TSP result recorded was 24.6µg/m³ which is well below the 90µg/m³ limit for 2012.

The long term average annual PM_{10} and TSP levels are all within the nominated criteria, and results demonstrate consistent PM_{10} and TSP levels from 2011 to 2012 monitoring results (see **Table 9**). The slight increase in both PM_{10} and TSP levels can be related to the commencement of mining in 2012.

Table 9
PM_{10} and TSP Summary

	Particulate Matter <10µm (µg/m³)	TSP (µg/m³)
Maximum 24h Average result 2011	35	n/a
Maximum 24h Average result 2012	33	n/a
EPL 4911 PM10 24h Limit	50	Not Required
Annual Average 2011	10.7	20.1
Annual Average 2012	11.1	24.6
EPL 4911 PM10 Annual Average	30	90

A review of the potential air quality impacts and management practices was undertaken during the reporting period as part of the Pollution Reduction Program (PRP) for the Pine Dale Mine. The assessment report titled "*Coal Mine Particulate Matter Control Best Practice, Pine Dale Mine*" was submitted to the EPA during the reporting period in accordance with EPL 4911. The review found that with the increase of water application for dust control, a significant proportional reduction in both emissions and impacts can be achieved. However, as levels at receptors are already minor, the actual magnitude of the impact reduction would not be significant.

The existing air quality monitoring program and dust management practices will continue to be implemented throughout 2013. All air quality monitoring units will be regularly calibrated and audited to ensure compliance with the appropriate Australian Standard in 2013.

3.3 Erosion and Sediment

The erosion and sediment controls for Pine Dale Mine have been implemented to safeguard against soil loss and, minimise potential water quality impacts. Erosion control structures have been installed around the site with the principle aim of containing sediment at its source. All runoff from disturbed areas is contained in temporary pollution control ponds within the open cut itself and surrounding hardstand areas.

Exposed areas which have been disturbed by the operation are controlled though the use of windrows constructed by subsoil and/or clay material. Once vegetation has been cleared and topsoil removed, subsoil and clay material is pushed against the interface between the disturbed and undisturbed area(s). Dozers are used to build a windrow where the potential for erosion impacts exist, and are also managed through the use of temporary measures, such as silt fencing, to avoid sedimentation impacts on downstream waterways until the area has been rehabilitated. Additionally, temporary sediment ponds are constructed downslope of disturbed areas to ensure the capture of 'dirty' water and treatment prior to discharge into the underground workings. The management measures for the control of erosion described above is also put in place to increase batter and bench stability prior to establishment of permanent rehabilitation measures, where possible.

Erosion control structures at Pine Dale Mine are inspected on a regular basis, particularly after significant rainfall events and repaired where necessary. Erosion and sediment control works which were undertaken during the reporting period included:

- The maintenance of haul roads on a regular basis with a grader to limit the build-up of fine sediment and material, which limits the amount of sediment that enters onsite dams;
- The installation of windrows and silt fencing to prevent potential surface water impacts and sediment entering Neubeck's Creek;
- The removal of sediment from roadside drains and low spots both within the pit and on the crusher pad when required;
- The construction of rock lined drains within the rehabilitation areas. This allows the surface water runoff to be channelled and controlled without eroding the surface soil (see **Plate 2**); and
- The regular removal of topsoil and clay from each area to be mined so as to limit the amount of material which has the potential to enter sediment dams through surface runoff.

The effectiveness of the erosion and sediment control structures at Pine Dale Mine was demonstrated by their performance against a number of high rainfall events throughout the reporting period (February 234.2mm and March 122.0mm).

Plate 2
Rock lined drainage line in rehabilitated area C

3.4 Surface Water Pollution

Surface water quality at Pine Dale Mine is managed in accordance with the Water Management Plan. In accordance with EPL 4911 the following six points at Pine Dale Mine are required to be monitored:

- Ambient Water Monitoring **Point 2** – Upstream of Delta Electricity flow gauge;
- Ambient Water Monitoring **Point 3** – 100m from discontinued discharge point;
- Discharge and Monitoring **Point 4** – Wallerawang Colliery No. 1A Mine Entry;
- Discharge and Monitoring **Point 5** – Wallerawang Colliery Punch Mine Entry;
- Discharge and Monitoring **Point 13** – Neubeck's Creek below final settling dam; and
- Ambient Water Monitoring **Point 14** – Cox's River downstream of Blue Lake.

The locations of the monitoring points are indicated on the Site Plan in **Appendix A**. Samples were analysed by RCA Laboratories (NATA Scope of Registration No. 9811).

Summary of Monitoring Results

Water flowing through Neubeck's Creek, was generally neutral during the reporting period, with an average pH of 7.3. The 2011 period had an average pH of 7.1. Surface water samples collected during the reporting period show water quality results have remained consistent. As there was no discharge from licenced discharge point 13 during the reporting period, EPL 4911 limits were not exceeded. All monitoring performed was undertaken in accordance with EPL 4911.

Surface water monitoring results from monitoring Point 2 and Point 3 are summarised in **Table 10** and **Table 11**, a comprehensive summary of all surface water monitoring is presented in **Appendix A**. Monitoring Point 2 and Point 3 are background surface water monitoring points and are required to be sampled on a quarterly basis and daily during discharge events. There are no EPL Limits for monitoring Point 2 and Point 3.

Table 10
Monitoring Point 2

Location:		Upstream of Delta Electricity flow gauge		
Number of Samples Collected:		4		
Tested Element	**Units**	**Lowest Value**	**Highest Value**	**Mean**
pH	-	7.3	8.1	7.7
Conductivity	µS/cm	383	1001	621
Total Suspended Solids	mg/L	<5	<5	<5
Sulphate	mg/L	99	402	217
Filterable Iron	mg/L	<0.05	0.15	0.10

Table 11
Monitoring Point 3

Location:		100 m from discontinued discharge point		
Number of Samples Collected:		4		
Tested Element	**Units**	**Lowest Value**	**Highest Value**	**Mean**
pH	-	6.4	8.0	7.3
Conductivity	µS/cm	620	1251	836
Total Suspended Solids	mg/L	<5	8	6
Sulphate	mg/L	219	639	532
Filterable Iron	mg/L	0.08	0.5	0.3

There were no controlled surface water discharge events during the reporting period. As such no samples were collected from licensed discharge monitoring Points 4, 5 or 13 during the 2012 reporting period.

Surface water results from monitoring point 14 are summarised in **Table 12** and included in **Appendix A**. Monitoring Point 14 is a background surface water monitoring point located on the Cox's River which assesses the water quality downstream of the Pine Dale Mine. Monitoring at Point 14 was undertaken on a quarterly basis, no additional monitoring was undertaken as there was no discharge from Point 13 during the reporting period. There are no EPL Limits for monitoring Point 14.

Table 12
Monitoring Point 14

Location:		Cox's River downstream of Blue Lake		
Number of Samples Collected:		4		
Tested Element	**Units**	**Lowest Value**	**Highest Value**	**Mean**
pH	-	7.5	8.2	7.8
Conductivity	µS/cm	368	965	687
Total Suspended Solids	mg/L	<5	23	9.5
Sulfate	mg/L	8	173	398
Filterable Iron	mg/L	0.14	0.5	0.3

3.5 Ground Water Pollution

Groundwater data is collected by RCA Laboratories and analysed at a NATA registered laboratory. Groundwater monitoring for the Pine Dale Mine is undertaken in accordance with the approved Groundwater Monitoring Program. Groundwater samples are collected from six monitoring bores (see **Plan 1A**), covered under Bore Licence No. 10BL165933, issued by NOW in December 2005. A copy of the monitored results and groundwater report is provided in full in **Appendix A**.

GROUNDWATER CRITERIA AND TRIGGER LEVELS

ANZECC (2000) recommends that, wherever possible, site-specific data is used to define trigger values for physical and chemical factors which can adversely impact the environment. Although ANZECC (2000) applies to surface water systems, due to the absence of guidelines which provide specific criteria for groundwater, ANECC (2000) is commonly applied for groundwater. As groundwater monitoring was not undertaken until the commencement of construction and mining operations, a true baseline level is not available. In the absence of baseline values, average values have been calculated based on results from monitoring undertaken since October 2005 till December 2006 as per the recommendations outlined in the Groundwater Monitoring Programme Results for Pine Dale Coal Mine (RCA ref 3761A-001/0, Sept 06).

The Water Management Plan details the protocol for the investigation, notification, and mitigation of any identified exceedences of the impacts on groundwater levels. The Water Management Plan also provides the groundwater impact assessment criteria, including trigger levels for investigating any potentially adverse groundwater impacts. It should be noted that the adopted trigger level values are detailed in the annual groundwater monitoring report (see **Appendix A**).

GROUNDWATER WATER QUALITY

Groundwater samples collected during the reporting period generally show water quality results which comply with the Action Trigger Levels for contingency action implementation, as stated in the Groundwater Management Program. The exceptions were bores P2, P3 and P6 which showed variations in the relative Standing Water Levels throughout the year. These three bores exhibited standing water levels which were higher than the Action Trigger Levels during all monitoring events in the reporting period. This is largely attributable to a higher average rainfall being experience during the reporting period.

The increase in water within all bore holes appears to correlate with high rainfall events received at Pine Dale Mine during February and the beginning of March 2012. Rainfall in these months is considerably higher than the remainder of the year. The increase, then subsequent decrease in water levels as low rainfall is observed throughout the remainder of the year can be observed across all bores, with the exception of P6. Further details are provided in the groundwater summary report in **Appendix B**.

The action thresholds for filtered iron were not exceeded on 4 of the 5 bore holes monitored. Monitoring bore 7 exceeded the filtered iron action concentration of 1.1mg/L in June (1.95mg/L) and August 2012 (2.21mg/L). It should be noted that the filtered iron levels immediately fell below the threshold level the preceding months to <0.05mg/L. Ongoing monitoring indicated that P7 is subject to significant fluctuations that are unrelated to mining activities and the trigger threshold value may need to be revised for this site. The action thresholds for pH and Electrical Conductivity were not exceeded at any boreholes sampled during the reporting period. A detailed summary of groundwater results can be found in **Appendix A**.

3.6 Contaminated Polluted Land

There was no land identified as being contaminated or polluted during the reporting period.

3.7 Threatened Flora

Measures for the management and mitigation of flora impacts at Pine Dale Mine and in the surrounding area are provided in the Flora and Fauna Management Plan. The Flora and Fauna Management Plan include a number of procedures and strategies aimed at ensuring that the impacts from mining activities are minimised.

A summary of the Flora and Fauna Management Plan is included in Section 11.7 of the MOP and outlines operating procedures to minimise impacts on flora and fauna. There was no threatened flora identified on the currently approved mining area during the reporting period.

3.8 Threatened Fauna

A summary of the Flora and Fauna Management Plan is included as an Appendix in Section 11.7 of the MOP and outlines operating procedures to minimise impacts on flora and fauna. No sightings of threatened fauna were made on the active mining site during the reporting period.

In 2009, the Purple Copper Butterfly, *Paralucia spinifera* (Purple Copper Butterfly) was listed as a Threatened species under the *Threatened Species Conservation Act 1995* and the *Environmental Protection and Biodiversity Conservation Act 1999* (see **Plate 3**). The Purple Copper Butterfly has been identified adjacent to the Pine Dale Mine and is known to occur in the area. Habitat for the Purple Copper Butterfly is provided by the native Blackthorn (*Bursaria spinosa subsp. Lasiophylla*) ("*Bursaria*"), which is known to occur in the area. To minimise potential indirect impacts of dust and vibration from the Pine Dale Mine, on the Purple Copper Butterfly approximately *Bursaria* trees are planned to be relocated to surrounding areas in accordance with the approved Flora and Fauna Management Plan.

Plate 3
A Purple Copper Butterfly

A Purple Copper Butterfly Monitoring Program has been prepared to monitor potential indirect impacts on the known populations of the butterfly and the success of the relocation of the *Bursaria* to the surrounding areas. A program that monitors the butterfly larvae has been in operation since October 2011 and the monitoring of the Purple Copper Butterfly and it's habitats since November 2012. The monitoring is conducted over the warmer months (usually November – April) and is conducted three days per week.

The objectives of the monitoring program are as follows:

- Identify the potential sources of indirect impacts upon the Purple Copper Butterfly and its larvae and relevant impact management measures that will be implemented at the mine;
- Monitor the potential impacts of the mining operations upon the Purple Copper Butterfly and its larvae; and
- Establish a management protocol for the review of monitoring results including contingency measures to be implemented in the event that monitoring indicates adverse indirect impacts from the mining operations.

The monitoring program will be undertaken while mining and rehabilitation works are being carried out. It is proposed, however, that the monitoring program will be reviewed on an annual basis and, if required, updated to reflect any changes to management or monitoring practices. The monitoring program was not altered in 2012 as there wasn't sufficient data obtained to justify changing the management or monitoring practices. The monitoring program will be reviewed again upon completion of the current monitoring cycle.

All research and monitoring is being undertaken under the direction and advice of the University of Sydney and the Australian Museum. Results will be reported upon completion of the monitoring late 2013.

3.9 Weeds

Weed control activities at Pine Dale Mine are undertaken in accordance with the Flora and Fauna Management Plan, which provides a range of measures to prevent and/or minimise the occurrence and dispersal of weeds. Weed inspections were undertaken on a regular basis with a large portion of weed problems on the mine's property being sprayed or chipped during the reporting period. Approximately 30 ha were actively sprayed during the reporting period throughout the Pine Dale Mine and rehabilitated areas.

Weed control methods target four noxious weeds previously identified within the Pine Dale Mine and Yarraboldy Extension area, namely:

- African Lovegrass (*Eragrostis curvula*);
- Blackberry (*Rubus fruticosus aggregate species*);
- Briar Rose (*Rosa rubiginosa*); and
- St John's Wort (*Hypericum perforatum*).

The control of weeds will be undertaken on an ongoing basis as required to ensure noxious species are managed accordingly.

3.10 Blasting

Blasting commenced at the Pine Dale Mine in 2008 and continued throughout the reporting period of 2012. During the reporting period a total of 38 blast events were initiated at Pine Dale Mine. The blasting annual results compared to the blast monitoring criteria are summarised in **Table 13**. The results for each blast event during the reporting period are presented in **Appendix A.**

Table 13
Blast Monitoring Criteria and 2012 Results

Air blast overpressure dB(Lin. Peak)	Allowable exceedance*	Results 2012
115	5%	2.6%
120	0%	0%
Ground vibration (mm/s)		
5	5%	0%
10	0%	0%

* Percentage of the total number of blasts over a period of 12 months

The air blast overpressure exceed 115dB (Lin. Peak) on one occasion during the 38 blast events. The blast event recorded an air blast overpressure of 116.3dB at Summer St. This represents 2.6% of the allowable 5% exceedance criteria for the reporting period. All other air blast overpressure and ground vibration results for 2012 remained well within the relevant criteria of <115dB (Lin. Peak) and <5 mm/s at all monitoring sites. All blasts occurred between the hours of 10:00am and 3:00pm (Monday to Friday), with no more than one blast per day during the reporting period as required under PA 10_0041. All blasts on site are carried out by Downer EDI Mining – Blasting Services Pty Ltd.

3.11 Operational Noise

Mining related noise impacts at Pine Dale Mine are managed in accordance with PA 10_0041, EPL 4911 and the approved Noise Monitoring Program. Noise emissions from Pine Dale Mine operations were monitored on a quarterly basis at six locations surrounding the site during the reporting period by RCA Laboratories (see **Plan 1A**). These locations included:

- NM1 – the Green residence, Blackman's flat;
- NM2 – the Cherry residence, Blackman's flat;
- NM3 – Castlereagh Highway, east of Blackman's flat;
- NM4 – the Rensen residence, north of View Street, Blackman's flat;
- NM5 – the Fraser residence, Lidsdale; and
- NM6 – the Turek residence, Wolgan Road, Lidsdale.

The operational noise assessment criteria is 42 dB $L_{Aeq\ (15\ minute)}$ at three of the six monitoring locations (NM1 to NM3); and a noise assessment criteria of 35dB $L_{Aeq\ (15\ minute)}$ at the remaining three monitoring locations (NM4 toNM6). During construction and removal of the amenity bund the noise assessment criteria is 46dB $L_{Aeq\ (15\ minute)}$ at all receptors. Attended quarterly noise monitoring was undertaken during the reporting period which assessed noise impacts from Pine Dale Mine against relevant criteria detailed within PA 10_0041 and EPL 4911.

Pine Dale Mine complied with the daytime $L_{Aeq\ (15\ minute)}$ noise criteria at all locations during the reporting period. It should be noted that elevated readings were recorded at location NM1 on two occasions during the reporting period. The first occasion in April 2012 occurred during construction works on the Amenity Bund. The contribution of noise from the Pine Dale Mine was recorded to be between 47dB - 48dB $L_{Aeq\ (15\ minute)}$. The noise criteria during construction works of the amenity bund is 46dB $L_{Aeq\ (15\ minute)}$. The recorded noise levels are within the 2dB allowable threshold as described under the NSW Industrial Noise Policy (Environmental Protection Authority, 2000).

The second occasion in October 2012, recorded the contribution of noise from the Pine Dale Mine to be 43dB $L_{Aeq\ (15\ minute)}$. Further surveys conducted at this site indicated the contribution from the Pine Dale Mine was recorded as 39dB and 40dB $L_{Aeq\ (15\ minute)}$ respectively over the two 15-minute survey periods. The recorded noise levels are within the 2dB allowable threshold as described under the NSW Industrial Noise Policy (Environmental Protection Authority, 2000).

3.12 Visual, Stray Light

There were no adverse impacts associated with stray light or visual disturbance identified during the reporting period. There were no complaints received during the reporting period regarding visual and stray light impacts.

3.13 Aboriginal Heritage

There were no artefacts of Aboriginal Cultural Heritage found at the Pine Dale Mine during the reporting period.

3.14 Natural Heritage

No items or areas of natural heritage significance were recorded or are considered to occur within the approved disturbance area at Pine Dale Mine.

3.15 Spontaneous Combustion

There were no incidences of spontaneous combustion in coal stockpiles or overburden material during the reporting period. The Lithgow Seam is known to have a low propensity for spontaneous combustion. The Lithgow Seam can experience some heating if left exposed for extended periods in poorly formed stockpiles. Experience in the Western Coalfields shows that the Lithgow Seam coal, when correctly stockpiled, can be exposed for up to 12 months without spontaneous combustion occurring. To minimise the potential for spontaneous combustion ROM coal and Product coal is not stockpile for long periods. The extraction, processing and stockpiling of coal will continue to be managed to ensure spontaneous combustion is avoided.

3.16 Mine Subsidence

There were no issues regarding mine subsidence during the reporting period.

3.17 Hydrocarbon Contamination

There were no reported incidents of hydrocarbon contamination at Pine Dale Mine over the reporting period. Refer to **Section 2.9** for details on hydrocarbon storage.

3.18 Bushfire

Bush fire control strategies for Pine Dale Mine are managed in accordance with the approved Bush Fire Management Plan. These strategies are employed for preventing the occurrence and spread of any fire events that may impact on the site or in surrounding lands (i.e. Ben Bullen State Forest). As such, measures are taken at Pine Dale Mine to prevent the occurrence and spread of fire through proper maintenance of machinery and equipment, and the maintenance of access roads. There were no bush fire events at or in close proximity to Pine Dale Mine during the reporting period.

3.19 Methane Drainage/Ventilation

The underground workings at this site were closed in 1986 and decommissioned over the period from 1987 to 1990. Methane levels are considered to be negligible at the Pine Dale Mine. There are two remaining entries to the underground workings, being the 1A mine entry and the Punch Mine Entry. These are used as surface water stage facilities as per the approved Water Management Plan.

3.20 Public Safety

No issues of public safety occurred during the reporting period. The site is regularly monitored by mine personnel. The entire perimeter of the Pine Dale Mine property is fenced, with “No Trespassing” signs displayed at various intervals. “Do Not Enter” and “Danger” signs are also displayed along the fence of the private sealed haul road. There has been a continuation of the elimination of trespassing, as continual fencing monitoring, upgrades and repairs have continued to occur during the reporting period.

3.21 Other Issues and Risks

There are no other known issues or identified hazards at the operating Pine Dale Mine.

4 COMMUNITY RELATIONS

4.1 Environmental Complaints

All stakeholder and community complaints regarding Pine Dale Mine are documented, with appropriate actions taken as soon as possible to determine the likely cause of the complaint and all possible corrective actions to resolve the problem and prevent its recurrence. Complaints are recorded and retained at the site office.

During the reporting period, a total of 14 complaints were recorded from 5 complainants. The complaints received during the reporting period related to blasting, air quality and noise impacts (see **Table 14**).

Blasting related matters were the most common complaint received during the reporting period making up 86% of the total number of complaints, followed by dust (7%) and noise (7%).

Table 14
Community Complaints

Complaint Type	Complaints Received 2012
Noise	2
Air Quality (Dust)	4
Blasting	26
Traffic	1
Water	0
Other	2
Total	**35**

4.2 Community Liaison

COMMUNITY CONSULTATIVE COMMITTEE

During 2012, two Community Consultative Committee (CCC) meetings were held on the 19 January 2012 and 7 August 2012. The Pine Dale Mine CCC commenced in January 2012 and comprises representatives from the local community, LCC and Pine Dale Mine. The Committee meets on a biannual basis to discussed matters relating to the Pine Dale mine. The CCC meeting minutes are made publicly available via the Company's Website www.enhanceplace.com.au.

WEBSITE INFORMATION

A website has been established to keep the broader community up to date with recent activities at the Pine Dale Mine in accordance with Schedule 5, Condition 10 of the PA 10_0041. Copies of the following documents are made publicly available on the Enhance Place Website:

- EPL 4911;
- The Environmental Impact Statement;
- Project Approval 10_0041;
- Environmental Management Plans for the Pine Dale Mine;
- CCC minutes;
- Community complaints; and
- Blasting information.

SOCIAL/ ECONOMIC CONTRIBUTIONS

Pine Dale Mine has contributed to the economy of the district and State by providing direct employment, indirect employment and through the purchase of services and materials from regional suppliers. Coal supplies to Delta Electricity are very competitively priced energy for the economic benefit of the local power station, to help it retain competitiveness in the NSW electricity supply industry.

5 REHABILITATION

5.1 Buildings

There were no buildings removed or constructed during the reporting period.

5.2 Rehabilitation of Disturbed Land

Where practicable, areas mined are progressively backfilled on a continual basis to form a profile similar to the pre-mining landscape. The rehabilitation area is made up of a series of parcels of land which are at various stages of being progressively rehabilitated back to a self-sustainable native ecosystem (acceptable post-mining land use and capability). The principal re-vegetation technique currently employed is direct seeding using native tree and shrub species for woodland communities and pasture species for areas intended for agricultural activities. The proposed final landform aims to emulate the pre-mining environment and to enhance local and regional ecological linkages across the site and surrounding areas. A summary of the disturbed and rehabilitated areas at the Pine Dale Mine can be seen in **Table 15**.

Rehabilitation Area A

Seeding of Area A (8 ha) commenced in 2008, with 1500 trees planted. In 2010 an additional 400 trees were planted with the assistance of the Gundungurra Tribal Aboriginal Council.

Pine Dale Mine is developing a revised rehabilitation strategy for area A and has sought expert advice from a specialist consultant to assist in this regard. Any revised rehabilitation strategy will be undertaken in consultation with DRE.

Annual Flora monitoring of Area A will commence in 2013 and will assess species diversity, plant density and ground cover within the rehabilitated area. It is planned to assess the rehabilitated area against comparable local grassland and woodland communities to establish baseline rehabilitation targets.

Rehabilitation Area B and C

Seeding of Areas B and C (approximately 25 ha) commenced in 2010 and was completed in 2011. The area was seeded with a pasture mixture known as 'Cox's River Mix' and comprises of:

- 40% Fescue;
- 25% Cocksfoot;
- 20% Subterranean Clover;

- 6% Perennial Ryegrass;
- 5% White Clover; and
- 4% Phalaris.

Contour drains and catchment dams were constructed within the rehabilitated Areas B and C and can be seen in **Plate 4**. Visual inspections of Areas B and C show that the final Land formation and ground cover are similar to the surrounding undisturbed land, this can be seen in **Plate 4**and **Plate 5**.

Pine Dale Mine has sought external assistance in the development of a revised rehabilitation strategy for the area. Any revised rehabilitation strategy will be undertaken in consultation with DRE.

Annual Flora monitoring of Areas B and C will commence in 2013 and will assess species diversity and ground cover percentage within the rehabilitated area. It is planned to assess the rehabilitated area against adjacent pasture lands to establish a baseline for a self-sustainable vegetation community. The proposed final land use for this area is grazing

Rehabilitation Area 8

Seeding of area 8 (10 ha) commenced in 2008, with a pasture mixture known as 'Cox's River Mix'. The vegetation communities prior to mining include a mixture of cleared land, pasture, pines and eucalyptus.

Three flora monitoring reports for Area 8 have been completed since February 2010. The flora monitoring reports assess the ground cover percentage, species abundance and weed management. The findings from the 2012 flora monitoring report (**Appendix C**) show that the area is progressing towards a self-sustainable area with living ground cover consuming up to 95%. A second quadrate has been established to obtain background data for future monitoring with Area 8.

The weed assessment of Area 8 found the following noxious weeds; African Lovegrass (*Eragrostis curvula*), Blackberry (*Rubus sp. agg*.), Briar Rose (*Rosa rubiginosa*), St John's Wort (*Hypericum perforatum*) which are classified as Class 4 noxious weeds. It should be noted that Pine Dale Mine has embraced the principles of Integrated Weed Management to control the Class 4 Noxious Weeds identified on the area and the management and monitoring will continue into the future. The report recommended that Pine Dale Mine should '*regularly undertake spot spraying campaigns to control Blackberry, Briar Rose and St John's Wort as they are in relatively low numbers at present but if not controlled will proliferate'*.

Plate 4
Area B & C Rehabilitation Looking East

Plate 5
Area B & C Rehabilitation Looking West

Table 15
Rehabilitation Summary

	Area Affected/Rehabilitated (ha)		
	To date	**Last report**	**Next Report (estimated)**
A: MINE LEASE AREA			
A1 Mine Lease Area	98.1		
B: DISTURBED AREAS			
B1 Infrastructure Area	21.0	18.6	21.0
B2 Active Mining Area	2.6	0	2.3
B3 Waste emplacements	14.2	14.2	15.2
B4 Tailings emplacements	N/A	N/A	N/A
B5 Shaped Waste Placement	0	2.3	0
ALL DISTURBED AREAS	37.8	35.1	38.5
C: REHABILITATION PROGRESS			
C1 Total Rehabilitated Area (except for maintenance)	32	32	32
D: REHABILITATION ON SLOPES			
D1 10 to 18 degrees	0	0	0
D2 Greater than 18 degrees	0	0	0
E: SURFACE OF REHABILITATED LAND			
E1 Pasture and grasses	24.5	24.5	24.5
E2 Native forest/ecosystems	7.5	7.5	7.5
E3 Plantations and crops	0	0	0
E4 Other (include non-vegetative outcomes)	0	0	0

During 2012 additional maintenance activities were conducted on rehabilitated lands in the form of erosion control, fertilizing and weed mitigation (see **Table 16**).

Table 16
Maintenance Activities on Rehabilitated Land

	Area Treated (ha)		
	Report Period	**Next Period**	**Comment/control strategies/treatment detail**
Additional erosion control works	1	1	Ongoing maintenance of sedimentation fencing was conducted in and around the rehabilitated areas.
Recovering	0	0	No further topsoil or subsoil sealing was required during the reporting period.
Soil treatment	7	5	Fertilizing was conducted over the previously rehabilitated “Area A”.
Treatment/Management	0	0	No grazing cropping or slashing was conducted during the reporting period.
Re-seeding/Replanting	10	5	Contingency for any seeding failure.
Adversely affected by weeds	30	30	Weed spraying was conducted through all rehabilitated areas as part of the Flora and Fauna Management Plan.
Feral animal control	0	0	No feral animal control was required during the reporting period.

5.3 Other Infrastructure

There was no rehabilitation of other infrastructure during the reporting period.

5.4 Rehabilitation Trials and Research

Research and monitoring on the Purple Copper Butterfly and its habitat is currently being undertaking under the direction and advice of the University of Sydney and the Australian Museum. More details are available in **Section 3.8**. There were no further rehabilitation trials or research undertaken during the reporting period.

5.5 Further Development of the Final Rehabilitation Plan

The final landform and rehabilitation plan is outlined in the MOP. Approval of the MOP was granted in February 2011 and the final landform and rehabilitation plan has remained unchanged.

6 ACTIVITIES PROPOSED IN THE NEXT AEMR PERIOD

The activities proposed for the 2013 reporting period are consistent with the MOP. No fundamental changes have been proposed.

MINING

Mining activities during the 2013 reporting period will progress in the northern direction within the Yarraboldy Extension area. The Pine Dale Mine is forecasted to extract up to 275,000 t of ROM coal in 2013 and move up to 1,900,000 m³ of waste rock. It is anticipated that all recoverable coal within the approved area will be extracted in 2013.

REHABILATION

There are no planned rehabilitation activities proposed during the 2013 reporting period. All maintenance activities required on the rehabilitation areas will continue throughout 2013 (sediment fences, fertilizing, re-seeding, weed control etc.)

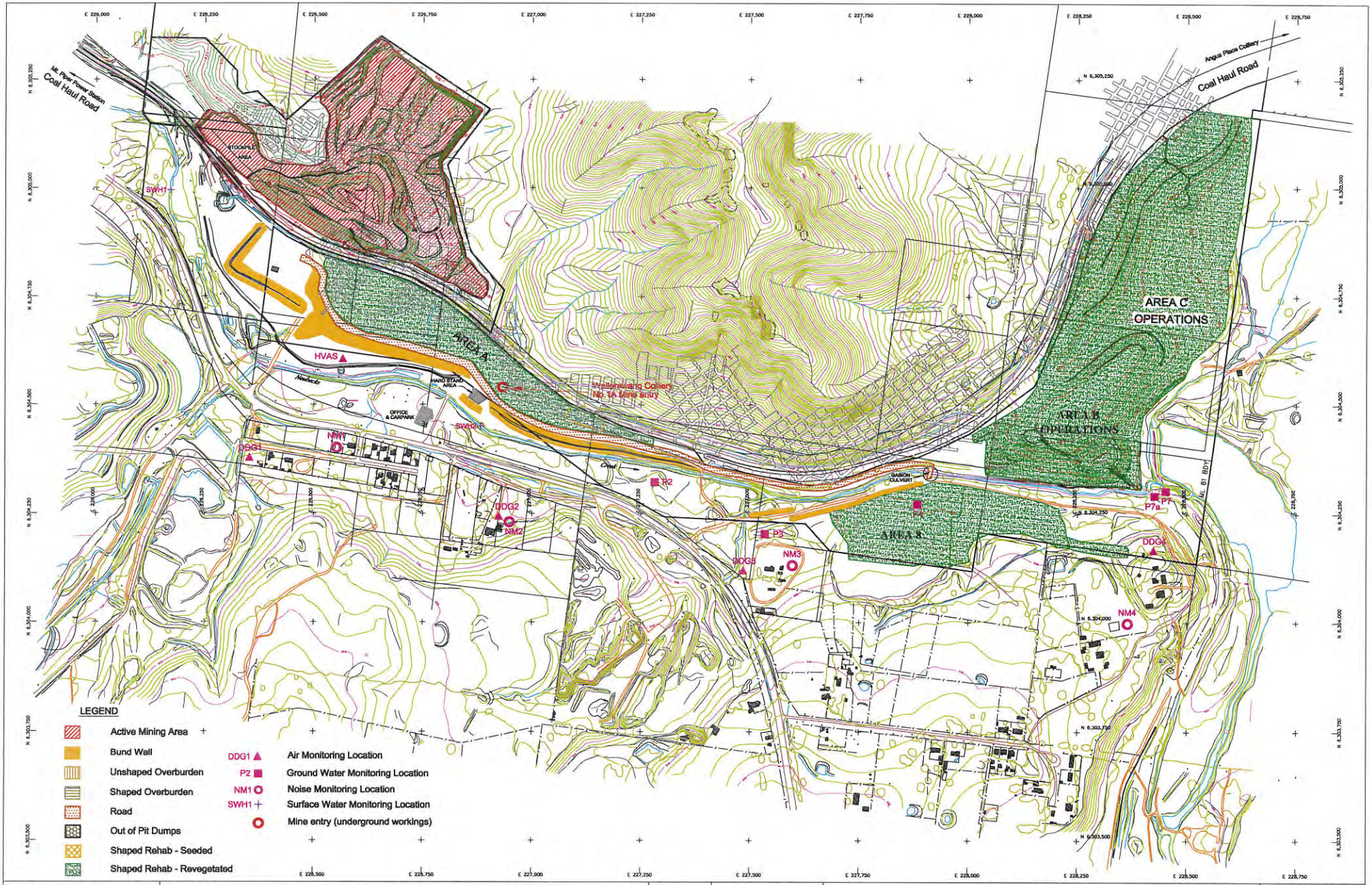
MODIFICATIONS TO REGULATORY APPROVALS

A State Significant Development Application SSD-5086 was lodged by Enhance Place with the DP&I in December 2012 under Part 4 of the EP&A Act for Pine Dale Stage 2 Extension Project. The development application and Environmental Impact Statement (EIS) addressing the Director Generals Requirements, is currently being assessed for adequacy by DP&I. If approved, the Pine Dale Stage 2 Extension Project will allow coal mining operations to continue for up to 15 years at maximum production rate of 2 Mtpa.

APPENDIX A

SITE PLANS 2012

PLAN 1A



NOTES:

CRAVEN, ELLISTON & HAYES (LITHGOW) PTY.LTD.
CONSULTING LAND, ENGINEERING AND MINING SURVEYORS
ACN 056 544 551
"ASTROLABE" RUTHERFORD LANE, LITHGOW, 2790 PH: (02) 6351 2281, FAX: (02) 6352 1339
EMAIL : survey@ceh.com.au

DATE	31-12-12
AMENDED	
SURVEYOR	AERIAL PHOTO/TE/TH
DRAWN	K.L.F.
CHECKED	

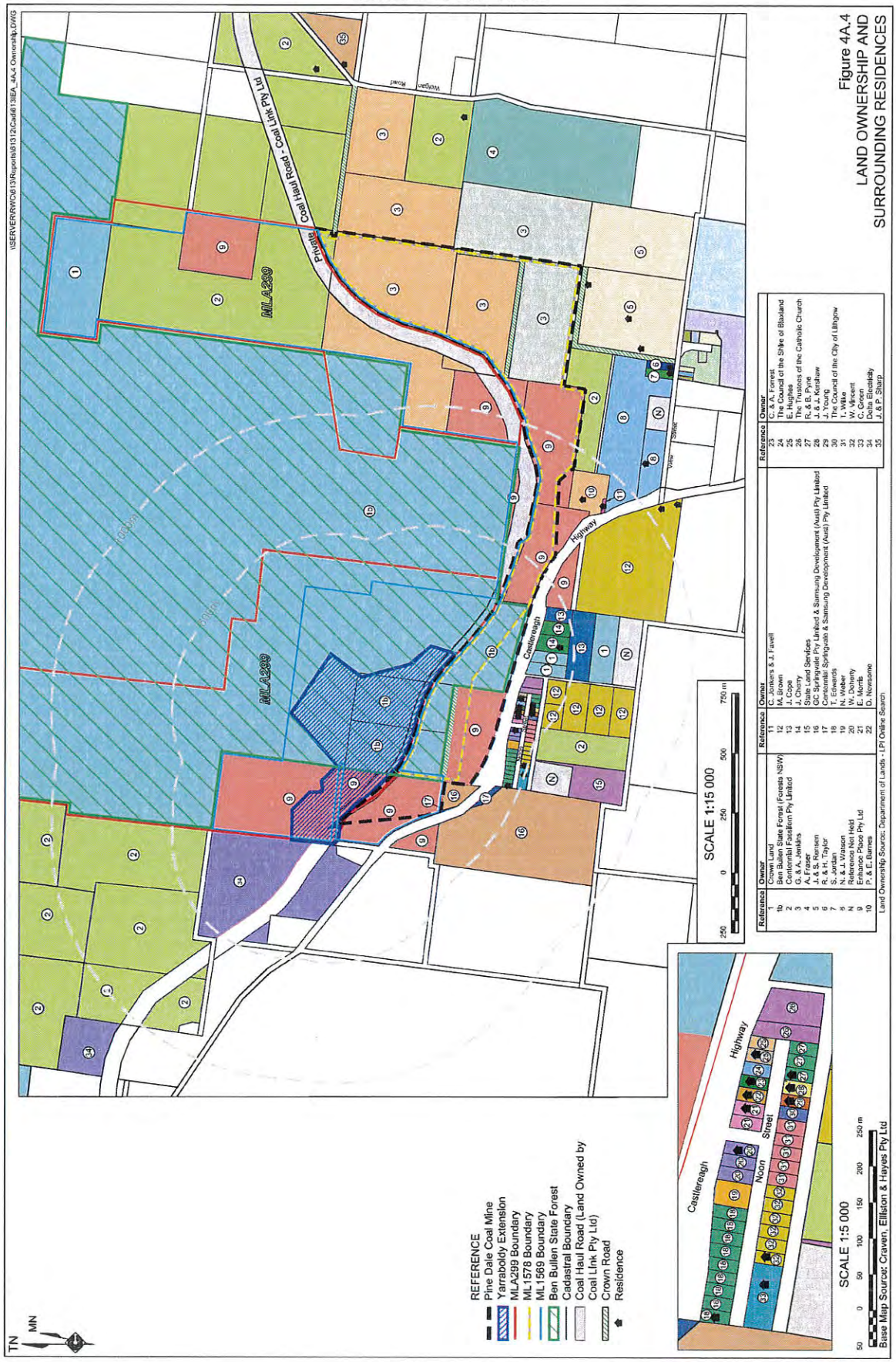
PINEDALE MINE
AEMR PLAN
END DECEMBER 2012

SCALE - 1 : 4000 (A1 Sheet)

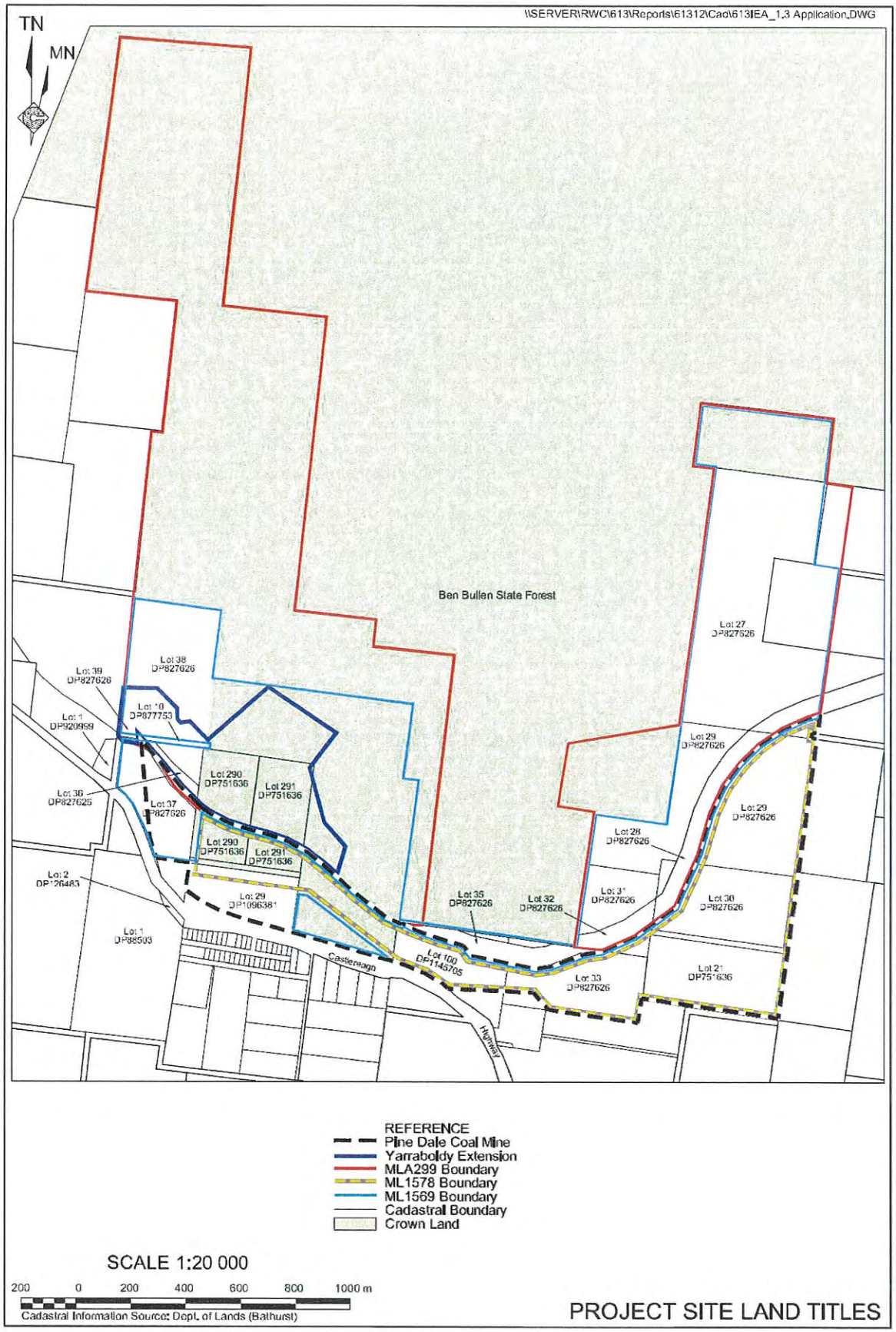
DWG No
PINE-AEMR12

PLAN 1

SCHEDULE OF LAND



PLAN 2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Lot 38 DP827626
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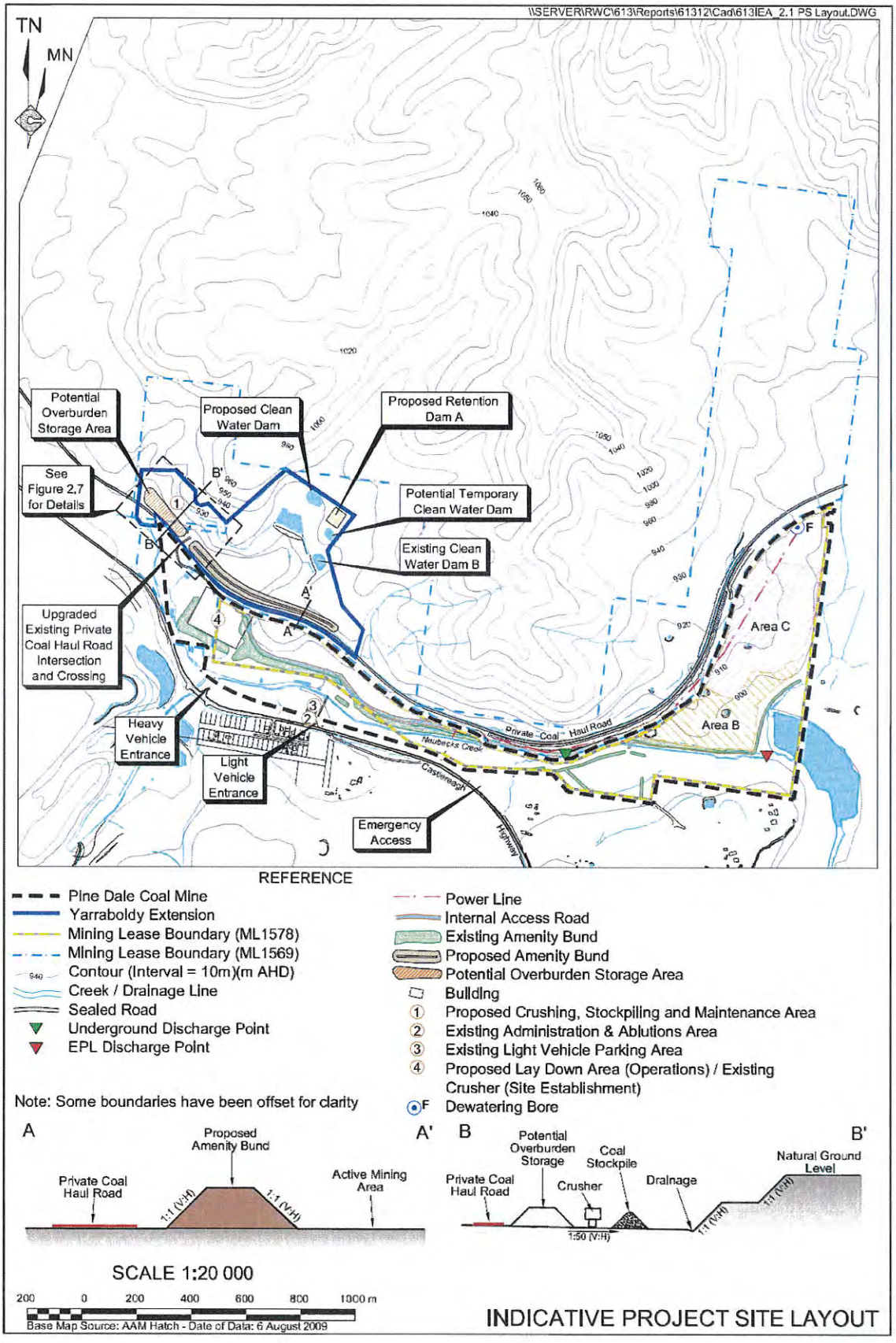
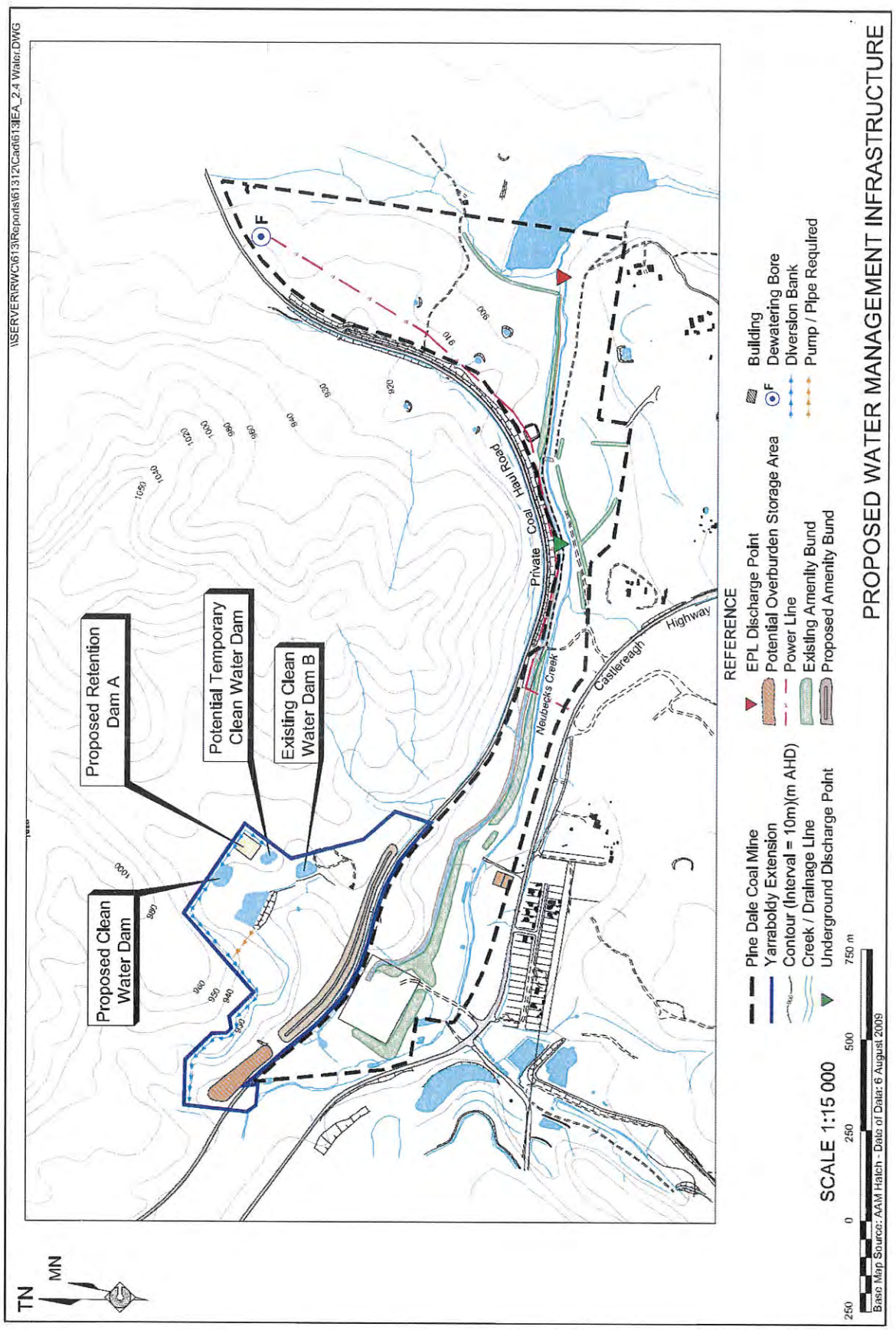
Lot 291 DP751636
Lot 36 DP827625
Lot 37 DP827626
Lot 29 DP827626
Lot 28 DP827626
Lot 2 DP126483
Lot 29 DP1096381
Lot 35 DP827626
Lot 32 DP827626
Lot 31 DP827626
Lot 30 DP827626
Lot 1 DP88503
Castlereagh
Lot 100 DP1145705
Lot 33 DP827626
Lot 21 DP751636
Highway
REFERENCE
Pine Dale Coal Mine
Yarraboldy Extension
MLA299 Boundary
ML1578 Boundary
ML1569 Boundary
Cadastral Boundary
Crown Land
SCALE 1:20 000
200 0 200 400 600 800 1000 m
Cadastral Information Source: Dept. of Lands (Bathurst)
PROJECT SITE LAND TITLES

PLAN 3

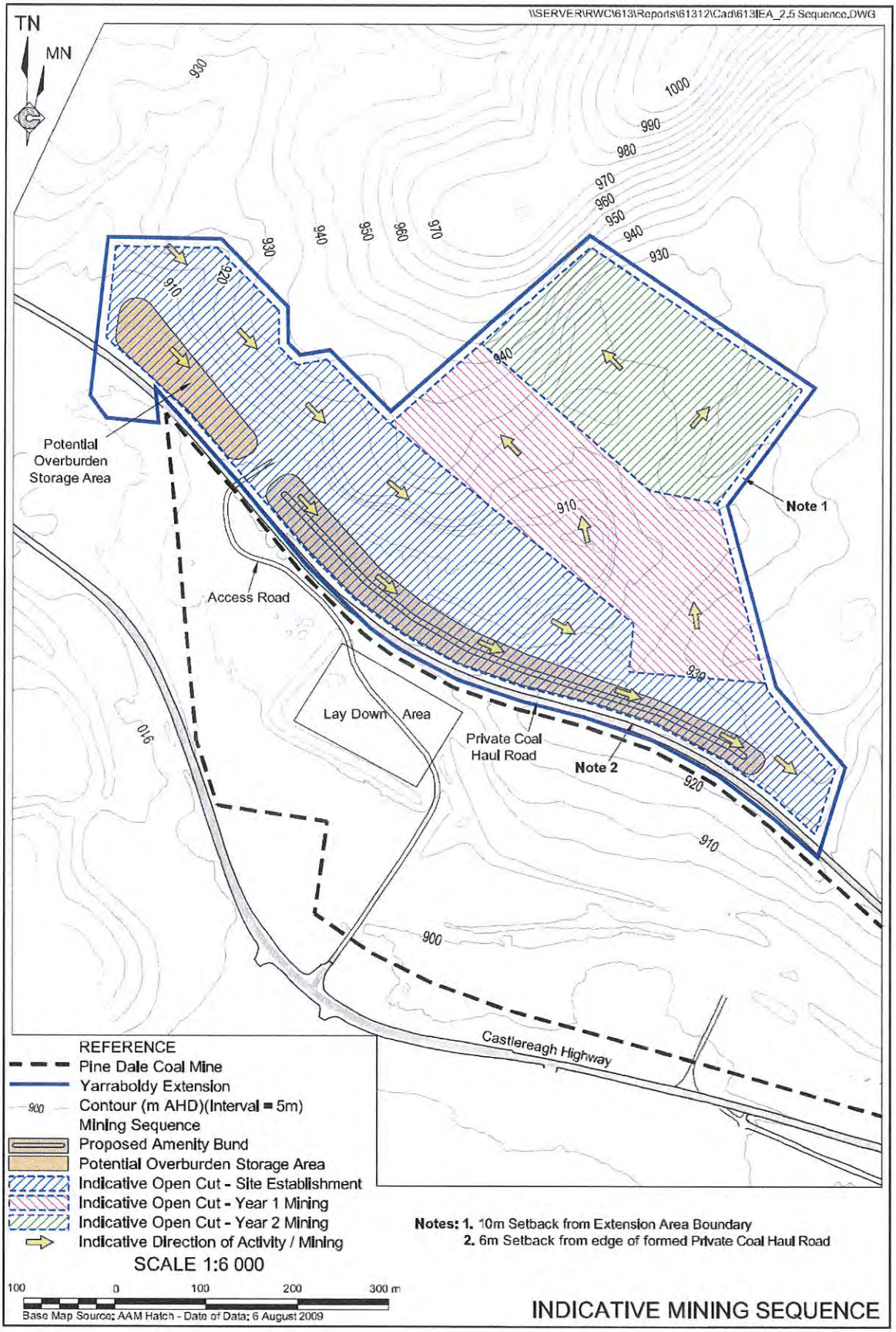
PROJECT LAYOUT PLANS



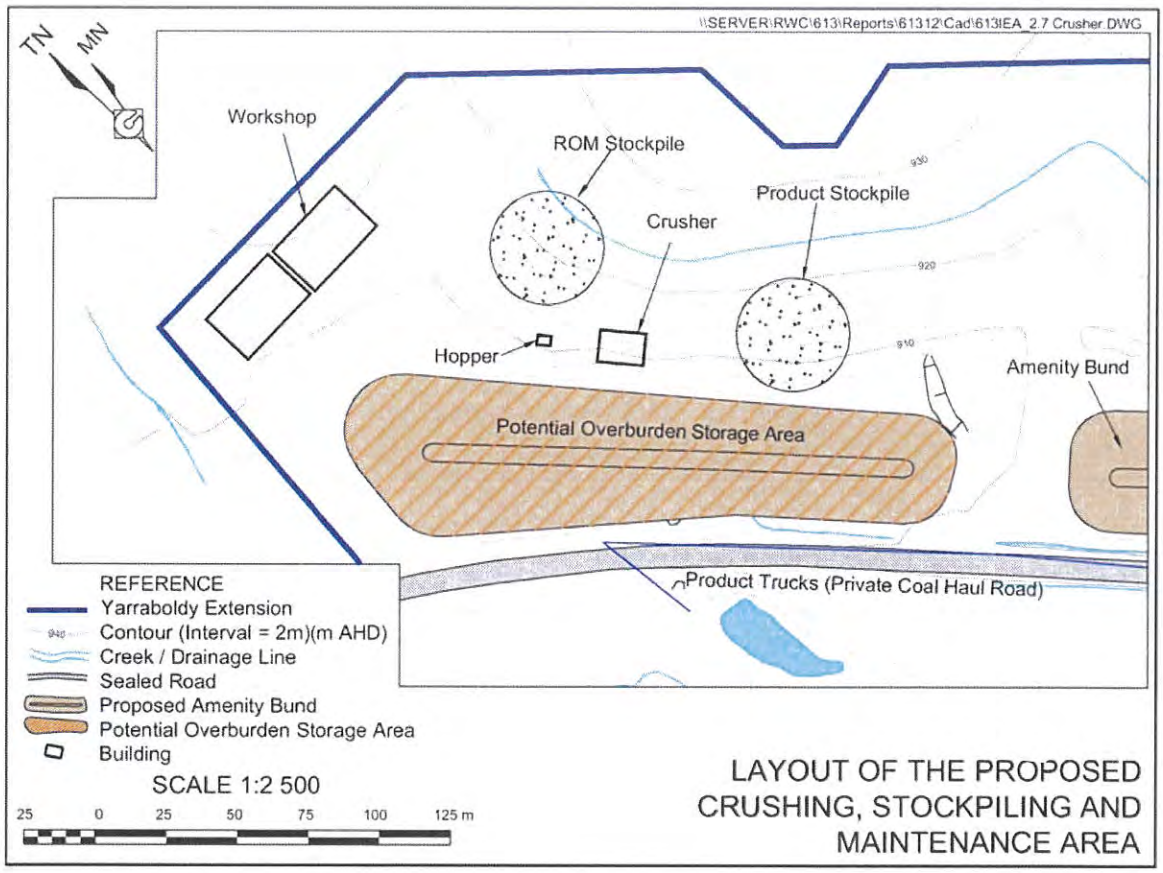
PLAN 4


\\SERVER\RWC\613\Reports\61312\Cad\613EA_2.4 Water.DWG
PROPOSED WATER MANAGEMENT INFRASTRUCTURE
Proposed Retention Dam A
Potential Temporary Clean Water Dam
Existing Clean Water Dam B
Proposed Clean Water Dam
Haul Road
Private Coal
Neubecks Creek
Castlereagh Highway
REFERENCE
Pine Dale Coal Mine
Yarraboldy Extension
Contour (Interval = 10m)(m AHD)
Creek / Drainage Line
Underground Discharge Point
EPL Discharge Point
Potential Overburden Storage Area
Power Line
Existing Amenity Bund
Proposed Amenity Bund
Building
Dewatering Bore
Diversion Bank
Pump / Pipe Required
SCALE 1:15 000
250 0 250 500 750 m
Base Map Source: AAM Hatch - Date of Data: 6 August 2009
TN
MN

PLAN 5

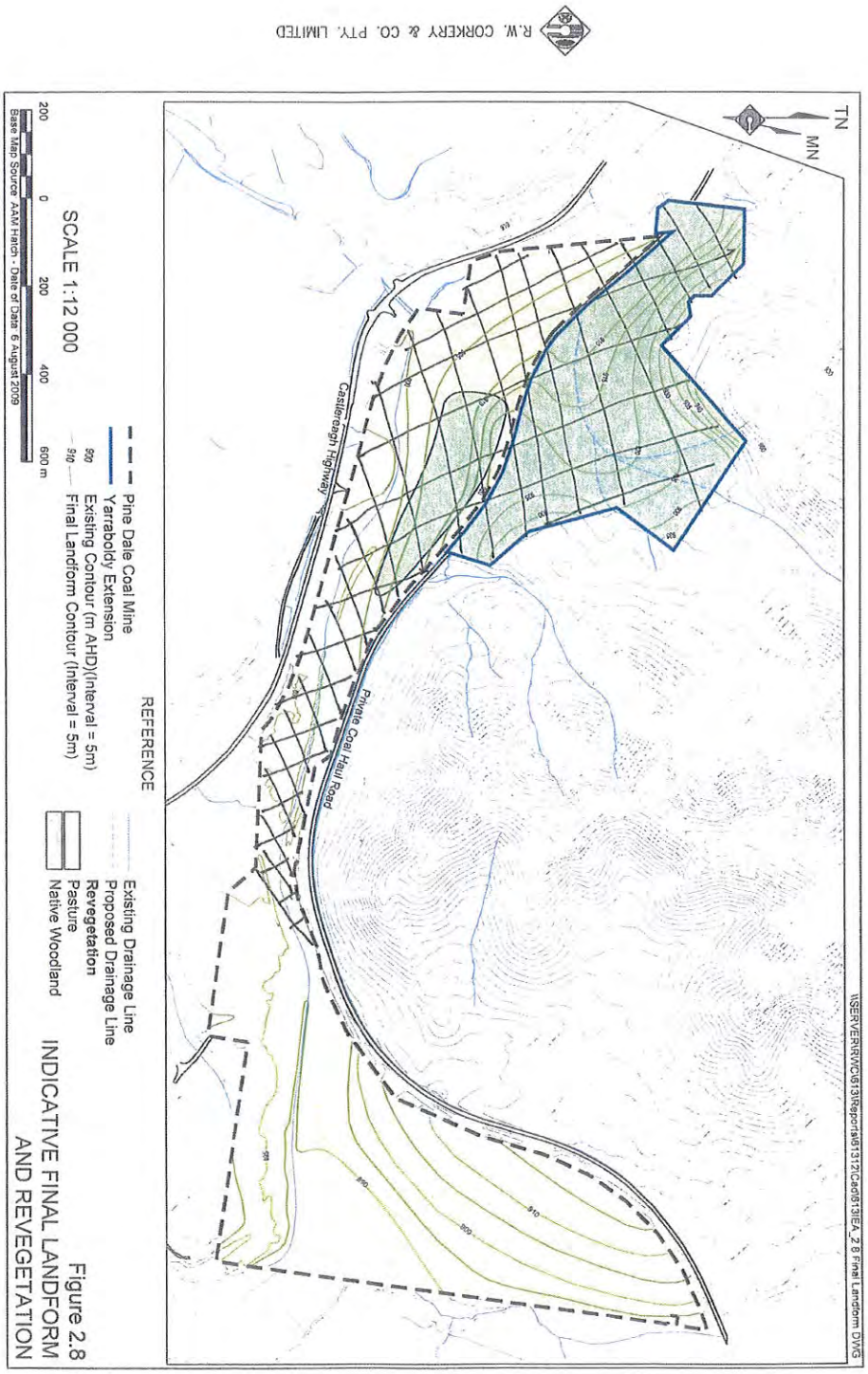

\\SERVER\RWC\613\Reports\61312\Cad\613IEA_2.5 Sequence.DWG
TN
MN
Potential Overburden Storage Area
Access Road
Lay Down Area
Private Coal Haul Road
Note 1
Note 2
Castlereagh Highway
REFERENCE
Pine Dale Coal Mine
Yarraboldy Extension
900 Contour (m AHD)(Interval = 5m)
Mining Sequence
Proposed Amenity Bund
Potential Overburden Storage Area
Indicative Open Cut - Site Establishment
Indicative Open Cut - Year 1 Mining
Indicative Open Cut - Year 2 Mining
Indicative Direction of Activity / Mining
SCALE 1:6 000
100 0 100 200 300 m
Base Map Source: AAM Hatch - Date of Data: 6 August 2009
Notes: 1. 10m Setback from Extension Area Boundary
2. 6m Setback from edge of formed Private Coal Haul Road
INDICATIVE MINING SEQUENCE

PLAN 6


\\SERVER\RWC\613\Reports\61312\Cad\613IEA_2.7 Crusher.DWG
TN
MN
Workshop
ROM Stockpile
Product Stockpile
Crusher
Hopper
Amenity Bund
Potential Overburden Storage Area
Product Trucks (Private Coal Haul Road)
930
920
910
940
REFERENCE
Yarraboldy Extension
Contour (Interval = 2m)(m AHD)
Creek / Drainage Line
Sealed Road
Proposed Amenity Bund
Potential Overburden Storage Area
Building
SCALE 1:2 500
25 0 25 50 75 100 125 m
LAYOUT OF THE PROPOSED CRUSHING, STOCKPILING AND MAINTENANCE AREA

PLAN 7

CONCEPTUAL REHABILITATION PLAN



APPENDIX B

DUST MONITORING AND GROUNDWATER SUMMARY REPORT

RCA-LE ref 6880-812/0

14 February 2013

Pine Dale Mine
PO Box 202
WALLERAWANG NSW 2845

Attention: Mr Hilton Goldfinch

AEMR SUMMARY REPORT
COMPILED FOR ENHANCE PLACE PTY LTD – PINE DALE MINE
DETAILING AIR QUALITY, GROUNDWATER, SURFACE WATER AND METEOROLOGICAL MONITORING JANUARY – DECEMBER 2012

Robert Carr & Associates Pty Ltd
T/A RCA Laboratories ABN 53 063 515 711
92 Hill St Carrington Newcastle NSW 2294
Ph 02 **4902 9200 Fax** 02 **4902 9299**
Email administrator@rca.com.au
Web www.rca.com.au

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APPENDIX A

1 INTRODUCTION

The following report provides a summary of monthly environmental monitoring data for Pine Dale Mine for the year 2012. Summary data is comprised of High Volume Air Samples (TSP & PM_{10}), Depositional Dust, Surface Water, Groundwater monitoring and Blast monitoring.

A compliance assessment of both depositional dust results and High Volume Air Sampler (HVAS) results is made in accordance with the criteria presented in the Pine Dale Mine *Air Quality Monitoring Program*.

Similarly, a compliance assessment of the routine Surface water and Groundwater monitoring results was undertaken in accordance with the criteria presented in the Pine Dale Mine *Groundwater Monitoring Program*.

A compliance assessment of the blasts undertaken during the monitoring period of January 2012 to December 2012 is evaluated against the criteria that are stipulated in the Pine Dale Mine Environmental Protection Licence, EPL 4911.

2 ASSESSMENT CRITERIA

2.1 DEPOSITIONAL DUST AND HVAS PARTICULATE MATTER ASSESSMENT CRITERIA

The Air Quality Monitoring Program stipulates that dust emissions generated by the project must not cause additional exceedances of the long term impact assessment criteria listed in **Table 1, 2** and **3** (below).

Table 1 *Depositional Dust: Long Term Impact Assessment Criteria*

Pollutant	Average Period	Maximum increase in deposited dust level	Maximum total deposited dust level
Deposited dust	Annual	2 g/m^2.month	4 g/m^2.month

Table 2 *HVAS Particulate Matter: Long Term Impact Assessment Criteria*

Pollutant	Average Period	Criterion
Total suspended particulate (TSP) matter	Annual	90µg/m^3
Particulate matter < 10µm (PM_{10})	Annual	30µg/m^3

Table 3 *HVAS Particulate Matter: Short Term Impact Assessment Criteria*

Pollutant	Average Period	Pollutant
Particulate matter < 10µm (PM_{10})	24 hours	50µg/m^3

2.2 GROUNDWATER ASSESSMENT CRITERIA

The purpose of groundwater monitoring is to ensure that any impact of the mining operations on the local groundwater can be identified. The Action Trigger Levels for contingency action implementation as stated in the Pine Dale Mine *Groundwater Monitoring Program* are shown in **Table 4**.

Table 4 *Groundwater Action Trigger Levels*

Trigger	Measurement / Identification	Daily Management of Potential Impact	Action (if triggered)
pH <4.0 or >8.5 (Note that a pH value of <4 has been selected given the site specific groundwater conditions encountered prior to the commencement of mining at the site)	pH is to be analysed monthly. Sampling is to take place around the 1st of each month.	NA	Resample the affected bore(s). If the result is still elevated then, install more bores around the area to assess the extent of the impact and conduct a risk assessment to assess the risk to the nearest groundwater user. If this risk is significant then, assess remedial options such as pump and treat or hydraulic isolation. Conduct remediation if necessary.
Standing Water Levels (SWLs) increase/decrease by >15% when compared to pre-mining levels.	SWLs are to be gauged monthly. Levels are to be collected around the 1st of each month.	NA	Should standing groundwater levels reduce by more than 15% of the baseline pre-mining levels further assessment of the natural fluctuations occurring within the other monitoring bores will be undertaken. Should the decrease be assessed to be caused by the mining, then the suggested remedial measure is to establish a new bore in the impacted area. The new bore should be installed to greater depth than the original such that the yield of the new bore is at least equal to the current yield. Should newly monitored levels still be varied by >15%, potential remedial actions will be discussed with DPI (MR) and DNR.

Table 4 *Groundwater Action Trigger Levels (continued)*

Monitoring Bore	Monitoring Parameters	Monitoring Frequency	Action Threshold
P6	pH, EC	Monthly	<4.0 or >8.5 2000uS/cm
	Aquifer water quality parameters (pH, salinity, Major Cations/Anions and Iron)	Four Monthly	>50% increase in baseline[#] iron concentrations
	Depth SWL (m AHD)	Monthly	<29.2 (883.2) or >39.5 (888.7)
P2, P3 and P4	pH, EC	Monthly	<4.0 or >8.5 2000uS/cm
	Aquifer water quality parameters (pH, salinity, Major Cations/Anions and Iron)	Four Monthly	>50% increase in baseline[#] iron concentrations
	Depth SWL (m AHD)	Monthly	P2 <6.0 (887.3) or >8.1 (889.4) P3 <6.2 (884.6) or >8.4 (886.8) P4 <5.2 (884.8) or >7.1 (886.6)
P7 and P7a	pH, EC	Monthly	<4.0 or >8.5 2000uS/cm
	Aquifer water quality parameters (pH, salinity, Major Cations/Anions and Iron)	Four Monthly	>30%[@] increase in baseline[#] iron concentrations
	Depth (SWL, m AHD)	Monthly	NA*

* Not applicable during monitoring during mining within Area A, however natural fluctuations of +/- 1.1m may occur.

[@]Due to the undisturbed nature of these strata it is anticipated that iron levels will fluctuate to a lower degree than in the other disturbed strata across the Mine Site. [#] ie. levels measured prior to commencement of mining.

2.3 SURFACE WATER ASSESSMENT CRITERIA

The purpose of surface water monitoring is to ensure that any impact of the mining operations on the surface water bodies / streams can be identified, and to prove compliance with relevant legislative requirements. The Concentration Limits as stated in the Pine Dale Mine Environmental Protection License (EPL 4911) are shown in **Table 5**.

Table 5 *Surface Water Monitoring Sites and Concentration Limits*

Surface Water Monitoring Sites	Monitoring Parameters	Monitoring Frequency	Concentration Limits
EPL 2 Neubeck's Creek upstream of the Delta Electricity flow gauging station.	pH, Conductivity, Filterable Iron, Sulfate, Total Suspended Solids, and Turbidity	Quarterly	NA
EPL 3 Neubeck's Creek approximately 100 metres downstream of Internal bridge near site offices.	pH, Conductivity, Filterable Iron, Sulfate, Total Suspended Solids, and Turbidity	Quarterly	NA
EPL 4 Wallerawang Colliery No.1A Mine Entry.	pH, Conductivity, Filterable Iron, Sulfate, Total Suspended Solids, Oil & Grease, and Turbidity	Quarterly during discharge	pH – 6.5 to 8.5 O&G – 10mg/L TSS – 50 mg/L
EPL 5 Wallerawang Colliery Punch Mine entry.	pH, Conductivity, Filterable Iron, Sulfate, Total Suspended Solids, Oil & Grease, and Turbidity	Quarterly during discharge	pH – 6.5 to 8.5 O&G – 10mg/L TSS – 50 mg/L
EPL 13 Discharge to concrete lined section of Neubeck's creek below final settling dam.	pH, Conductivity, Filterable Iron, Sulfate, Total Suspended Solids, Oil & Grease, and Turbidity	Quarterly during discharge	pH – 6.5 to 8.5 O&G – 10mg/L TSS – 30 mg/L
EPL 14 Points in Cox's River downstream of 'Blue Lake'.	pH, Conductivity, Filterable Iron, Sulfate, Total Suspended Solids, and Turbidity	Quarterly	NA

Notes: NA – no concentration limits defined.

2.4 BLASTING OPERATIONS ASSESSMENT CRITERIA

The purpose of monitoring the blasting operations is to ensure that any impact of the mining operations on the surrounding land and noise sensitive locations can be identified, and to show compliance with relevant legislative requirements. The compliance levels as stated in the Pine Dale Mine Environmental Protection License (EPL 4911) are presented in **Table 6**.

Table 6 *Blasting Operations: Compliance Requirements*

Monitoring Parameter	Average Period	Criterion
Airblast Overpressure	95%	115dB (Lin Peak)
Airblast Overpressure	100%	120dB (Lin Peak)
Ground Vibration Peak Particle Velocity	95%	5mm/sec
Ground Vibration Peak Particle Velocity	100%	10mm/sec

3 AIR POLLUTION

3.1 METEOROLOGICAL MONITORING RELATING TO AIR

Pine Dale Mine records meteorological data continuously via an on-site meteorological monitoring station. Parameters recorded (at 15-minute intervals) include Wind Speed, Wind Direction, Temperature at 10m height, Temperature at 2m height and Rainfall. Details of weather data recorded for the period January to December 2012 are available upon request.

3.2 AIR MONITORING RESULTS – DEPOSITIONAL DUST GAUGE DATA SUMMARY

The Pine Dale Mine Environmental Protection Licence (No. 4911) requires depositional dust monitoring to be undertaken at 6 locations. Two of these gauges are located within the township of Blackmans Flat (gauges D1 & D2). A third gauge is located to the east of Blackmans Flat along the Castlereagh Highway (gauge D3). The remaining three gauges (D4, D5 & D6) were installed in November 2006 to coincide with the commencement of mining in Areas B & C. Gauge D4 is located to the north of View St, Blackmans Flat. Two more gauges (D5 & D6) are located to the east of Mining Areas B & C, along Wolgan Road, Lidsdale (refer **Appendix 1**).

Depositional Dust summary results for the period January – December 2012 are shown in **Tables 7** to **12**. Graphical presentations are shown in **Figure 1**.

Table 7 *Depositional Dust Data Summary Gauge D1 Jan – Dec 2012*

Month	Gauge No.	Insoluble Solids (g/m2.month)	Ash (g/m2.month)	Combustible Matter (g/m2.month)
Jan-12	D1	0.4	ND	ND
Feb-12	D1	0.9	0.4	0.5
Mar-12	D1	0.7	0.4	0.3
Apr-12	D1	1.0	0.6	0.4
May-12	D1	0.7	0.4	0.3
Jun-12	D1	0.3	0.1	0.2
Jul-12	D1	0.6	0.4	0.2
Aug-12	D1	0.8	0.5	0.3
Sep-12	D1	1.1	0.6	0.5
Oct-12	D1	1.0	0.6	0.4
Nov-12	D1	1.4	0.8	0.6
Dec-12	D1	2.4	1.6	0.8
AVERAGE		**0.9**	**0.6**	**0.4**

Notes: ND: No Data- Crucible damaged during analysis; partial result only for this sample.

Table 8 *Depositional Dust Data Summary Gauge D2 Jan – Dec 2012*

Month	Gauge No.	Insoluble Solids (g/m2.month)	Ash (g/m2.month)	Combustible Matter (g/m2.month)
Jan-12	D2	0.4	0.1	0.3
Feb-12	D2	0.2	0.05*	0.2
Mar-12	D2	0.5	0.2	0.3
Apr-12	D2	0.7	0.4	0.3
May-12	D2	0.6	0.3	0.3
Jun-12	D2	0.2	0.05*	0.2
Jul-12	D2	0.7	0.3	0.4
Aug-12	D2	0.8	0.4	0.4
Sep-12	D2	0.8	0.4	0.4
Oct-12	D2	0.8	0.4	0.4
Nov-12	D2	0.9	0.5	0.4
Dec-12	D2	1.0	0.6	0.4
AVERAGE		***0.6***	***0.3***	***0.3***

Notes: * Where results are found to be less than the detection limit, values of half the detection limit are used for reporting purposes.

Table 9 *Depositional Dust Data Summary Gauge D3 Jan – Dec 2012*

Month	Gauge No.	Insoluble Solids (g/m2.month)	Ash (g/m2.month)	Combustible Matter (g/m2.month)
Jan-12	D3	0.5	0.3	0.2
Feb-12	D3	0.7	0.4	0.3
Mar-12	D3	1.2	0.7	0.5
Apr-12	D3	1.0	0.6	0.4
May-12	D3	0.9	0.6	0.3
Jun-12	D3	0.5	0.3	0.2
Jul-12	D3	0.7	0.5	0.2
Aug-12	D3	1.1	0.7	0.4
Sep-12	D3	1.3	0.6	0.7
Oct-12	D3	1.4	0.9	0.5
Nov-12	D3	1.4	1.0	0.4
Dec-12	D3	1.3	0.9	0.4
AVERAGE		***1.0***	***0.6***	***0.4***

Table 10 *Depositional Dust Data Summary Gauge D4 Jan – Dec 2012*

Month	Gauge No.	Insoluble Solids (g/m2.month)	Ash (g/m2.month)	Combustible Matter (g/m2.month)
Jan-12	D4	0.5	0.4	0.1
Feb-12	D4	0.3	0.05*	0.3
Mar-12	D4	0.4	0.05*	0.4
Apr-12	D4	0.6	0.2	0.4
May-12	D4	0.4	0.2	0.2
Jun-12	D4	0.2	0.1	0.1
Jul-12	D4	0.3	0.1	0.2
Aug-12	D4	0.4	0.2	0.2
Sep-12	D4	0.4	0.1	0.3
Oct-12	D4	0.5	0.2	0.3
Nov-12	D4	0.6	0.3	0.3
Dec-12	D4	1.0	0.5	0.5
AVERAGE		***0.5***	***0.2***	***0.3***

Notes: * Where results are found to be less than the detection limit, values of half the detection limit are used for reporting purposes.

Table 11 *Depositional Dust Data Summary Gauge D5 Jan – Dec 2012*

Month	Gauge No.	Insoluble Solids (g/m2.month)	Ash (g/m2.month)	Combustible Matter (g/m2.month)
Jan-12	D5	0.2	0.1	0.1
Feb-12	D5	ND	ND	ND
Mar-12	D5	0.3	0.05*	0.3
Apr-12	D5	0.4	0.2	0.2
May-12	D5	0.4	0.2	0.2
Jun-12	D5	0.1	0.05*	0.1
Jul-12	D5	0.6	0.4	0.2
Aug-12	D5	0.3	0.1	0.2
Sep-12	D5	0.4	0.1	0.3
Oct-12	D5	0.3	0.1	0.2
Nov-12	D5	3.6	1.2	2.4
Dec-12	D5	0.9	0.6	0.3
AVERAGE		***0.7***	***0.3***	***0.4***

Notes: ND: No Data due to broken crucible during laboratory analysis. * Where results are found to be less than the detection limit, values of half the detection limit are used for reporting purposes.

Table 12 *Depositional Dust Data Summary Gauge D6 Jan – Dec 2012*

Month	Gauge No.	Insoluble Solids (g/m2.month)	Ash (g/m2.month)	Combustible Matter (g/m2.month)
Jan-12	D6	3.4	1.8	1.6
Feb-12	D6	1.4	0.5	0.9
Mar-12	D6	0.5	0.2	0.3
Apr-12	D6	0.3	0.05*	0.3
May-12	D6	0.4	0.2	0.2
Jun-12	D6	0.05*	0.05*	0.05*
Jul-12	D6	0.3	0.1	0.2
Aug-12	D6	0.4	0.2	0.2
Sep-12	D6	ND	ND	ND
Oct-12	D6	0.3	0.1	0.2
Nov-12	D6	0.7	0.4	0.3
Dec-12	D6	1.4	0.7	0.7
AVERAGE		***0.8***	***0.4***	***0.5***

Notes: ND – No Data due to broken (vandalized) funnel found during field sampling. * Where results are found to be less than the detection limit, values of half the detection limit are used for reporting purposes.

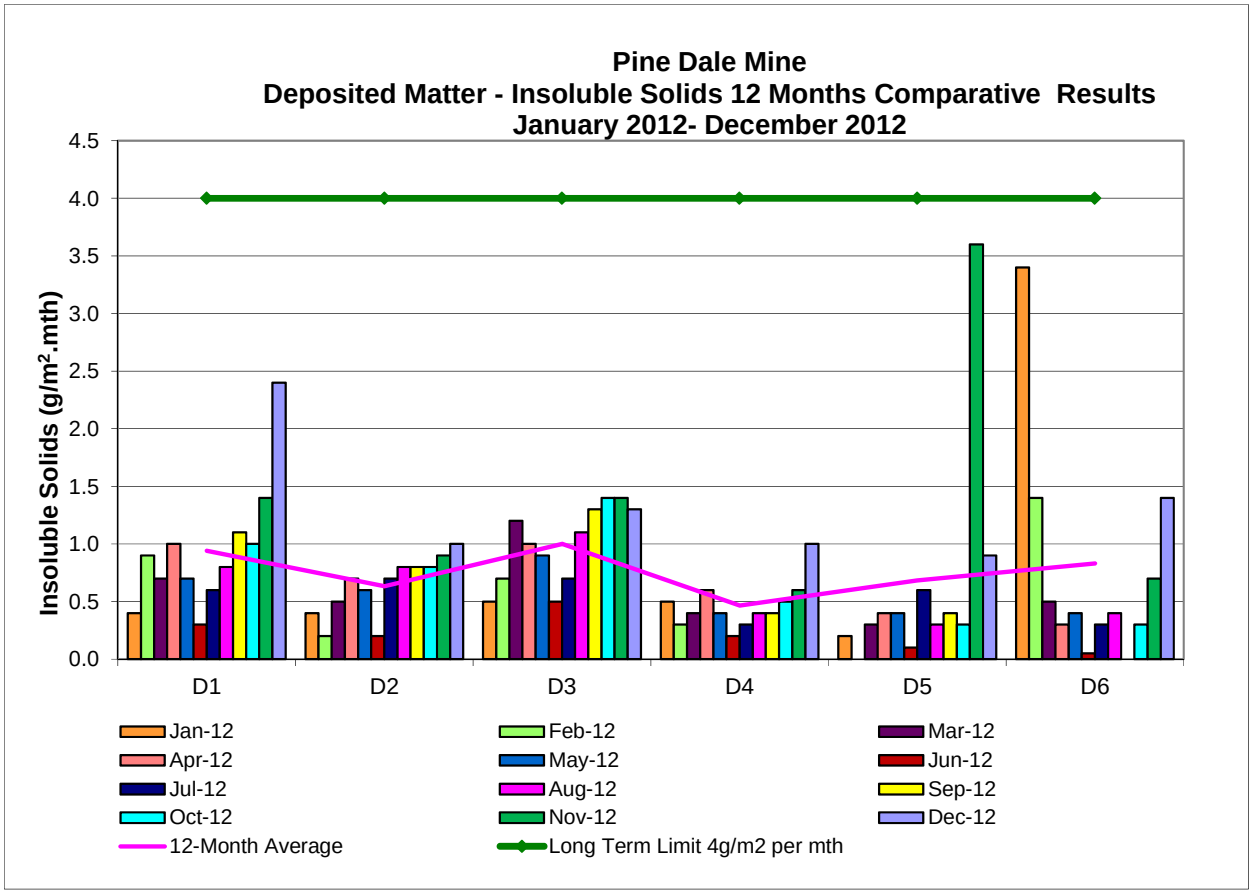


Figure 1 *Depositional Dust Results Graph*

3.3 AIR MONITORING RESULTS – HVAS PARTICULATE MATTER DATA SUMMARY

Pine Dale Coal Mine monitors Total Particulate Matter <10µm (PM_{10}) and Total Suspended Particulate matter (TSP) at one location in accordance with the requirements of EPL 4911. The HVAS TSP and PM_{10} units are both located adjacent to the mine office at Blackmans Flat (refer **Appendix 1**).

HVAS Particulate Matter summary results for the period January – December 2012 are shown in **Table 13**. Graphical presentations are shown in **Figure 2**.

Table 13 *HVAS Particulate Matter Summary Jan – Dec 2012*

Run Date	HVAS TSP (µg/m^3)	HVAS PM_{10} (µg/m^3)
3-Jan-12	35	22
9-Jan-12	38	16
15-Jan-12	8	4
21-Jan-12	20	11
27-Jan-12	7	4
2-Feb-12	11	3
8-Feb-12	38	8
14-Feb-12	31	17
20-Feb-12	28	18
26-Feb-12	33	6
3-Mar-12	4	2
9-Mar-12	13	5
15-Mar-12	37	18
21-Mar-12	29	11
27-Mar-12	21	11
2-Apr-12	23	12
8-Apr-12	16	15
14-Apr-12	21	11
20-Apr-12	22	10
26-Apr-12	22	10
2-May-12	35	12
8-May-12	83	33
14-May-12	32	16
20-May-12	18	13
26-May-12	18	7
01-Jun-12	13	9
07-Jun-12	27	10
13-Jun-12	14	5
19-Jun-12	13	4
25-Jun-12	15	8

Table 13 *HVAS Particulate Matter Summary Jan – Dec 2012 Continued*

Run Date	HVAS TSP ($\mu g/m^3$)	HVAS PM_{10} ($\mu g/m^3$)
1-Jul-12	8	2
7-Jul-12	12	11
13-Jul-12	9	4
19-Jul-12	26	14
25-Jul-12	24	11
31-Jul-12	33	12
6-Aug-12	15	6
12-Aug-12	13	13
18-Aug-12	7	4
24-Aug-12	14	6
30-Aug-12	18	9
5-Sep-12	62	30
11-Sep-12	48	25
17-Sep-12	46	18
23-Sep-12	26	12
29-Sep-12	25	7
05-Oct-12	34	15
11-Oct-12	8	3
17-Oct-12	30	14
23-Oct-12	22	9
29-Oct-12	30	13
4-Nov-12	31	18
10-Nov-12	14	11
16-Nov-12	7	5
22-Nov-12	18	13
28-Nov-12	30	12
04-Dec-12	62	16
10-Dec-12	16	4
16-Dec-12	38	9
22-Dec-12	20	6
28-Dec-12	28	12
Annual Average	**24.6**	**11.1**

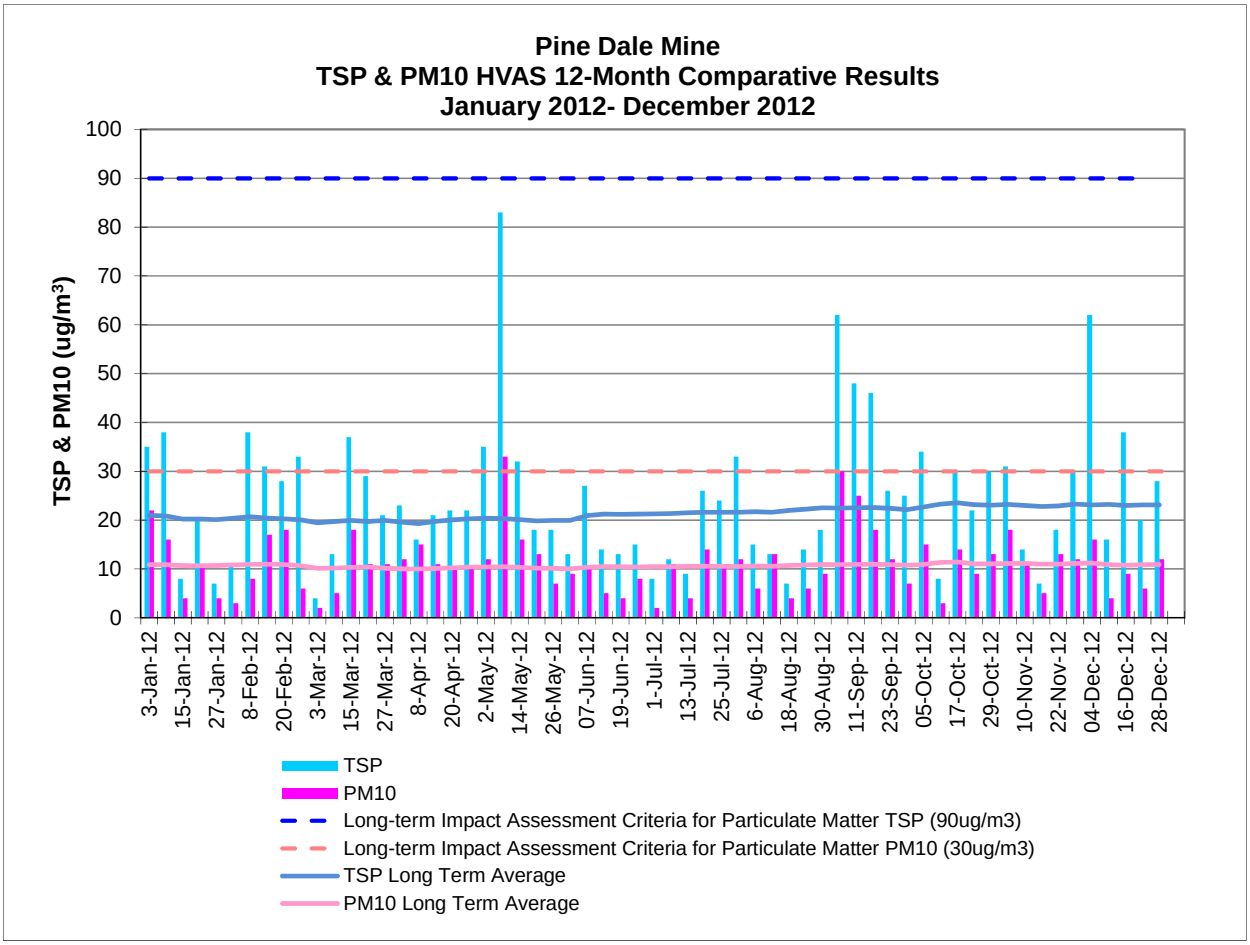


Figure 2 *HVAS TSP & PM_{10} Particulate Matter Summary Jan- Dec 2012*

4 WATER POLLUTION

4.1 GROUNDWATER MONITORING DATA SUMMARY

Groundwater monitoring for the Pine Dale Mine is undertaken in accordance with the *Groundwater Monitoring Program* at six locations (refer **Appendix 2**.). This monitoring is not a requirement of EPL 4911.

Groundwater summary results for the period January – December 2012 are shown in **Tables 14** to **18**. Graphical presentations are shown in **Figures 3** thru **8**.

No sampling of groundwater bore P4 was undertaken during the 2012 period as the bore was dry.

Table 14 *Groundwater Monitoring Bore P2 Results Jan - Dec 2012*

Location	Bore P2											
Sample Number	01126880021	02126880021	03126880021	04126880020	05126880022	06126880020	07126880019	08126880019	09126880019	10126880019	11126880019	12126880019
Sampling Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Date Sampled	07/02/12	06/03/12	02/04/12	02/05/12	30/05/12	28/06/12	30/07/12	30/08/12	27/09/12	25/10/12	22/11/12	20/12/12
Time Sampled	17:30	15:20	16:15	7:42	15:10	15:58	14:45	13:24	15:48	12:32	14:48	17:05
Standing Water Level (m)	6.10	3.15	5.10	5.42	5.40	5.50	4.90	5.05	5.25	5.30	5.46	5.55
Standpipe Height (m)	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Relative Standing Water Level (m)	5.15	2.20	4.15	4.47	4.45	4.55	3.95	4.10	4.30	4.35	4.51	4.60
pH (pH units)	4.6	5.1	4.6	5.1	4.8	5.0	4.2	4.4	4.7	4.4	4.9	5.3
Conductivity (µS/cm)	249	121	1523	273	347	391	333	328	398	384	476	442
Total Alkalinity (mg/L $CaCO_3$)	---	---	---	2	---	---	---	<1	---	---	---	<1
Bicarbonate Alkalinity (mg/L $CaCO_3$)	---	---	---	2	---	---	---	<1	---	---	---	<1
Chloride (mg/L)	---	---	---	67	---	---	---	114	---	---	---	176
Sulphate (mg/L)	---	---	---	7	---	---	---	11	---	---	---	15
Calcium (mg/L)	---	---	---	8	---	---	---	15	---	---	---	24
Magnesium (mg/L)	---	---	---	6	---	---	---	11	---	---	---	16
Sodium (mg/L)	---	---	---	10	---	---	---	19	---	---	---	22
Potassium (mg/L)	---	---	---	4	---	---	---	5	---	---	---	5
Filtered Iron (mg/L)	---	0.49	---	5.32	---	2.36	---	0.52	---	0.21	---	8.1

Indicates results are outside the Action Thresholds Levels. --- Indicates no sampling required during particular period.

Table 15 *Groundwater Monitoring Bore P3 Results Jan - Dec 2012*

Location	Bore P3											
Sample Number	01126880022	02126880022	03126880022	04126880021	05126880023	06126880021	07126880020	08126880020	09126880020	10126880020	11126880020	12126880020
Sampling Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Date Sampled	07/02/12	06/03/12	02/04/12	02/05/12	30/05/12	28/06/12	30/07/12	30/08/12	27/09/12	25/10/12	22/11/12	20/12/12
Time Sampled	17:25	15:15	15:45	7:36	15:00	15:53	14:38	13:18	15:41	12:25	14:41	16:55
Standing Water Level (m)	6.36	2.92	5.30	5.82	6.00	5.80	5.64	5.80	5.90	5.96	6.02	6.10
Standpipe Height (m)	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Relative Standing Water Level (m)	5.70	2.26	4.64	5.16	5.34	5.14	4.98	5.14	5.24	5.30	5.36	5.44
pH (pH units)	4.6	5.2	4.7	5.5	4.9	4.8	5.4	4.7	4.2	4.7	4.4	4.6
Conductivity (µS/cm)	405	212	243	332	369	438	411	597	688	750	754	729
Total Alkalinity (mg/L $CaCO_3$)	---	---	---	3	---	---	---	<1	---	---	---	<1
Bicarbonate Alkalinity (mg/L $CaCO_3$)	---	---	---	3	---	---	---	<1	---	---	---	<1
Chloride (mg/L)	---	---	---	115	---	---	---	236	---	---	---	322
Sulphate (mg/L)	---	---	---	9	---	---	---	14	---	---	---	19
Calcium (mg/L)	---	---	---	17	---	---	---	36	---	---	---	53
Magnesium (mg/L)	---	---	---	12	---	---	---	26	---	---	---	36
Sodium (mg/L)	---	---	---	14	---	---	---	26	---	---	---	32
Potassium (mg/L)	---	---	---	5	---	---	---	7	---	---	---	8
Filtered Iron (mg/L)	---	0.38	---	2.35	---	0.62	---	2.13	---	5.66	---	4.12

Indicates results are outside the Action Thresholds Levels. --- Indicates no sampling required during particular period.

Table 16 *Groundwater Monitoring Bore P6 Results Jan - Dec 2012*

Location	Bore P6											
Sample Number	01126880011	0212688011	03126880011	04126880011	05126880011	06126880011	07126880010	08126880010	09126880010	10126880010	11126880010	12126880010
Sampling Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Date Sampled	07/02/12	06/03/12	02/04/12	01/05/12	30/05/12	28/06/12	30/07/12	30/08/12	27/09/12	25/10/12	22/11/12	20/12/12
Time Sampled	16:40	13:48	14:20	17:03	13:40	14:35	13:30	12:09	14:46	10:58	13:35	15:40
Standing Water Level (m)	29.41	28.30	27.49	27.14	27.13	26.90	26.64	26.60	26.72	26.77	28.05	27.04
Standpipe Height (m)	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Relative Standing Water Level (m)	28.46	27.35	26.54	26.19	26.18	25.95	25.69	25.65	25.77	25.82	27.10	26.09
pH (pH units)	6.5	6.9	6.6	6.8	6.6	6.6	6.9	6.8	6.3	6.6	6.6	6.9
Conductivity (µS/cm)	644	643	672	601	600	654	814	653	934	989	991	1072
Total Alkalinity (mg/L $CaCO_3$)	---	---	---	168	---	---	---	174	---	---	---	67
Bicarbonate Alkalinity (mg/L $CaCO_3$)	---	---	---	168	---	---	---	174	---	---	---	67
Chloride (mg/L)	---	---	---	84	---	---	---	111	---	---	---	430
Sulphate (mg/L)	---	---	---	37	---	---	---	30	---	---	---	19
Calcium (mg/L)	---	---	---	61	---	---	---	65	---	---	---	104
Magnesium (mg/L)	---	---	---	27	---	---	---	28	---	---	---	46
Sodium (mg/L)	---	---	---	17	---	---	---	18	---	---	---	30
Potassium (mg/L)	---	---	---	15	---	---	---	15	---	---	---	19
Filtered Iron (mg/L)	---	4.9	---	6.78	---	23.3	---	16.4	---	22.5	---	24.6

Indicates results are outside the Action Thresholds Levels.

--- Indicates no sampling required during particular period.

Table 17 *Groundwater Monitoring Bore P7 Results Jan - Dec 2012*

Location	Bore P7											
Sample Number	01126880024	02126880024	03126880024	04126880022	05126880024	061268880022	07126880021	08126880022	09126880021	10126880021	11126880021	12126880021
Sampling Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Date Sampled	07/02/12	06/03/12	02/04/12	01/05/12	30/05/12	28/06/12	30/07/12	30/08/12	27/09/12	25/10/12	22/11/12	20/12/12
Time Sampled	16:58	14:30	14:50	16:29	14:05	15:07	14:10	12:20	15:09	11:35	13:51	16:13
Standing Water Level (m)	8.16	7.33	7.54	7.93	8.30	7.90	7.73	7.82	7.90	7.91	8.10	8.35
Standpipe Height (m)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Relative Standing Water Level (m)	7.16	6.33	6.54	6.93	7.30	6.90	6.73	6.82	6.90	6.91	7.10	7.35
pH (pH units)	6.7	6.6	6.5	6.9	6.6	7.3	7.0	6.7	6.3	6.4	6.6	6.6
Conductivity (µS/cm)	682	649	672	673	683	788	693	690	703	741	745	1020
Total Alkalinity (mg/L $CaCO_3$)	---	---	---	186	---	---	---	205	---	---	---	218
Bicarbonate Alkalinity (mg/L $CaCO_3$)	---	---	---	186	---	---	---	205	---	---	---	218
Chloride (mg/L)	---	---	---	62	---	---	---	76	---	---	---	91
Sulphate (mg/L)	---	---	---	73	---	---	---	62	---	---	---	61
Calcium (mg/L)	---	---	---	37	---	---	---	37	---	---	---	42
Magnesium (mg/L)	---	---	---	42	---	---	---	43	---	---	---	45
Sodium (mg/L)	---	---	---	39	---	---	---	39	---	---	---	42
Potassium (mg/L)	---	---	---	7	---	---	---	8	---	---	---	8
Filtered Iron (mg/L)	---	<0.05	---	<0.05	---	1.95	---	2.21	---	<0.05	---	<0.05

Indicates results are outside the Action Thresholds Levels. --- Indicates no sampling required during particular period.

Table 18 *Groundwater Monitoring Bore P7a Results Jan - Dec 2012*

Location	Bore P7a											
Sample Number	01126880025	02126880025	03126880025	04126880023	05126880025	06126880023	07126880022	08126880023	09126880022	10126880022	11126880022	12126880022
Sampling Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Date Sampled	07/02/12	06/03/12	02/04/12	01/05/12	30/05/12	28/06/12	30/07/12	30/08/12	27/09/12	25/10/12	22/11/12	20/12/12
Time Sampled	17:00	14:39	14:59	16:39	14:10	15:11	14:18	12:25	15:14	11:40	13:55	16:18
Standing Water Level (m)	6.36	5.80	5.92	6.10	5.22	5.84	5.80	5.87	6.00	5.95	6.12	6.29
Standpipe Height (m)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Relative Standing Water Level (m)	5.46	4.90	5.02	5.20	4.32	4.94	4.90	4.97	5.10	5.05	5.22	5.39
pH (pH units)	6.8	6.6	6.6	6.9	6.6	6.8	6.9	6.7	6.2	6.2	6.7	6.4
Conductivity (µS/cm)	749	741	777	768	780	787	776	777	773	814	807	860
Total Alkalinity (mg/L $CaCO_3$)	---	---	---	205	---	---	---	215	---	---	---	226
Bicarbonate Alkalinity (mg/L $CaCO_3$)	---	---	---	205	---	---	---	215	---	---	---	226
Chloride (mg/L)	---	---	---	35	---	---	---	36	---	---	---	44
Sulphate (mg/L)	---	---	---	118	---	---	---	118	---	---	---	113
Calcium (mg/L)	---	---	---	45	---	---	---	46	---	---	---	50
Magnesium (mg/L)	---	---	---	46	---	---	---	45	---	---	---	46
Sodium (mg/L)	---	---	---	41	---	---	---	42	---	---	---	43
Potassium (mg/L)	---	---	---	9	---	---	---	10	---	---	---	9
Filtered Iron (mg/L)	---	1.79	---	3.29	---	1.09	---	<0.05	---	<0.05	---	2.72

Indicates results are outside the Action Thresholds Levels.

--- Indicates no sampling required during particular period.

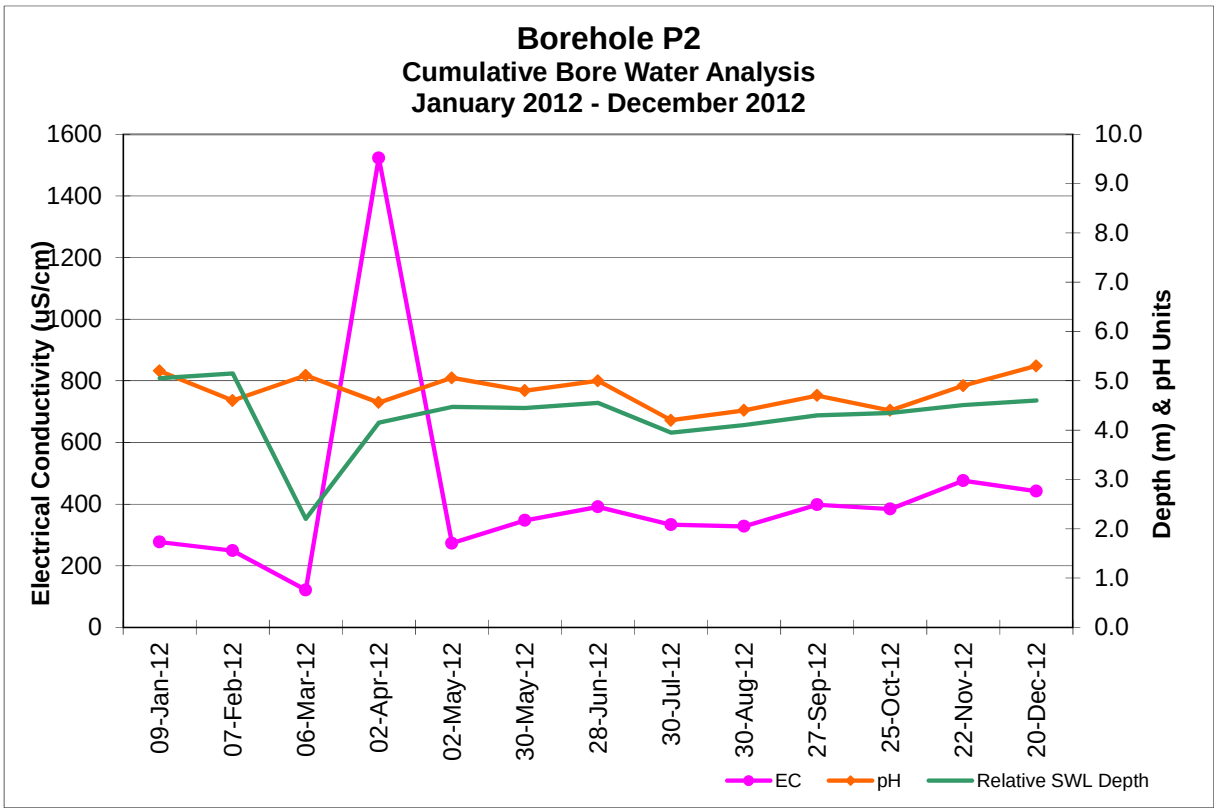


Figure 3 *Groundwater Monitoring Bore P2 Results Jan – Dec 2012*

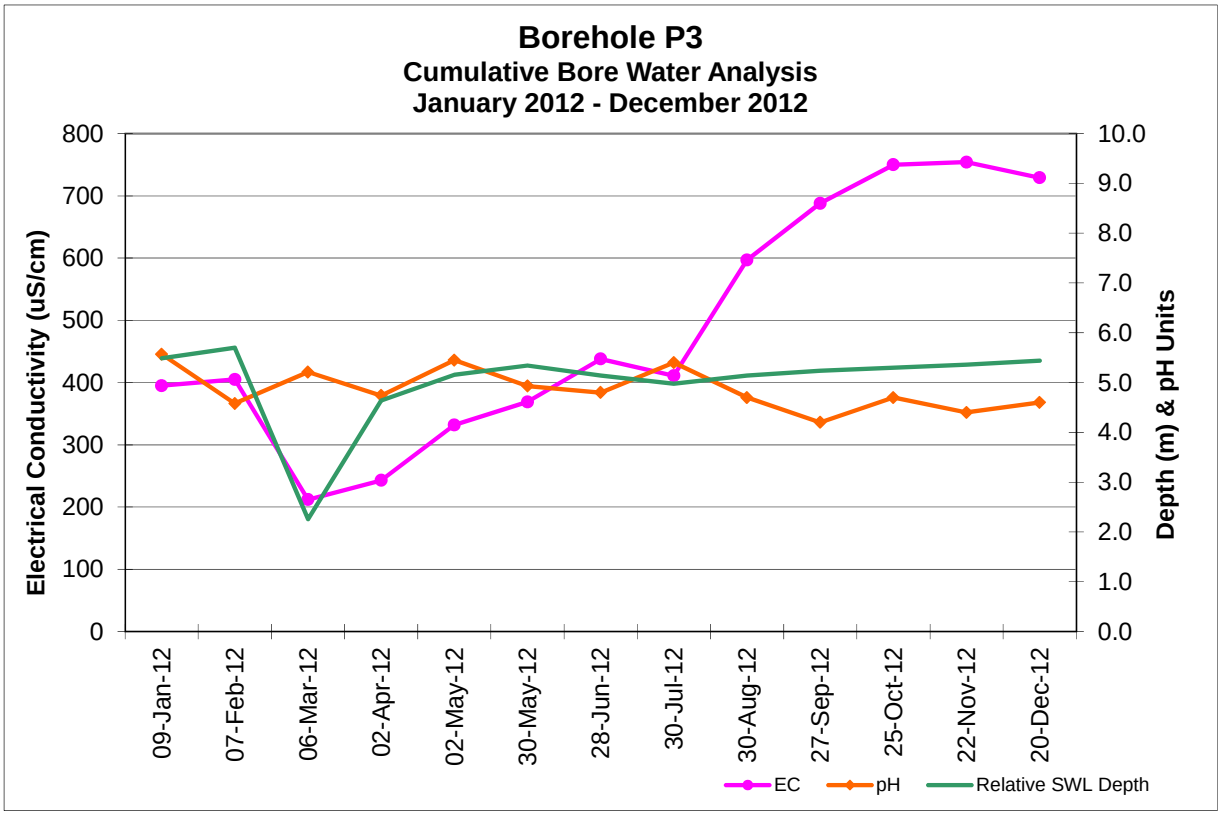
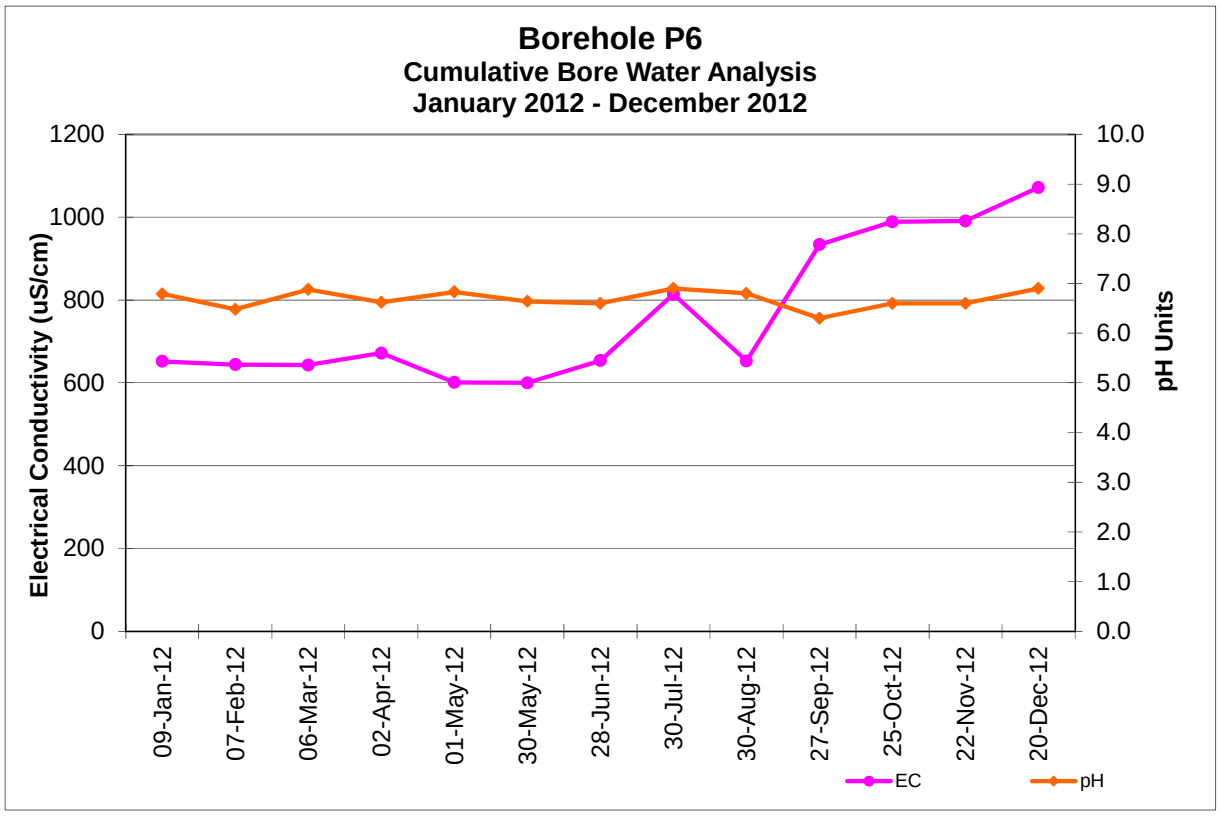


Figure 4 *Groundwater Monitoring Bore P3 Results Jan – Dec 2012*

Figure 5 *Groundwater Monitoring Bore P6 – pH & EC Results Jan – Dec 2012*



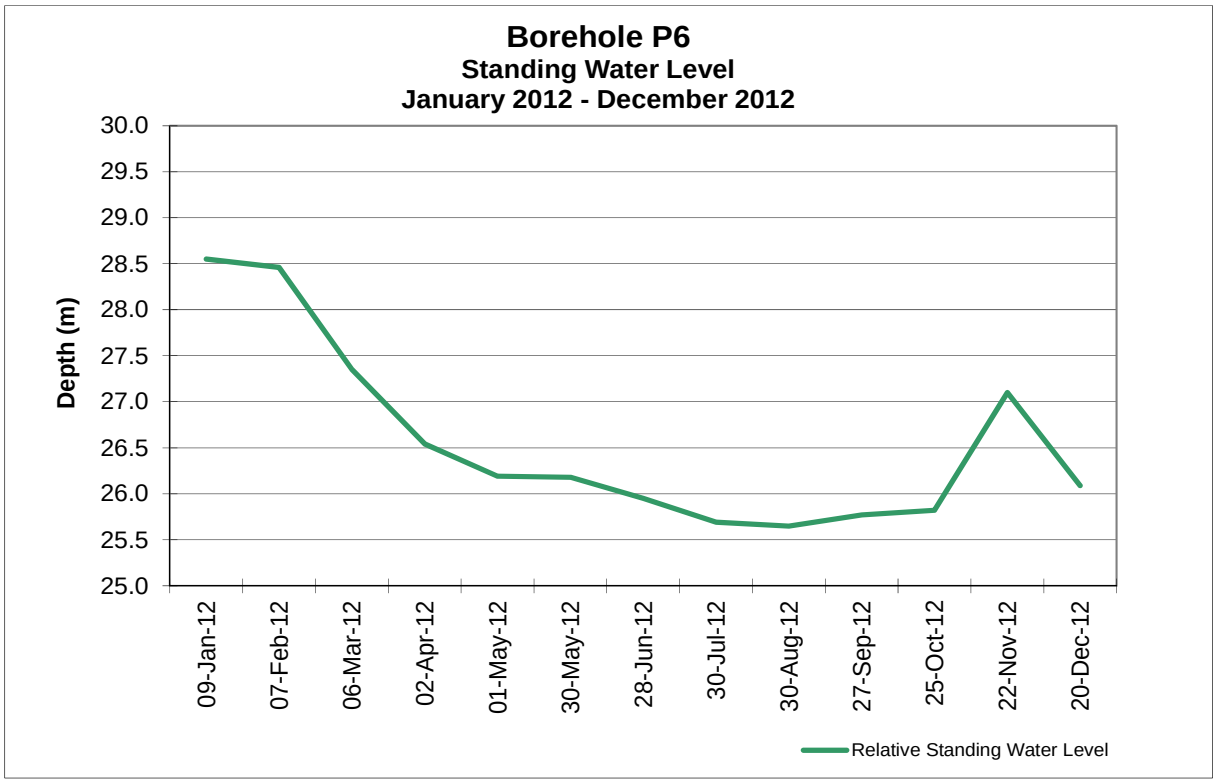
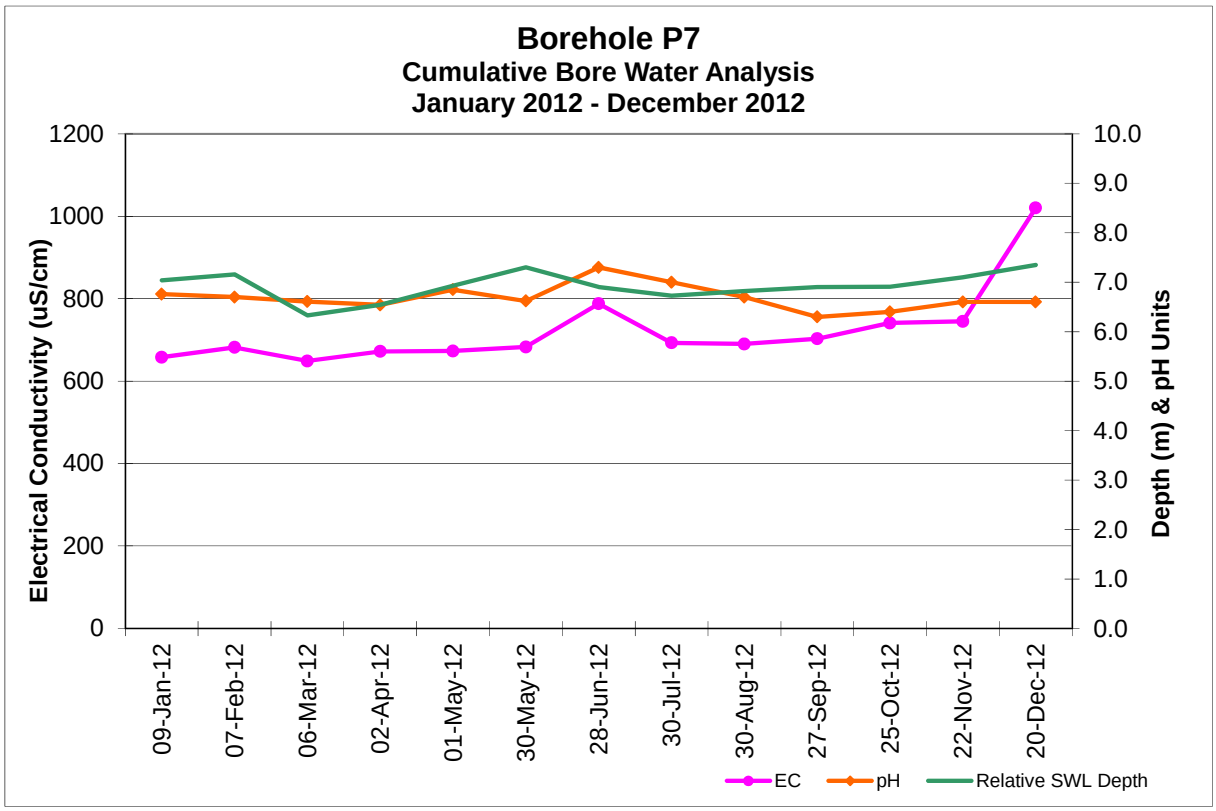


Figure 6 *Groundwater Monitoring Bore P6 – Depth Results Jan – Dec 2012*

Figure 7 *Groundwater Depth Bore P7 Jan – Dec 2012*



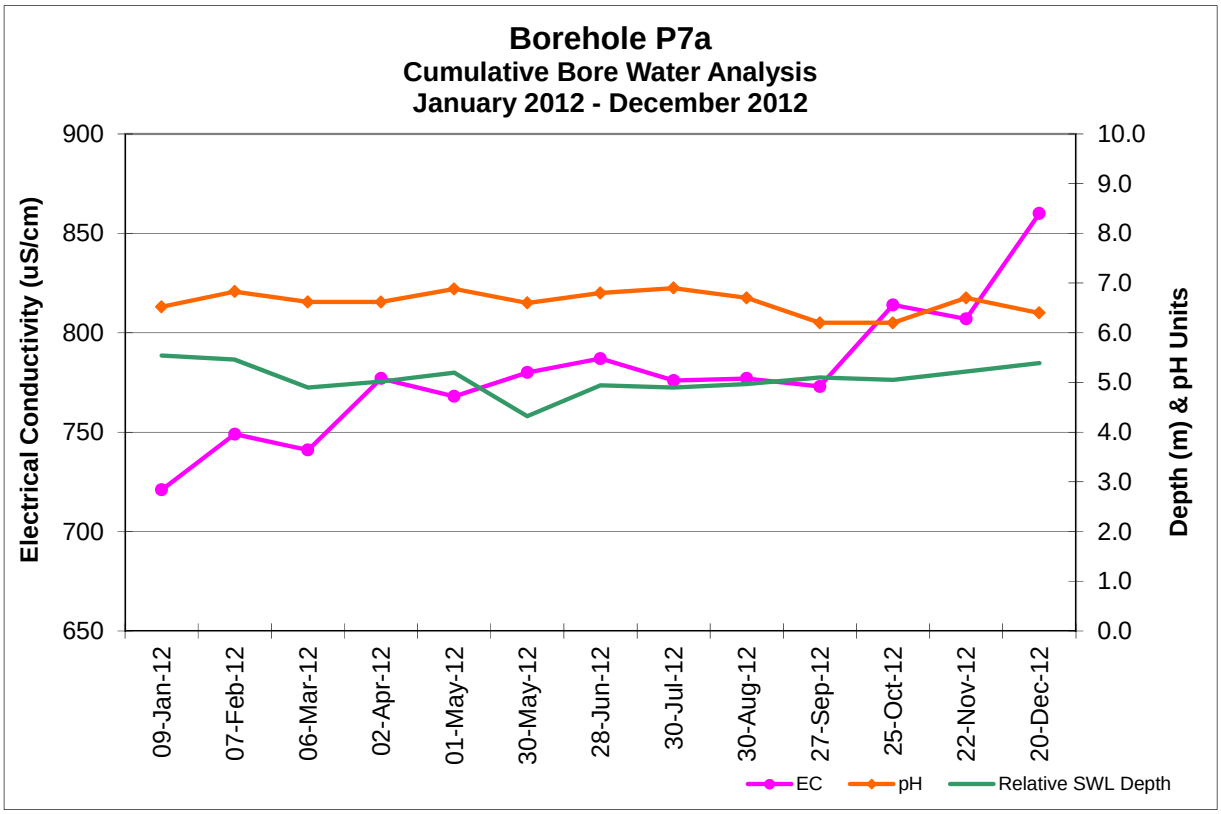


Figure 8 *Groundwater Depth Bore P7a Jan – Dec 2012*

4.2 SURFACE WATER MONITORING DATA SUMMARY

Surface water monitoring for the Pine Dale Mine is undertaken in accordance with the Pine Dale Mine Environmental Protection License (EPL 4911). During the period January to December 2012, monitoring was undertaken on a quarterly basis (Feb, May, Aug & Nov) at a total of six locations as per the EPL (refer **Appendix 3**).

Surface water summary results for the period January – December 2012 are shown in **Tables 19** to **21**.

No samples were collected from the EPL Point 4 sampling location (Wallerawang Colliery No. 1A Mine Entry), the EPL Point 5 sampling location (Wallerawang Colliery Coal Punch Mine Entry), nor EPL Point 13 (discharge to concrete lined section of Neubeck's creek below final settling dam) during the 2012 period, as water discharge from the mine at these locations did not occur during the quarterly monitoring periods.

Table 19 *Surface Water Monitoring Results EPL Point 2 Jan - Dec 2012*

Location	**EPL Point 2**			
Sample No	02126880026	05126880020	08126880033	11126880046
Sampling Month	Feb	May	Aug	Nov
Date Sampled	6/03/12	30/05/12	30/08/12	22/11/12
Time Sampled	16:35	16:55	11:40	11:11
pH (pH units)	7.6	8.1	7.6	7.3
Conductivity (µS/cm)	528	383	572	1001
Sulphate (mg/L)	167	99	200	402
Iron filterable (mg/L)	0.15	0.08	<0.05	0.13
TSS (mg/L)	<5	<5	<5	<5
Turbidity (NTU)	12.5	5.6	1.8	3.2

Table 20 *Surface Water Monitoring Results EPL Point 3 Jan - Dec 2012*

Location	EPL Point 3			
Sample No	02126880016	05126880015	08126880014	11126880014
Sampling Month	Feb	May	Aug	Nov
Date Sampled	6/03/12	30/05/12	30/08/12	22/11/12
Time Sampled	15:40	14:20	13:33	15:53
pH (pH units)	6.4	7.3	7.4	8
Conductivity (µS/cm)	840	620	631	1251
Sulphate (mg/L)	353	639	219	617
Iron filterable (mg/L)	0.27	0.35	0.5	0.08
TSS (mg/L)	8.0	<5	<5	<5
Turbidity (NTU)	14.6	4.2	2.7	3.4

Table 21 *Surface Water Monitoring Results EPL Point 14 Jan - Dec 2012*

Location	EPL Point 14			
Sample No	02126880027	06126880021	08126880034	12126880051
Sampling Month	Feb	May	Aug	Nov
Date Sampled	6/03/12	30/05/12	31/08/2012	22/11/2012
Time Sampled	17:30	16:27	6:43	17:04
pH (pH units)	7.5	7.8	7.6	8.2
Conductivity (µS/cm)	368	819	596	965
Sulphate (mg/L)	100	173	8	117
Iron filterable (mg/L)	0.5	0.21	0.36	0.14
TSS (mg/L)	23.0	<5	<5	<5
Turbidity (NTU)	22.5	13.1	5.4	2.5

4.3 BLASTING OPERATIONS MONITORING DATA SUMMARY

The monitoring of blasts for Pine Dale Mine is undertaken in accordance with the Pine Dale Mine Environmental Protection License (EPL 4911). Throughout the 2012 monitoring period there were a total of 36 blasts conducted at the site. There were zero incidences where multiple blasts were fired on the same day.

Blasting results for the period January 2012 to December 2012 are shown in **Table 22**. Graphical presentations of the airblast overpressure and ground vibration results are presented in **Figures 9** and **10** respectively.

Where airblast overpressure or ground vibration levels are too low to be detectable at the monitors, no trigger is set off and therefore no result is recorded, as indicated by the shaded cells in **Table 22**, below.

Table 22 *Blast Monitoring Results Jan- Dec 2012*

Date	Park		Noon St.		Summer St.	
	Overpressure (dB)	Vibration (mm/sec)	Overpressure (dB)	Vibration (mm/sec)	Overpressure (dB)	Vibration (mm/sec)
10/01/2012	105.1	3.95	106.0	1.82		
25/01/2012	108.8	2.85	109.6	1.39		
8/02/2012	107.1	1.26				
29/02/2012	106.9	1.56	104.7	0.62		
15/03/2012	106.0	0.68	111.2	0.33		
28/03/2012						
5/04/2012	107.7	2.50	112.2	1.22		
17/04/2012	107.7	1.04	108.8	0.92		
30/04/2012	112.9	2.24				
2/05/2012	114.6	3.87	112.3	1.64	113.2	3.31
11/05/2012	112.0	0.32			112.3	0.38
16/05/2012	103.9	0.42			104.1	0.32
23/05/2012			114.0	1.66	111.9	4.58
1/06/2012	111.3	3.50	114.4	2.59	111.1	2.11
14/06/2012	114.5	3.57				
20/06/2012			112.5	1.77	113.4	3.47
27/06/2012			112.6	2.68	112.7	3.28
4/07/2012			112.4	0.51	113.9	0.57
17/07/2012					108.3	0.47
25/07/2012			112.0	0.84	*116.3*	1.49
3/08/2012			113.0	2.69	111.9	2.81
7/08/2012					101.9	0.90
15/08/2012			113.8	0.84	110.6	2.36
22/08/2012					113.0	1.38
5/09/2012			112.3	0.99	112.3	1.60
19/09/2012			105.7	0.74		
27/09/2012					107.7	0.25
3/10/2012			103.6	0.41	113.3	2.85
10/10/2012			106.6	2.39	104.6	1.29

Table 23 *Blast Monitoring Results Jan- Dec 2012 continued*

Date	Park		Noon St.		Summer St.	
	Overpressure (dB)	Vibration (mm/sec)	Overpressure (dB)	Vibration (mm/sec)	Overpressure (dB)	Vibration (mm/sec)
19/10/2012			107.9	1.25	104.3	1.32
7/11/2012			103.9	0.38	95.7	0.10
28/11/2012			110.1	1.61	113.7	1.61
6/12/2012						
11/12/2012			106.3	0.67	108.9	0.63
13/12/2012			107.2	0.59	106.2	0.48
20/12/2012			105.2	1.25	109.5	1.53

Indicates no trigger received at monitor.

Italics- indicate that results are greater than the 95% compliance criteria as specified in the EPL.

Bold italics- indicate that results are greater than the 100% compliance criteria as specified in the EPL.

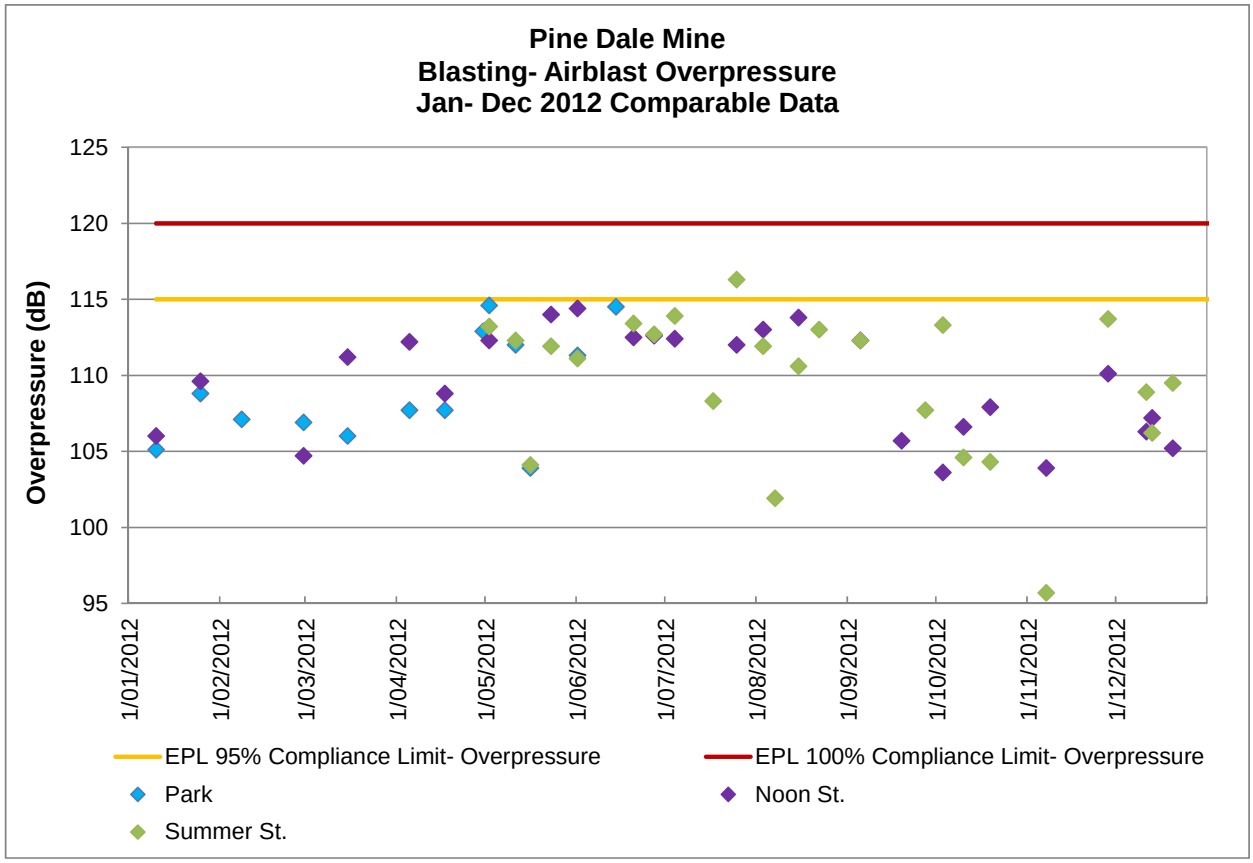


Figure 9 *Blasting Operations: Airblast Overpressure Results Summary*

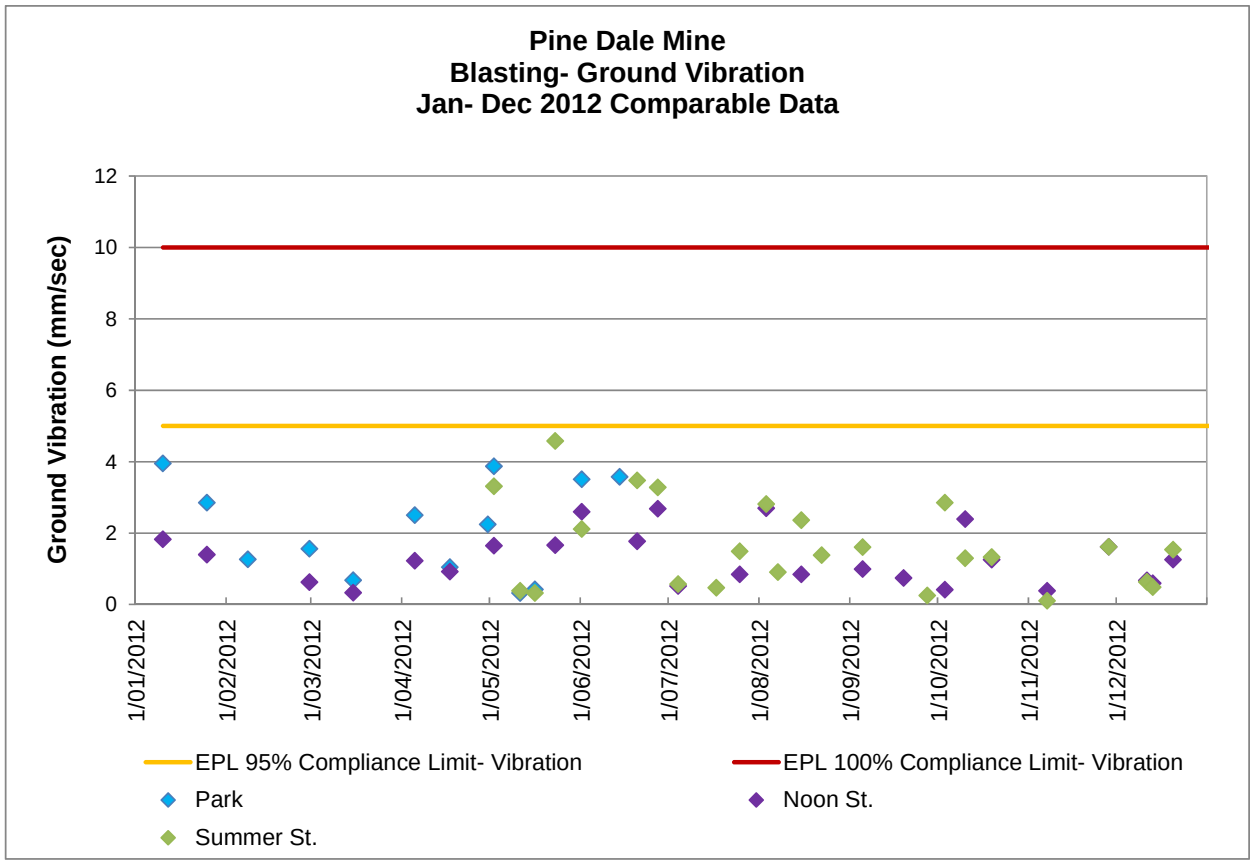


Figure 10 Blasting Operations: Ground Vibration Results Summary

5 COMPLIANCE ASSESSMENTS

5.1 REVIEW & INTERPRETATION OF AIR MONITORING RESULTS

5.1.1 DEPOSITIONAL DUST RESULTS

Depositional Dust results for the period January – December 2012 show an average insoluble solids range of 0.5 g/m^2 per month to 1.0 g/m^2 per month for dust gauges D1 to D6. These results fall well below the nominated annual average assessment criteria of 4.0g/m^2 per month, as stipulated in the *Air Quality Monitoring Program*.

During the 2012 monitoring period, there was one instance where a dust gauge (D5) exceeded the maximum increase of 2g/m^2 per month in deposited matter, as stipulated in the site's *Air Quality Monitoring Program*. However, the field sheets completed during the November 2012 period noted bird droppings were present in the sample. The increase of 3.3g/m^2.month observed between the October and November 2012 sampling periods may be attributed to the contamination of the gauge by bird droppings.

5.1.2 HVAS PARTICULATE MATTER RESULTS

HVAS Total Suspended Particulate (TSP) results for the period January – December 2012 show an average result of 24.6μg/m^3, which is well below the nominated annual average assessment a criterion of 90μg/m^3 for total suspended particulates.

Similarly, the HVAS particulate matter results <10μm (PM_{10}) also show results within the required *Air Quality Monitoring Program* assessment criteria. The average PM_{10} result was 11.1μg/m^3, which is below the annual average PM_{10} assessment criteria of 30μg/m^3. The highest PM_{10} result recorded during a single 24 hour run period was 33μg/m^3 on 8 May 2012, which is also below the 24 hour-maximum assessment criteria of 50μg/m^3.

5.2 REVIEW & INTERPRETATION OF GROUND WATER MONITORING RESULTS

Groundwater samples collected during the January – December 2012 period generally show water quality results which comply with the Action Trigger Levels for contingency action implementation, as stated in the Groundwater Management Program. The exceptions were bores P2, P3 and P6 which showed variations in the relative Standing Water Levels throughout the year. These three bores exhibited standing water levels which were outside of the Action Trigger Levels during all monitoring events during 2012. These bores were found to have higher water levels (contain more water) than the depths listed in their respective Action Thresholds.

The Groundwater monitoring action thresholds state the Standing Water Level of each borehole should not increase or decrease by more than 15% of the baseline pre-mining levels. However, as groundwater monitoring was not undertaken until the commencement of construction and mining operations, a true baseline level is not available.

The relative Standing Water Level of Bore P2 shows a sharp increase in the amount of water present in March 2012, which occurred after significant rainfall events in February. Standing water levels are shown to increase and remain steady from April through December. The standing water level within the bore remained outside the action threshold level of <6.0m for the entire 2012 monitoring period.

A similar trending is shown in Bore P3. There is a considerable increase in water within the bore in March 2012, then stable levels are observed throughout the rest of the year. Again, for the whole of the year the standing water level within the bore was outside the action threshold of <6.2m.

The Standing Water Level of Bore P6 shows a steady increase in water levels from February onwards during the 2012 period, following high rainfall events in February. In November 2012, water levels fell, following consecutive months of low rainfall, before rising again post rainfall in late November 2012. Throughout the entire 2012 sampling period the standing water level within the bore was outside the action threshold of <29.2m.

Water level in bore P7 is shown to increase in March 2012, then gradually decrease until June 2012 where levels are shown to remain fairly consistent through till December 2012.

The water level in bore P7a shows an increase in water levels in March 2012, which has also been observed in the rest of the bores. Water levels are shown to remain steady before another decrease in groundwater depth was observed in May 2012. For the second half of the year, groundwater depths remain stable.

The increase in water within all bore holes is shown to correlate with total monthly rainfall received during February and the beginning of March 2012. Rainfall in these months is considerably higher than the remainder of the year. The increase, then subsequent decrease in water levels as low rainfall is observed throughout the remainder of the year can be observed across all bores, with the exception of P6.

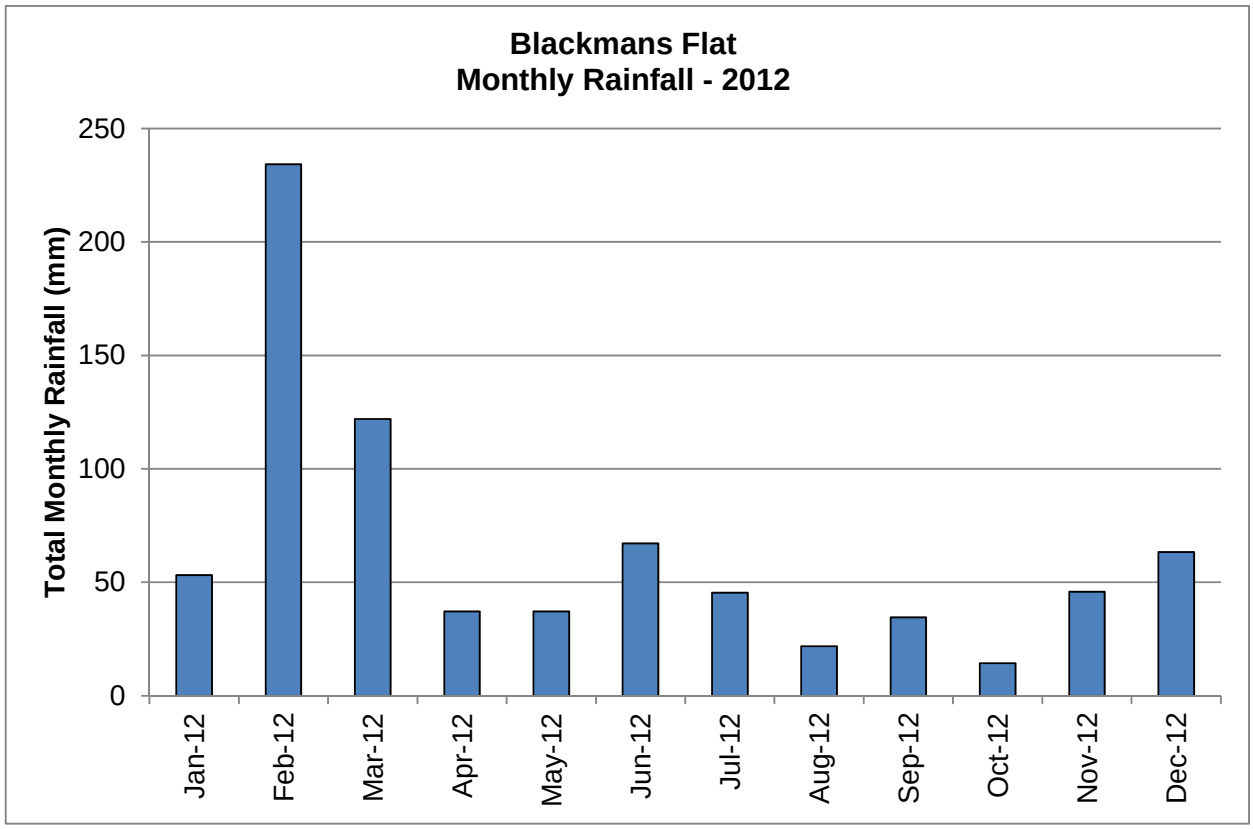


Figure 11 *Blackmans Flat Rainfall Jan – Dec 2012*

Action thresholds for Filtered Iron are based on an increase of >50% from the baseline iron concentrations for Bores P2, P3, P4 and P6; and an increase of >30% for bores P7 and P7a. As groundwater monitoring was not undertaken until the commencement of construction and mining operations, a true baseline level is not available. In the absence of baseline values, average Filtered Iron values have been calculated based on results from monitoring undertaken on the 15/10/05, 25/1/06, 13/4/06, 17/8/06, 1/11/06 and 1/12/06 as per the recommendations outlined in the Groundwater Monitoring Programme Results for Pine Dale Coal Mine (RCA ref 3761A-001/0, Sept 06). Although monitoring of the groundwater bores commenced in December 2005, it has taken some time for the Filtered Iron concentrations to become consistent.

An average Filtered Iron concentration has been calculated for each bore based on sampling undertaken between October 2005 and December 2006. Action thresholds are calculated in **Table 23**, below.

Table 24 *Groundwater Monitoring Bore Average Filtered Iron Levels*

Samples Collected Oct 05 to Dec 06	**Bore P2**	**Bore P3**	**Bore P4**	**Bore P6**	**Bore P7**	**Bore P7a**
	Filtered Iron (mg/L)	**Filtered Iron (mg/L)**	**Filtered Iron (mg/L)**	**Filtered Iron (mg/L)**	**Filtered Iron (mg/L)**	**Filtered Iron (mg/L)**
Baseline Average	7.6	4.7	12.0	20.3	0.8	7.3
Calculated Action Threshold	**11.5**	**7.0**	**8.0**	**30.4**	**1.1**	**9.5**

The action thresholds for filtered iron were not exceeded on any boreholes sampled during the January to December 2012 period with the exception of Bore 7 which exceeded the filtered iron action concentration of 1.1mg/L in June and August 2012.

When the pH and Electrical Conductivity of the groundwater bores is examined, all sites are shown to fall within the required action threshold limits.

5.3 REVIEW & INTERPRETATION OF SURFACE WATER MONITORING RESULTS

Surface water samples collected during the January – December 2012 period show all water quality analysis results comply with the Concentration Limits specified by EPL 4911.

All monitoring performed was undertaken in accordance with the EPL. Monitoring at Point 2, Point 3 and Point 14 was undertaken on a quarterly basis with no exceedances of the Concentration Limits recorded to date. Monitoring at Points, 4, 5 and 13 was not undertaken as no discharge from the site was recorded during the 2012 sampling period.

5.4 REVIEW & INTERPRETATION OF BLASTING OPERATIONS MONITORING RESULTS

Blast monitoring results obtained during the monitoring period of January – December 2012 show that airblast overpressure results were in compliance with both the 95% and 100% assessment criteria as stipulated in EPL 4911.

As displayed in **Table 24** (below), full compliance was attained across all monitors during 2012 for vibration levels at both the 100% and 95% velocity levels of 10mm/sec and 5mm/sec, respectively.

Across all of the monitoring locations, airblast overpressure levels were recorded to be below the 120dB (Lin Peak) airblast overpressure compliance criteria during the reporting period.

There was one instance, at Summer Street, where the airblast overpressure level was greater than the specified compliance level of 115dB (Lin Peak). The Pine Dale Mine EPL stipulates this level cannot be exceeded for more than 5% of the blasts during the reporting period. However, as this was the only exceedance recorded during 2012, the airblast overpressure level recorded was not in breach of EPL compliance conditions, as the assessment criteria of 115dB (Lin Peak) was not exceeded for more than 5% of the blasts conducted during the 2012 period.

Table 25 *Summary of Blasting Results and Compliance Performance*

Jan- Dec 2012 Information	*Park*		*Noon St.*		*Summer St.*	
	Airblast Overpressure (dB)	**Vibration (mm/sec)**	**Airblast Overpressure (dB)**	**Vibration (mm/sec)**	**Overpressure (dB)**	**Airblast Overpressure (dB)**
Minimum	103.9	0.32	103.6	0.33	95.7	0.10
Average	109.1	2.14	109.8	1.30	109.8	1.69
Maximum	114.6	3.95	114.4	2.69	116.3	4.58
% blasts > EPL 95% Compliance Criteria	0%	0%	0%	0%	3%	0%
% blasts > EPL 100% Compliance Criteria	0%	0%	0%	0%	0%	0%

Please contact the undersigned if you have any queries on the above.

Katy Shaw
Environmental Scientist

Karen Tripp
Senior Environmental Scientist

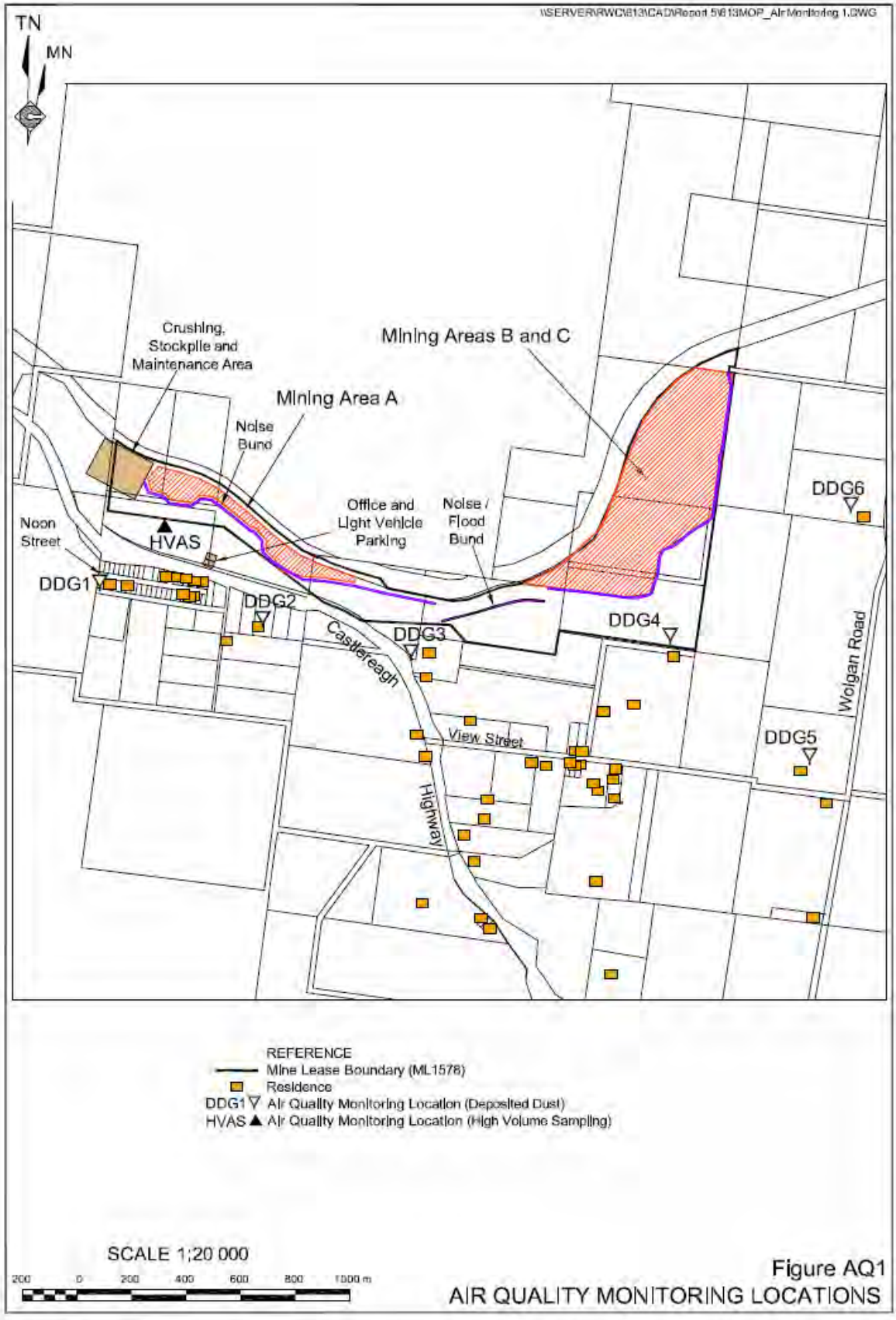
Appendix A

Figures

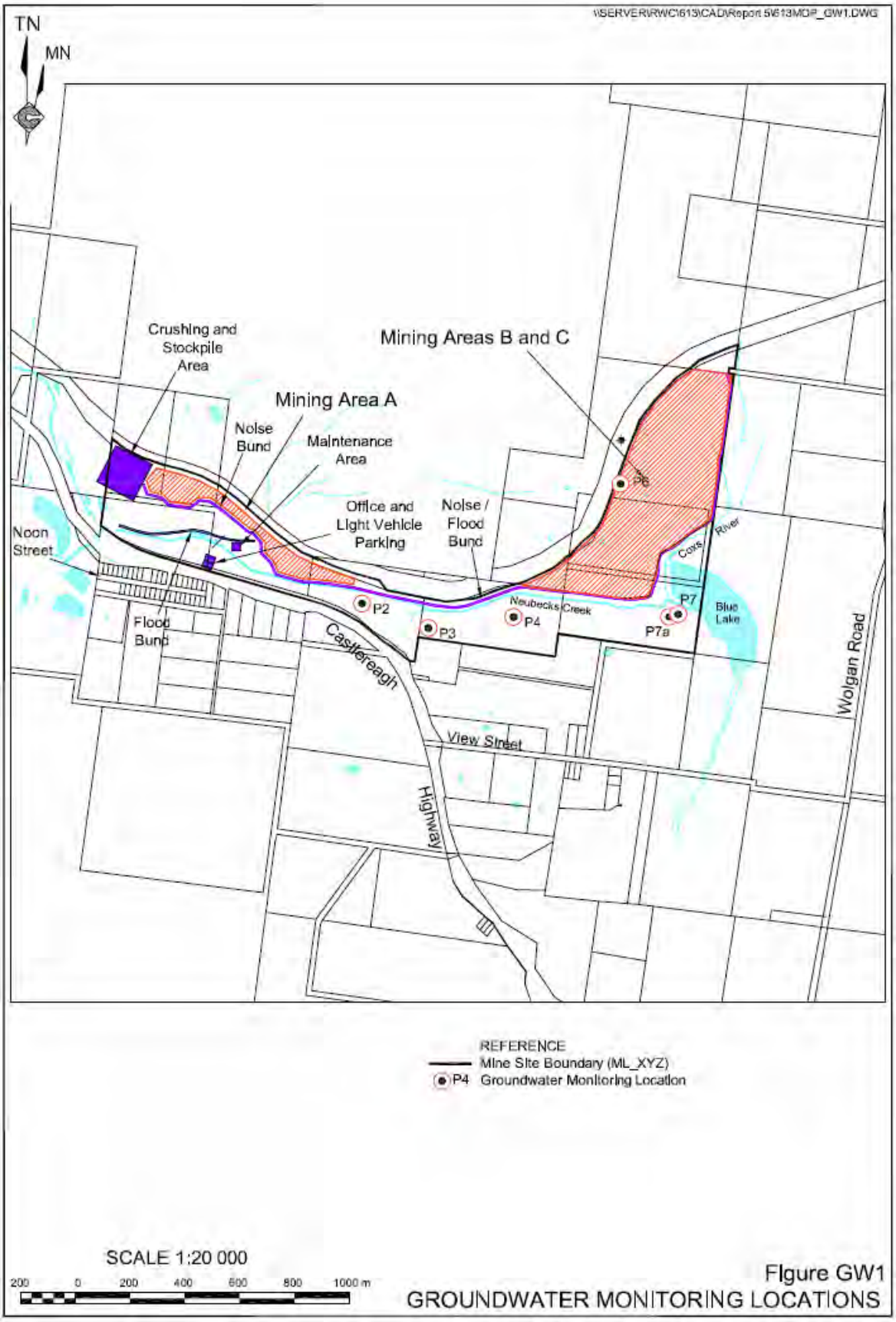
Air Quality Monitoring Locations

Groundwater Monitoring Locations

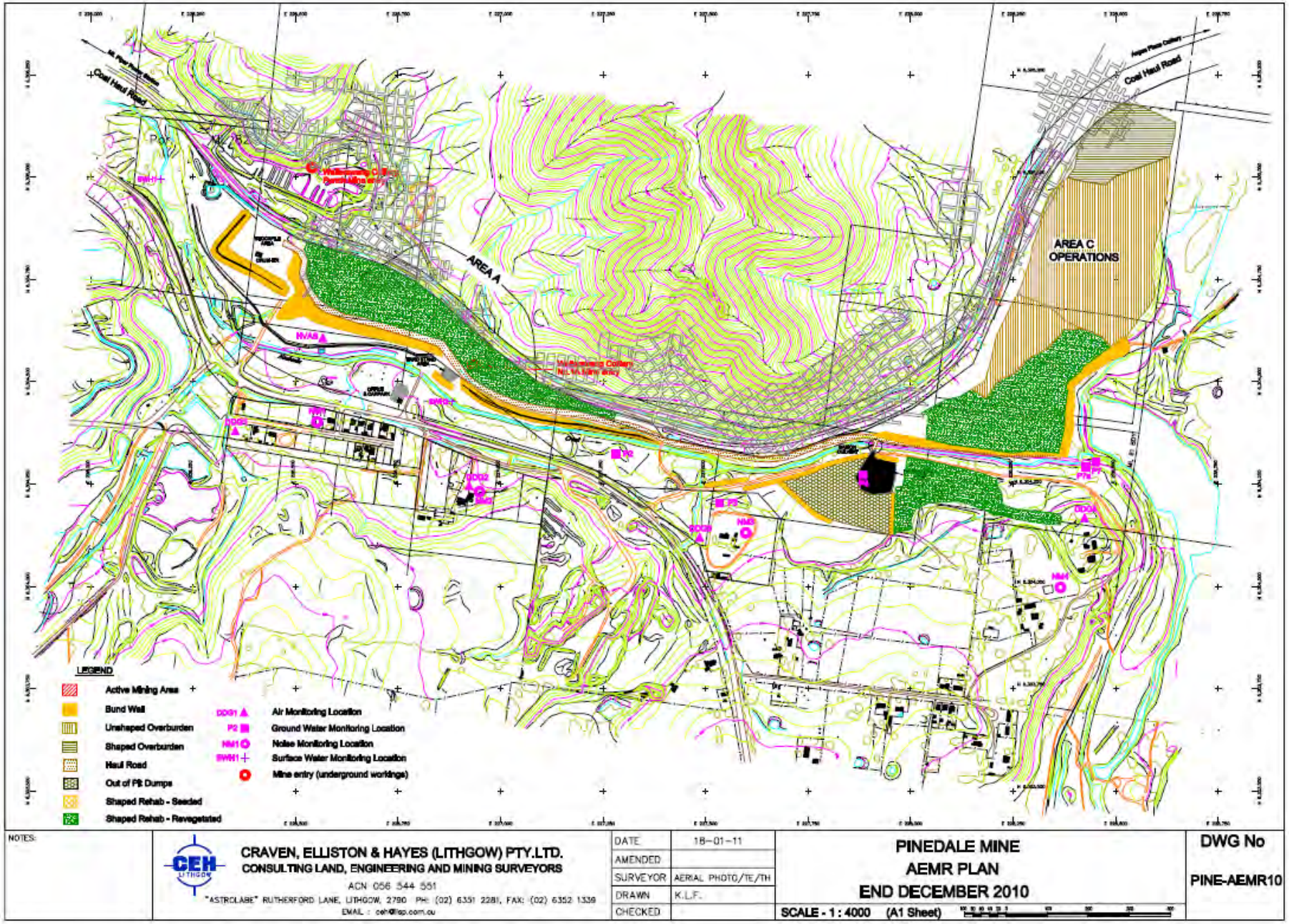
Surface Water Monitoring Locations



AIR QUALITY MONITORING LOCATIONS



GROUNDWATER MONITORING LOCATIONS



Surface Water Monitoring Locations

APPENDIX C

FLORA MONITORING REPORT

FLORA MONITORING REPORT

PINE DALE MINE –

February, 2010 to November 2012

Prepared for

Enhance Place Pty Limited
Locked Bag 14060
MELBOURNE CITY MAIL VIC 8001

By

Geoff Cunningham Natural Resource Consultants
Pty Ltd,
9 The Crest
KILLARA NSW 2071 [ACN 058 178 493]

Telephone: 02 9416 1995
Fax: 02 9416 6626
Email: geoffcun @ bigpond.net.au

May, 2013

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1 BACKGROUND

A rehabilitation monitoring report is required for the Pine Dale Mine under Project Approval (PA) 10_0041 as described in the approved Rehabilitation Management Plan. This report has been prepared in accordance with Schedule 3, Condition 55 of PA 10_0041.

Previous monitoring at Pine Dale Mine has been undertaken in 2010 and 2011 and has been reported in the combined Enhance Place Mine and Pine Dale Mine monitoring report. This report includes a summary of all monitoring data collected in **Quadrate 1** at Pine Dale Mine since 2010.

The monitoring program will provide the Company and relvant government agencies with details of the extent and composition of the ground cover that establishes on the rehabilitated land.

In addition, the monitoring program will provide information on the presence of undesirable species on the rehabilitated lands and allow the provision of advice on management of these lands to maintain and improve vegetative cover. The procedures adopted for this monitoring program are detailed in Section 4 of this report

2 VEGETATION COMMUNITIES PRIOR TO MINING

NOTE: * denotes an introduced species.

The vegetation communities occurring on the Pine Dale Mine site were field surveyed by Geoff Cunningham Natural Resource Consultants Pty Ltd [GCNRC] for the Environmental Impact Statement prepared and exhibited prior to approval being received for commencement of mining the site. The vegetation communites identified at Pine Dale are described in the section below.

2.1 The Vegetation Communities of the Pine Dale Mine Site [GCNRC, 2003]

Most of the study area has been cleared, and some probably cultivated, in the past. At least some of this area has been sown to a range of improved pasture species. The field study identified seven vegetation communities within the study area. These are:

- **Community 1 -** Cleared and Disturbed Areas
- **Community 2 -** Cleared Pastureland with Scattered Trees
- **Community 3 -** *Pinus* spp.* [Pine] Community
- **Community 4 -** *Eucalyptus aggregata* [Black Gum] Community
- **Community 5 -** *Eucalyptus rossii* [Scribbly Gum] Community
- **Community 6 -** *Eucalyptus sparsifolia* [Narrow-leaf Stringybark] -*Eucalyptus macrorhyncha* [Red Stringybark] - *Eucalyptus dives* [Broad-leaved Peppermint] - *Eucalyptus rossii* [Scribbly Gum] Community
- **Community 7 -** *Eucalyptus dives* [Broad-leaved Peppermint] - *Eucalyptus macrorhyncha* [Red Stringybark] - *Eucalyptus praecox* [Brittle Gum] - *Eucalyptus mannifera* Brittle Gum] Community

Details of these communities are contained in the following sections.

2.3.1 Community 1 - Cleared and Disturbed Areas

Treeless and shrubs generally absent. These areas are associated with old coal mine workings, storage areas and associated facilities such as railway lines and yards. Ground cover is generally low and variable or even non-existent in occurrence. The species present are generally rpresentative of the introduced weed species recorded within the study area.

2.3.2 Community 2 - Cleared Pastureland with Scattered Trees

Generally open pastureland with trees absent, present in small clumps or scattered in their distribution. This community also includes small areas that have been reclaimed in the past. Trees species include scattered *Eucalyptus bridgesiana* [Apple Box], *Eucalyptus praecox* and *Eucalyptus mannifera* [Brittle Gums], *Eucalyptus dives* [Broad-leaved Peppermint] and occasional *Eucalyptus macrorhyncha* [Red Stringybark] and *Eucalyptus rubida* [Candlebark],

Shrub cover includes scattered *Acacia decurrens* [Black Wattle], *Clematis aristata* [Old Man's Beard], *Billardiera scandens* [Apple-berry], *Rubus* spp.* [Blackberry], *Rosa rubiginosa** [Briar Rose], *Acacia buxifolia* [Box-leaf Wattle], *Brachyloma daphnoides* [Daphne Heath], *Acacia gunnii* [Ploughshare Wattle], *Hibbertia obtusifolia* [Hoary Guinea-flower], *Pultenaea microphylla* and *Astroloma humifusum* [Cranberry Heath]. Occasional *Hakea* sp. and some *Dillwynia phylicoides* [Eggs and Bacon] shrubs are present.

Ground cover species include *Acetosella vulgaris** [Sorrel], *Aira elegantissima** [Hairgrass], *Anagallis arvensis** [Scarlet Pimpernel], *Austrodanthonia* spp. [Wallaby Grasses], *Bromus molliformis** [Silky Brome], *Dactylis glomerata** [Cocksfoot], *Echium plantagineum** [Paterson's Curse], *Echium vulgare** [Viper's Bugloss], *Elymus scaber* [Common Wheatgrass], *Hypericum perforatum** [St. John's Wort], *Hypochaeris radicata** [Flatweed], *Plantago lanceolata** [Ribwort], *Silene gallica* var. *gallica** [Catchfly], *Trifolium arvense** [Haresfoot Clover], *Trifolium campestre** [Hop Clover], *Trifolium dubium** [Yellow Suckling Clover], *Trifolium glomeratum** [Cluster Clover] and *Vulpia muralis** [Silver Grass].

2.3.3 Community 3 - *Pinus* spp.* [Pine] Community

This community occurs as discrete entities where Pine trees have been planted in the past - probably to screen mine workings from travelers on the Castlereagh Highway. Pines dominate this community. The Pine trees have invaded small sections of adjacent areas of Community 2.

However the main invasion is associated with parts of Community 4 - drainage depressions and creek lines - that have more favourable moisture regimes.

Shrubs basically absent except for invasions of various introduced fruit trees, occasional *Crataegus monogyna** [Hawthorn] and some *Cotoneaste*r sp.* [Cotoneaster]

Groundcover species are few in the dense Pine areas but *Aira elegantissima** [Hairgrass], *Plantago lanceolata** [Ribwort], *Paspalum dilatatum** [Paspalum] and *Hypochaeris radicata** [Flatweed] were recorded.

2.3.4 Community 4 - *Eucalyptus aggregata* [Black Gum] Community

This community occurs along Coxs River and Neubecks Creek as well as in some hillside drainage depressions. The main tree species is *Eucalyptus aggregata* [Black Gum] with some *Eucalyptus rubida* [Candlebark], *Eucalyptus rossii* [Scribbly Gum], *Eucalyptus pauciflora* [Snow Gum] and *Eucalyptus viminalis* [Ribbon Gum] in places. Eucalypt saplings are common and *Pinus* spp.* [Pines] have invaded many sections of this community. *Salix* spp.* [Willows] are also present.

Shrubs present include *Malus domestica** [Apple], *Cassinia arcuata* [Chinese Shrub], *Crataegus monogyna** [Hawthorn], *Genista monspessulana** [Montpellier Broom], *Rosa rubiginosa** [Briar Rose], *Rubus* spp.* [Blackberry], *Acacia decurrens* [Black Wattle], *Gompholobium grandiflorum*, *Bursaria spinosa* [Native Blackthorn], *Cotoneaster* sp.* [Cotoneaster], *Leptospermum obovatum* and *Acacia baileyana* [Cootamundra Wattle].

Ground cover species include *Austrodanthonia* spp. [Wallaby Grasses], *Elymus scaber* [Common Wheatgrass], *Echium plantagineum** [Paterson's Curse], *Echium vulgare** [Viper's Bugloss], *Hypericum perforatum** [St. John's Wort], *Plantago lanceolata** [Ribwort], *Vulpia muralis** [Silver Grass], *Trifolium glomeratum** [Cluster Clover] and *Trifolium campestre** [Hop Clover].

2.3.5 Community 5 - *Eucalyptus rossii* [Scribbly Gum] Community

This community is present on scattered rocky outcrops generally near the Coxs River and the lower reaches of Neubecks Creek. *Eucalyptus rossii* [Scribbly Gum] is the main tree species.

Shrubs include scattered *Dillwynia phylicoides* [Eggs and Bacon], *Hibbertia obtusifolia* [Hoary Guinea Flower], *Astroloma humifusum* [Native Cranberry], *Acacia decurrens* [Black Wattle], *Rubus* spp.* [Blackberry], *Clematis aristata* [Old Man's Beard], *Bursaria spinosa* [Native Blackthorn] and *Rosa rubiginosa** [Briar Rose].

Ground cover species include *Geranium solanderi* [Australian Cranesbill], *Themeda australis* [Kangaroo Grass], *Scleranthus annuus** [Knawel], *Petrorhagia velutina** [Velvet Pink], *Phalaris aquatica** [Phalaris], *Plantago lanceolata** [Ribwort], *Hypochaeris radicata** [Flatweed], *Echium plantagineum** [Paterson's Curse], *Echium vulgare** [Viper's Bugloss], *Dactylis glomerata** [Cocksfoot] and *Cirsium vulgare** [Spear Thistle].

2.3.6 Community 6 - *Eucalyptus sparsifolia* [Narrow-leaf Stringybark] - *Eucalyptus macrorhyncha* [Red Stringybark] - *Eucalyptus dives* [Broad-leaved Peppermint] - *Eucalyptus rossii* [Scribbly Gum] Community

This community occurs on upper slopes and crests on the margin of the study area. The main tree species include *Eucalyptus macrorhyncha* [Red Stringybark],

Eucalyptus dives [Broad-leaved Peppermint], *Eucalyptus praecox* and *Eucalyptus mannifera* [Brittle Gums], *Eucalyptus rossii* [Scribbly Gum] and *Eucalyptus sparsifolia* [Narrow-leaf Stringybark].

Shrub species include *Hibbertia obtusifolia* [Hoary Guinea-flower], *Acacia buxifolia* [Box-leaf Wattle], *Gompholobium grandiflorum, Cryptandra amara*, *Leucopogon virgatus, Brachyloma daphnoides* [Daphne Heath], *Podolobium ilicifolium* [Prickly Shaggy Pea], *Exocarpos cupressiformis* [Cherry Ballart], *Acacia terminalis* [Sunshine Wattle], *Persoonia* sp., *Acacia decurrens* [Black Wattle], *Astroloma humifusum* [Cranberry Heath] and *Dillwynia phylicoides* [Eggs and Bacon].

Ground cover species include *Ajuga australis* [Australian Bugle], *Poa sieberiana* [Tussock Grass], *Senecio diaschides*, *Wahlenbergia* spp. [Bluebells], *Viola sieberiana* [Native Violet], *Stylidium graminifolium* [Trigger Plant], Silky Purple-flag], *Lomandra bracteata*, *Linum marginale* [Wild Flax], *Dianella revoluta* [Spreading Flax-lily], *Geranium solanderi* [Native Cranesbill], *Elymus scaber* [Common Wheatgrass] and *Craspedia canens* [Billy Buttons].

2.3.7 Community 7 - *Eucalyptus dives* [Broad-leaved Peppermint] - *Eucalyptus macrorhyncha* [Red Stringybark] - *Eucalyptus praecox* and *Eucalyptus mannifera* [Brittle Gums] Community

This community occurs on the mid- and upper slopes of the hills that bound the study area. Tree species include *Eucalyptus sparsifolia* [Stringybark], *Eucalyptus macrorhyncha* [Red Stringybark], *Eucalyptus dives* [Broad-leaved Peppermint], *Eucalyptus rubida* [Candlebark], *Eucalyptus praecox* and *Eucalyptus mannifera* [Brittle Gums], *Eucalyptus rossii* [Scribbly Gum], *Eucalyptus pauciflora* [Snow Gum], *Pinus* spp.* [Pine] and *Eucalyptus dalrympleana* [Mountain Gum]

Shrubs include *Astroloma humifusum* [Cranberry Heath], *Rosa rubiginosa** [Briar Rose], *Dillwynia phylicoides* [Eggs and Bacon], *Pomaderris andromedifolia*, *Rubus* spp.* [Blackberry], *Hibbertia obtusifolia* [Hoary Guinea -flower], *Acacia dealbata* [Silver Wattle], *Acacia decurrens* [Black Wattle], *Ozothamnus diosmifolius* [Pill Flower], *Clematis aristata* [Old Man's Beard], *Gompholobium grandiflorum*, *Crataegus monogyna* * [Hawthorn], *Acacia* sp., *Billardiera scandens* [Apple Berry], *Persoonia* sp., *Exocarpos cupressiformis* [Cherry Ballart], *Pultenaea microphylla*, *Cassinia arcuata* [Chinese Shrub], *Pimelea* sp., *Bursaria spinosa* [Native Blackthorn], *Cotoneaster* sp.* [Cotoneaster] and *Brachyloma daphnoides* [Daphne Heath].

Ground cover species include *Acaena novae-zelandiae, Aira elegantissima** [Hairgrass], *Ajuga australis* [Australian Bugle], *Austrodanthonia* spp. [Wallaby Grasses], *Austrostipa rudis* ssp. *nervosa* [Speargrass], *Dactylis glomerata** [Cocksfoot], *Echium plantagineum* * [Paterson's Curse], *Echium vulgare** [Viper's Bugloss], *Leucochrysum albicans* ssp. *albicans* var. *albicans* [Hoary Sunray], *Lomandra multiflora* [Many-flowered Matrush], *Poa sieberiana* [Tussock Grass], *Senecio diaschides, Stackhousia monogyna* [Slender Stackhousia], *Viola sieberiana* [Native Violet], *Vulpia muralis** [Silver Grass] and *Gonocarpus* sp. [Raspwort].

3 SCOPE OF THE REHABILITATION WORKS AT THE PINE DALE SITE

Rehabilitation of the Pine Dale site was undertaken progressively as mining wascompleted and the final landform was shaped.

Approximatly 32 ha of the Pine Dale site has been rehabilitated although the major part has not been complete for a long period.

The seed mixture used in the rehabilitation of the site comprised:

- 40% Tall Fescue
- 25% Cocksfoot
- 20% Subterranean Clover
- 6% Perennial Ryegrass
- 4% Phalaris
- 5% White Clover

In addition to seeding, much of the rehabilitated land was fertilized with a mixture of lime to rectify soil acidity and fowl manure to provide nutrients for the establishing pasture.

In more recent times some sections of the rehabilitated landscape have been resown in order to achive a more successful pasture establishment.

4 FLORA MONITORING OF THE REHABILITATED LANDSCAPE

4.1 Details of the Monitoring Procedure

A single monitoring quadrat was established and monitored at the Pine Dale site in February, 2010 and further observations were made in September 2011 and November 2012. Monitored results results for all observation periods noted above are reported in this document.

In addition to the data from the single monitoring quadrat on Pine Dale [**Quadrat 1**], preliminary field cover measurements were made on a newly rehabilitated site adjacent to **Quadrat 1** during the November 2012 field work. The data collected forms the initial observation for what was intended to become **Quadrat 2.**

Quadrat 1 is one hectare in area [a 200m X 50m rectangle] and laid out with sides in an east – west and north – south orientation wherever possible.

The use of a quadrat one hectare in area should be repeated for any quadrats established in future wherever possible making the quadrat square, although where it is not possible to utilize this format, rectangular or trapezoid shaped quadrats can be used.

Monitoring of each quadrat involves the following procedures.

[i] A minimum of one permanent photopoint will be established per quadrat.

[ii] Photographs will be taken in set directions from one or more designated corners of the quadrat at the commencement of monitoring and thereafter at annual intervals for five years and then biennially until the monitoring program ceases.

[iii] Each quadrat will initially be monitored at the time of establishment and thereafter at approximately annual intervals for five years and then biennially until the monitoring program ceases.

[iv] Measurements to be made will include:

- foliage cover measurements along two 100 metre step-point transects;
- an assessment of the species composition of the ground flora in the quadrat using the modified Braun-Blanquet [Poore, 1955] scale; and
- tree and shrub counts in the quadrat to quantify deaths and regeneration [where these are relevant].

4.2 Details of Monitoring at Pine Dale [to date]

As previously noted there is a very limited suite of information regarding the rehabilitated areas on Pine Dale with data available for **Quadrat 1** for three years and preliminary data available for what is proposed to be **Quadrat 2** in 2013.

4.3 Procedure for Consultation Following Monitoring

The monitoring ecologist will consult with Enhance Place Pty Limited at the end of each flora monitoring program to advise of any need for replantings, additional plantingsweed mitigation and maintenance works required to ensure the success of the vegetation establishment programs.

5 VEGETATION MONITORING QUADRAT LOCATION AT THE PINE DALE SITE

Flora monitoring at the initial inspection involved an assessment of ground cover alone and no counts of trees or shrubs were made.

5.1 Quadrat 1 Location

The corner peg locations are shown in **Table 1**.

Table 1

Quadrat 1 Corner Peg Locations [AMG coordinates]

CORNER PEG	EASTING	NORTHING
Northwest	228211E	6304048N
Southwest	228020E	6304043N
Southeast	228020E	6304015N
Northeast	228212E	6303998N

5.2 Preliminary [base] Data for the Proposed Quadrat 2 site

While the **Quadrat 2** boundaries have yet to be established the data collected in November 2012 forms a good basis for the comparison of change in plant cover on the Quadrat when it is established. The location surveyed is adjacent to, but west of **Quadrat 1**.

6 STEP POINT TRANSECT MEASUREMENTS

NOTE * denotes introduced species

The following **Tables 2, 3** and **4** summarise the % groundcover provided by individual species within **Quadrat 1** at the three field inspections.

NOTE: The letters **A** and **P** in the Life Form columns of these Tables indicates an Annual or Perennial species respectively.

6.1 Monitoring Quadrat 1 [*previously Quadrat 5 in the Enhance Place / Pine Dale combined monitoring reports in 2010 and 2011*]

6.1.1 February 2010 Observations

Table 2 - Transect Data

SPECIES	% COVER TRANSECT 1	% COVER TRANSECT 2	MEAN % COVER	LIFE FORM
*Acetosella vulgaris** [Sorrel]	2.0%	6.0%	4.0%	P
Annual Herb	0%	1.0%	0.5%	A
Chenopodium sp. [Crumbweed]	4.0%	0%	2.0%	A
*Dactylis glomerata** [Cocksfoot]	4.0%	11.0%	7.5%	P
*Echinochla esculenta** [Japanese Millet]	1.0%	1.0%	1.0%	A
*Echium vulgare** [Viper's Bugloss]	2.0%	3.0%	2.5%	A
*Eragrostis curvula** [African Lovegrass]	9.0%	7.0%	8.0%	P
Eragrostis sp. [Lovegrass]	2.0%	5.0%	3.5%	P
Gnaphalium sphaericum [Japanese Cudweed]	1.0%	0%	0.5%	A
Lolium perenne [Ryegrass]	1.0%	7.0%	4.0%	P
*Panicum gilvum**	42.0%	17.0%	29.5%	P
*Paspalum dilatatum** [Paspalum]	21.0%	16.0%	18.5%	P
Perennial Grass	0%	7.0%	3.5%	P
Petrorhagia sp.* [Pink]	1.0%	0%	0.5%	A
*Phalaris aquatica** [Phalaris]	2.0%	7.0%	4.5%	P
*Plantago lanceolata** [Ribwort]	4.0%	5.0%	4.5%	A
*Polygonum sp.** [Wireweed]	2.0%	2.0%	2.0%	A
Sporobolus sp.	0%	1.0%	0.5%	P
LITTER	**0%**	**1.0%**	**0.5%**	
BARE	**2.0%**	**3.0%**	**2.5%**	
TOTAL COVER	**98.0%**	**97.0%**	**97.5%**	
TOTAL LIVING COVER	**98.0%**	**96.0%**	**97.0%**	
PERENNIAL LIVING COVER	**83.0%**	**84.0%**	**83.5%**	
ANNUAL LIVING COVER	**15.0%**	**12.0%**	**13.5%**	

6.1.2 Other Species Observed Within the Quadrat

Centaurium sp. [Centaury]
*Chenopodium album** [Fat Hen]
*Cirsium vulgare** [Spear Thistle]
*Cynodon dactylon** [Couch]
*Hypericum perforatum** [St. John's Wort]
Polygonum lapathifolium [Pale Knotweed]
Rubus fruticosus sp. agg.* [Blackberry]
Rumex brownii [Slender Dock]
Senecio quadridentatus [Cotton Fireweed]
*Solanum nigrum** [Black-berry Nightshade]

6.2.1 September 2011 Observations

Table 3 - Transect Data

SPECIES	% COVER TRANSECT 1	% COVER TRANSECT 2	MEAN % COVER	LIFE FORM
*Hypochaeris glabra** [Smooth Catsear]	1.0%	0%	0.5%	A
Perennial Grass	75.0%	100.0%	87.5%	P
Trifolium sp.*	22.0%	0%	11.0%	A
LITTER	2%	0%	1.0%	
BARE	0%	0%	0%	
TOTAL COVER	100.0%	100%	100%	
TOTAL LIVING COVER	98.0%	100%	99%	
PERENNIAL LIVING COVER	75%	100%	87.5%	
ANNUAL LIVING COVER	23%	0%	11.5%	

6.2.2 Other Species Observed Within the Quadrat

*Cirsium vulgare** [Spear Thistle]
*Conyza bonariense** [Flaxleaf Fleabane]
*Dactylis glomerata** [Cocksfoot]
*Eragrostis curvula** [African Lovegrass]
Medicago polymorpha var. *vulgaris** [Burr Medic]
*Phalaris aquatica** [Phalaris]
*Plantago lanceolata** [Ribwort]
Rubus fruticosus sp. agg.* [Blackberry]

6.3.1 November 2012 Observations

Table 4- Transect Data

SPECIES	% COVER TRANSECT 1	% COVER TRANSECT 2	MEAN % COVER	LIFE FORM
Annual Grass	1.0%	0%	0.5%	A
*Cirsium vulgare** [Spear Thistle]	0%	1.0%	0.5%	A
*Eragrostis curvula** [African Lovegrass]	14.0%	1.0%	7.5%	P
*Holcus lanatus** [Yorkshire Fog]	1.0%	1.0%	1.0%	P
*Hypericum perforatum** [St John's Wort]	0%	1.0%	0.5%	P
Juncus sp. [Rush]	0%	3.0%	1.5%	P
Perennial Grass	68.0%	68.0%	68.0%	P
*Plantago lanceolata** [Ribwort]	3.0%	9.0%	6.0%	A
Sown Perennial Grass]	3.0%	0%	3.0%	P
Trifolium sp.* [Clover]	4.0%	12.0%	8.0%	A
LITTER	**5.0%**	**4%**	**4.5%**	
BARE	**1.0%**	**0%**	**0.5%**	
TOTAL COVER	**99.0%**	**100.0%**	**99.5%**	
TOTAL LIVING COVER	**94.0%**	**96.0%**	**95.0%**	
PERENNIAL LIVING COVER	**86.0%**	**74.0%**	**80.0%**	
ANNUAL LIVING COVER	**8.0%**	**22.0%**	**15.0%**	

6.3.2 Other Species Observed Within the Quadrat

*Acetosella vulgaris** Sorrel]
Cassinia arcuata [Chinese Shrub]
Centaurium sp. [Centaury]
*Festuca arundinacea** [Tall Fescue]
*Hypochaeris radicata** [Flatweed]
*Plantago lanceolata** [Ribwort]
*Rosa rubiginosa** [Briar Rose]
Rubus fruticosus sp. agg.* [Blackberry]
*Trifolium repens** [White Clover]

6.4 Preliminary Observations for Proposed Quadrat 2

6.4.1 November 2012 Observations

Table 5 - Transect Data

SPECIES	% COVER TRANSECT 1	% COVER TRANSECT 2	MEAN % COVER	LIFE FORM
Aira sp.* [Hairgrass]	5.0%	0%	2.5%	A
Annual Grass	6.0%	0%	3.0%	A
*Echium vulgare** [Viper's Bugloss]	1.0%	0%	0.5%	A
Gnaphalium sp.	0%	1.0%	0.5%	A
Gonocarpus sp. [Raspwort]	1.0%	0%	0.5%	P
Holcus lanatus [Yorkshire Fog]*	2.0%	0%	1.0%	P
*Hypericum perforatum** [St John's Wort]	1.0%	1.0%	1.0%	P
*Hypochaeris radicata** [Flatweed]	2.0%	0%	1.0%	A
*Lolium rigidum** [Annual Ryegrass]	59.0%	60.0%	59.5%	A
Perennial Grass	2.0%	2.0%	2.0%	P
Perennial Herbs	1.0%	0%	0.5%	P
*Secale cereale** [Ryecorn]	1.0%	8.0%	4.5%	A
Sown Perennial Grass	0%	1.0%	0.5%	P
*Spergularia sp.** [Spurrey]	0%	1.0%	0.5%	A
*Trifolium repens** [White Clover]	1.0%	0%	0.5%	P
Trifolium sp.* [Clover]	6.0%	8.0%	7.0%	A
Vulpia sp.* [Silver Grass]	5.0%	0%	2.5%	A
LITTER	**3.0%**	**0%**	**1.5%**	
BARE	**4.0%**	**18.0%**	**11.0%**	
TOTAL COVER	**96.0%**	**82.0%**	**89.0%**	
TOTAL LIVING COVER	**93.0%**	**82.0%**	**87.5%**	
PERENNIAL LIVING COVER	**8.0%**	**4.0%**	**6.0%**	
ANNUAL LIVING COVER	**85.0%**	**78.0%**	**81.5%**	

6.4.2 Other Species Observed Within the Quadrat

*Bromus mollis** [Soft Brome]
*Cirsium vulgare** [Spear Thistle]
*Eruca sativa** [Purple-vein Rocket]
*Festuca arundinacea** [Tall Fescue]
*Plantago lanceolata** [Ribwort]

7 SPECIES ABUNDANCE DATA

The monitoring program adopted for the Pine Dale Mine dictates that the species recorded on each of the permanent quadrats will be given a modified Braun -Blanquet [Poore, 1995] cover abundance scale rating at each monitoring event. This scale is summarised in **Table 6**.

The species recorded on the different quadrats in the step-pointing transects are not the only species present. There are other species that were present in low numbers [i.e. < 0.5% cover] that were recorded as being present on the different quadrats.

These species were recorded during the step-point transects as plants not actually 'hit' but nevertheless present.

Tables 7, 8, and **9** provide this data based on the Step-point transects and these additional observations for Quadrat 1.

Table 7
Modified Braun-Blanquet Cover Abundance Scale [Poore, 1955]

Aerial Vegetative Cover	Cover Class
95 -100°/a	6
75 - 95°/a	5
50 – 75%	4
25 – 50%	3
5 – 25%	2
1-5%	1
< 1%	+
Rare	r

7.1 Species Abundance in Monitoring Quadrat 1

7.1.1 February 2010 Observations

Table 8

Species Lists and modified Braun-Blanquet Scores for Monitoring Quadrat 1

SPECIES	modified BRAUN-BLANQUET SCORE
*Acetosella vulgaris** [Sorrel]	1
Annual Herb	+
Centaurium sp. [Centaury]	r
*Chenopodium album** [Fat Hen]	r
*Cirsium vulgare** [Spear Thistle]	r
*Cynodon dactylon** [Couch]	r
Chenopodium sp. [Crumbweed]	1
*Dactylis glomerata** [Cocksfoot]	2
*Echinochla esculenta** [Japanese Millet]	1
*Echium vulgare** [Viper's Bugloss]	1
*Eragrostis curvula** [African Lovegrass]	2
Eragrostis sp. [Lovegrass]	1
Gnaphalium sphaericum [Japanese Cudweed]	+
*Hypericum perforatum** [St. John's Wort]	r
Lolium perenne [Ryegrass]	1
*Panicum gilvum**	3
*Paspalum dilatatum** [Paspalum]	2
Perennial Grass	1

Table 8 [cont]
Species Lists and modified Braun-Blanquet Scores for Monitoring Quadrat 1

SPECIES	modified BRAUN-BLANQUET SCORE
Petrorhagia sp.* [Pink]	+
*Phalaris aquatica** [Phalaris]	1
*Plantago lanceolata** [Ribwort]	1
Polygonum lapathifolium [Pale Knotweed]	r
*Polygonum sp.** [Wireweed]	1
Rubus fruticosus sp. agg.* [Blackberry]	r
Rumex brownii [Slender Dock]	r
Senecio quadridentatus [Cotton Fireweed]	r
*Solanum nigrum** [Black-berry Nightshade]	r
Sporobolus sp.	+

7.1.2 September 2011 Observations

Table 9

Species Lists and modified Braun-Blanquet Scores for Monitoring Quadrat 1

SPECIES	modified BRAUN-BLANQUET SCORE
*Cirsium vulgare** [Spear Thistle]	r
*Conyza bonariense** [Flaxleaf Fleabane]	r
*Dactylis glomerata** [Cocksfoot]	r
*Eragrostis curvula** [African Lovegrass]	r
*Hypochaeris glabra** [Smooth Catsear]	+
Medicago polymorpha var. *vulgaris** [Burr Medic]	r
Perennial Grass	5
*Phalaris aquatica** [Phalaris]	r
*Plantago lanceolata** [Ribwort]	r
Trifolium sp.*	2
Rubus fruticosus sp. agg.* [Blackberry]	r

7.1.3 November 2012 Observations

Table 10
Species Lists and modified Braun-Blanquet Scores for Monitoring Quadrat 1

SPECIES	modified BRAUN-BLANQUET SCORE
*Acetosella vulgaris** Sorrel]	r
Annual Grass	+
Cassinia arcuata [Chinese Shrub]	r
Centaurium sp. [Centaury]	r
*Cirsium vulgare** [Spear Thistle]	+
*Eragrostis curvula** [African Lovegrass]	2
*Festuca arundinacea** [Tall Fescue]	r
*Holcus lanatus** [Yorkshire Fog]	1
*Hypericum perforatum** [St John's Wort]	+
*Hypochaeris radicata** [Flatweed]	r
Juncus sp. [Rush]	1
Perennial Grass	4
*Plantago lanceolata** [Ribwort]	2
*Rosa rubiginosa** [Briar Rose]	r
Rubus fruticosus sp. agg.* [Blackberry]	r
Sown Perennial Grass]	1
*Trifolium repens** [White Clover]	r
Trifolium sp* [Clover]	2

7.2 Species Abundance in Monitoring Quadrat 2

7.2.1 Preliminary Observations for Quadrat 2 – November 2012

Table 11
Species Lists and modified Braun-Blanquet Scores for Proposed Monitoring Quadrat 2

SPECIES	MEAN % COVER
Aira sp.* [Hairgrass]	1
Annual Grass	1
*Bromus mollis** [Soft Brome]	r
*Cirsium vulgare** [Spear Thistle]	r
*Echium vulgare** [Viper's Bugloss]	+
*Eruca sativa** [Purple-vein Rocket]	r
*Festuca arundinacea** [Tall Fescue]	r
Gnaphalium sp.	+
Gonocarpus sp. [Raspwort]	+
Holcus lanatus [Yorkshire Fog]*	1
*Hypericum perforatum** [St John's Wort]	1
*Hypochaeris radicata** [Flatweed]	1
*Lolium rigidum** [Annual Ryegrass]	4
Perennial Grass	1
Perennial Herbs	2

Table 11 [cont]
Species Lists and modified Braun-Blanquet Scores for Proposed Monitoring Quadrat 2

SPECIES	MEAN % COVER
*Plantago lanceolata** [Ribwort]	r
*Secale cereale** [Ryecorn]	1
Sown Perennial Grass	+
*Spergularia sp.** [Spurrey]	+
*Trifolium repens** [White Clover]	+
Trifolium sp.* [Clover]	2
Vulpia sp.* [Silver Grass]	1

8 PHOTO POINTS

Photographs were taken from the southeast corner of Quadrat 1 looking towards the northwest corner peg in February, 2010, September, 2011 and November, 2012.

These photographs will provide a visual record of change over the monitoring period. The photographs are contained in **Appendix 1.**

9 COMMENTS ON THE CHANGES IN VEGETATION COVER ON QUADRAT 1 and PROPOSED QUADRAT 2

9.1 Rainfall Records

This section of the Monitoring Report provides details of the rainfall received at the site since rehabilitation began and offers comment on the levels of cover recorded on **Quadrat 1** in relation to total living cover, perennial living cover and annual living cover.

At the initial observation of Quadrat 1 in 2010 all that can be commented upon is the absolute level of cover and the proportion occupied by annual and perennial species.

In the subsequent years this section provides comment on measured changes in these parameters since the last observation.

Table 12

Rainfall [mm] Recorded at Pine Dale Mine – 2006 to November 2012

YEAR / MONTH	2006	2007	2008	2009	2010	2011	2012
January	89.8	34.4	72.2	46.4 [7]	140.4	62.8	53.2
February	18.8	133.6 [3]	100.4	133.2	107.2	51.0	234.2
March	10.2	45.8	3.8 [4]	66.0	57.8	71.4	122.0
April	14.2	32.4	6.4 [5]	52.8	37.2	21.4	37.2
May	6.0	61.0	8.0 [6]	39.8	56.4	48.4	37.2
June	24.0 [1]	163.6	52.6	36.0	32.2	26.0	67.2
July	42.2 [2]	15.4	28.8	29.6 [8]	90.6	17.8	45.4
August	6.4	34.4	52.4	34.4 [9]	71.4	55.8	21.8
September	33.4	3.8	56.0	34.0 [10]	58.6	59.2	34.6
October	2.6	43.0	66.2	41.2	71.4	39.6	14.4
November	34.2	138.2	50.4	28.6	119.8	149.6	7.2[11]
December	39.0	72.2	121.4	76.0	190.4	91.0	-

Notes:

1 no data from 23rd June to end of month
2 no data from 1st July to 6th July
3 no data from 2nd February to 6th February
4 no data after 7th March at 22.15 hrs
5 no data from 16th to 23rd April and after 14.30 hrs on 30th April
6 no data fom 1st May to to 5.30 hrs on 3rd May and from 28th May at 12.15 hrs to end of month
7 total incorrect
8 no data from 22nd July to end of month
9 battery failure; Bathurst data
10 no data for 1st September to 2nd September 9.45 hrs
11 to 14th November, 2012

9.2 Quadrat 1 Observations

9.2.1 The February 2010 Observations

The measurements reported here for **Quadrat 1** are the initial measurements and provide a base from which to gauge the direction and magnitude of changes in ground cover in ensuing years.

Obviously, as these are the initial measurements, it is not possible to comment on any changes that have occurred in the period since the previous monitoring.

From the data in **Table 13** it is evident that total living cover is very high and comprised of mainly perennial ground cover species with a much lower cover of annual species. It would be desirable over time to further increase the proportion of perennial species in the total living ground cover but this may be difficult to achieve.

The bare area is very small considering there is 97% living cover over the site.

Table 13
Cover Breakdown – Quadrat 1, February 2010

Cover Classification	Percentage Cover at Each Observation		% change in absolute terms
	February, 2010	Future Observation	
Total Living Cover	97.0%	na	na
Annual Living Cover	13.5%	na	na
Perennial Living Cover	83.5%	na	na
Litter Cover	0.5%	na	na
Bare Surface	2.5%	na	na

9.2.2 September 2011 Observations

Table 14 shows that total living cover was improved by this observation with the proportion of both perennial and annual species increasing slightlty - basically at the expense of the bare area which decreased slightly.

Table 14
Cover Breakdown and Changes – Quadrat 1, February 2010 to September, 2011

Cover Classification	Percentage Cover at Each Observation		% change in absolute terms
	February, 2010	September, 2011	
Total Living Cover	97.0%	99.0%	+2.0%
Annual Living Cover	13.5%	11.5%	-2.0%
Perennial Living Cover	83.5%	87.5%	+4.0%
Litter Cover	0.5%	1.0%	+0.5%
Bare Surface	2.5%	0%	-2.5%

9.2.2 November 2012 Observations

Table 15 shows that the level of total living cover decreased by 4% during this 14 month period. Perennial living cover decreased to the greatest degree [-4%] and annual living cover increased by 3.5% - probably due to the drier period from March to November, 2012. Litter cover increased by 3.5% and the bare area increased marginally.

Table 15
Cover Breakdown and Changes – Quadrat 1, September, 2011 to November, 2012

Cover Classification	Percentage Cover at Each Observation		% change in absolute terms
	September, 2011	November, 2012	
Total Living Cover	99.0%	95.0%	-4.0%
Annual Living Cover	11.5%	15.0%	+3.5%
Perennial Living Cover	87.5%	80.0%	-7.5%
Litter Cover	1.0%	4.5%	+3.5%
Bare Surface	0%	0.5%	+0.5%

9.3 Proposed Quadrat 2 Observations

The area where **Proposed Quadrat 2** would be located exhibited a good growth of living plant cover at the time of inspection [see **Table 16**] but the downside was that most of it was dominated by annual species that were close to dying off at the time of inspection.

The aim should be to increase the level of perennials on this area so that the ratios of the annual: perennial species are mirror-reversed in the future.

Table 16
Cover Breakdown – Proposed Quadrat 2, November, 2012

Cover Classification	Percentage Cover at Each Observation		% change in absolute terms
	November, 2012	Future Observation	
Total Living Cover	87.5%	na	na
Annual Living Cover	81.5%	na	na
Perennial Living Cover	6.0%	na	na
Litter Cover	1.5%	na	na
Bare Surface	11.0%	na	na

10 WEED MANAGEMENT

10.1 General

The Noxious Weed Declarations for the Lithgow Local Government Area [Primary Industries – Agriculture NSW website] have been examined and the following noxious weeds have been recorded on the monitoring quadrats.

African Lovegrass* [*Eragrostis curvula*], Blackberry* [*Rubus* sp. agg.], Briar Rose* [*Rosa rubiginosa*], St John's Wort* [*Hypericum perforatum*] are all present at the Pine Dale site and are classified as **Class 4** noxious weeds.

Class 4 noxious weeds are plants whose growth and spread nust be controlled according to measures specified in a management plan published by the local control authority – in this case the Upper Macquarie County Council.

The Upper Macquarie County Council Weed Management Plan Number 4 [as amended on 5th December, 2008] deals with the management and control of Class 4 weeds within the Council area.

The Plan requires landholders to institute, as soon as practicable after becoming aware of the presence of a **Class 4** noxious weed, to institute an effective program of work for controlling the growth and spread of the weed according to the principles of Integrated Weed Management.

The Plan defines Integrated Weed Management as ***'the planning and implementation of a program of work for controlling the growth and spread of a weed using such available methods of control that may be appropriate in the circumstances, including, but not necessarily limited to:***

- ***Measures to prevent invasion, or reinvasion, by the weed***
- ***Physical or mechanical measures***
- ***Biological agents***
- ***Herbicide methods***
- ***Cultural methods, and land management practices.'***

It has been appropriate that Enhance Place Pty Limited has embraced the principles of Integrated Weed Management to control the three Class 4 Noxious Weeds identified on the lands that it controls during the past years.

In the following sections, appropriate approaches to Class 4 noxious weed control for individual species are discussed. These approaches use the principles of Integrated Weed Management.

10.2 Control of Blackberry, Briar Rose and St John's Wort

The infestations of Blackberry, Briar Rose and St John's Wort on the rehabilitated lands need to be controlled largely by regular spot spraying campaigns using chemicals approved for control of these species.

10.3 Control of African Lovegrass

African Lovegrass control in a pasture such as that established on **Quadrat 1** at Pine Dale Mine requires a different approach to that recommended for control of Blackberry, Briar Rose and St John's Wort.

The African Lovegrass plants are more prevalent and are contributing to soil cover on the rehabilitated landscape. There are too many plants to effectively spot spray and if a total spray approach that selectively targeted grass plants was used then a large amount of useful pasture species would be killed.

Obviously, any control [Integrated Weed Management] measures must recogise the need to retain a good cover on the area while the required management technique is being applied.

Parsons and Cuthberton [1992] in their book ***Noxious Weeds of Australia*** [Inkata Press, Melbourne] note that this species is most common on disturbed soil on wastelands, roadsides, railway tracks etc on acid sands and light sandy loams.

They indicate that the best way to control African Lovegrass on arable areas is to cultivate and establish a strong perennial pasture.

For generally non-arable areas, such as the rehabilitated lands at Pine Dale Mine, they suggest that it may be best to utilize the species as a pasture plant by grazing it when it is nutritious [ie before flowering].

Grazing, at least in the early years of pasture establishment on rehabilitated mined land is also an inappropriate land use.

As a consequence, it is my opinion that the most appropriate way to control African Lovegrass is to use increased competition from desirable species by establishing a strong cover of improved pasture species.

This cover should be maintained by regular fertilization with a suitable inorganic fertilizer plus, perhaps, regular dressings of mature [rather than fresh] fowl manure.

Applications of lime may also assist by raising the soil pH on the rehabilitated land if it is low. This will remove some of the habitat suitability that African Lovegrass prefers and may assist the other improved pasture species to grow more competitively.

It is recomended that an appropriate rate of a fertilizer containing nitrogen, phosphorus and potassium be applied at intervals in the future to maintain a vigorous pasture growth. Application by broadcasting would be the appropriate method of applying the fertilizer.

11 ACTIONS REQUIRED

10.1 Permanent Marking of the Monitoring Quadrats

It is recommended that all staff and contractors be familiar with the purpose of the monitoring Quadrats and their locations.

The importance of these quadrats in monitoring impacts at the mine site and the need at all times to avoid driving through the quadrats should be highlighted to mine staff and contractors.

10.2 Erection of Signage and Access Control and Activity on and near Quadrats

To minimize potential impacts toquadrate monitoring points it is recommended that signs be erected indicating authorized personnel access only. A similar approach should be taken should additional monitoring quadrats be established on other rehabilitated lands at Pine Dale.

10.3 Maintaing Stock Control

Parts of the rehabilitated Pine Dale Mine lands were grazed by the landowner soon after the work was complete. This appears to have contributed to a relatively poor eatablishement of pasture cover on the greater proportion of the rehabilitation.

While the cover on the level **Quadrat 1** area is excellent, that on the adjacent proposed Quadrat 2 area is not ideal given the dry time that has been experienced since the rehabilitation work was undertaken.

While no measurements [quadrats] have been made on the more sloping lands to the north of **Quadrat 1** that were grazed relatively heavily soon after rehabilitation work was complete. This cover appears much poorer to the eye despite some sections having been resown.

It is recommended that no grazing be permitted on the rehabilitation areas at any time until a cover of sufficient density and quality is established and the landform has stabilised. Further advice should be sought to assess and determine the suitablility of the rehabilitated areas for grazing by an appropriately qualified person.

There may have to be an exception to this policy at some time in the future if a fire hazard develops but for the time being this policy should prevail. Diverting from this policy stance should only occur after the Company has discussed the issue with the monitoring ecologist and he / she has inspected the area to ascertain the need for variation.

There is a need also to continually ensure that staff and contractors do not leave gates open in situations where stock from surrounding properties may stray onto the monitoring Quadrats [and the work areas as well]. It is also essential that boundary fencing and the perimeters of the stock exclusion zone are kept in stock-proof condition.

10.4 Vehicle Access to Rehabilitated Lands for Monitoring and Weed Control

Designated access tracks should be retained to facilitate vehicular access for monitoring, weed spraying and tree watering when required. Designated access tracks will minimize potential for impacts by vehicles in other parts of the rehabilitated area.

10.5 Noxious Weed Control

As dicussed previously, noxious weeds are present on the **Quadrat 1** and elsewhere on the mine site. Regular spot spraying campaigns should be undertaken to control Blackberry, Briar Rose and St John's Wort as they are in relatively low numbers at present but may proliferate if not controlled.

Spot spraying is the most appropriate means of control of these scattered infestations.

The main problem issue is the control of African Lovegrass* which is present on **Quadrat 1** at least. In any case every effort should be made to minimize its presence on the Pine Dale site.

The establishment and maintenamnce of a dense pasture cover dominated by introduced improved pasture species is the best way to minimize the degree of infestation of African Lovegrass. Such an aim would require regular fertilizer applications to maintain an adequate level of soil fertility.

12 REFERENCES

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[signed electronically]
Geoff Cunningham B.Sc.Agr [Hons]; FAIAST
Managing Director and Principal Ecologist
Geoff Cunningham Natural Resource Consultants Pty Ltd.
8th May, 2013

APPENDIX 1 - Photographs

Quadrat 1 – February, 2010

Quadrat 1 – September, 2011

Quadrat 1 – November 2012