

1. INTRODUCTION

1.1 ENHANCE PLACE PTY LIMITED

Enhance Place Pty Limited is the owner and operator of the Pine Dale Coal Mine (incorporating the Pine Dale Coal Mine – Yarraboldy Extension) (**Figures 1.1**), Mining Leases ML 1569 and ML 1578 and the Mining Lease resulting from application MLA 375 (**Figure 1.2**) and the adjacent Enhance Place Coal Mine south of the Castlereagh Highway, ML 1422, ML 1458 and ML 1520. Mining operations at the Enhance Place Coal Mine have ceased with rehabilitation completed.

1.2 ACTIVITIES AUTHORISED BY THE AUTHORISATION

Activities proposed within this Mining Operations Plan (MOP) have been subject to an *Environmental Assessment* and approval under Part 3A of the *Environmental Planning and Assessment Act 1979* (Project Approval 10_0041 – see **Appendix 1**).

1.3 MINING OPERATIONS PLAN AREA AND DURATION

This Mining Operations Plan (MOP) addresses the rehabilitation and environmental management pertaining to all activities associated with the Pine Dale Coal Mine, including the Yarraboldy Extension (**Figure 1.3**). This includes the following areas and authorisations.

- The original Pine Dale Coal Mine covering an area of approximately 83ha and incorporating ML 1578 and part of ML 1569.
- The Pine Dale Coal Mine – Yarraboldy Extension covering an area of approximately 27ha directly north of the original Pine Dale Coal Mine incorporating parts of ML 1569 (26.1ha) and the Mining Lease resulting from MLA 375 (17.9ha).

The combined area covered by the original Pine Dale Coal Mine and Yarraboldy Extension area is referred to as the “Mine Site”.

The duration of this MOP is for approximately three years to 28 February 2014 which is equivalent to the expected project life.

1.4 REHABILITATION SUMMARY

1.4.1 Introduction

The following sections provide a summary of rehabilitation objectives for the area covered under the MOP including objectives for mine closure and post mine land use.

1.4.2 Mine Closure Objectives

The mine closure objectives for the area covered by this MOP are as follows.

1. The rehabilitated landform is safe, stable, non-polluting and suitable for its intended long term land use.
2. The rehabilitated land is self-sustaining or maintenance requirements are consistent with the agreed post mining land use(s).



3. Achievement of an acceptable post disturbance land use capability/suitability with downstream water quality preserved.
4. Rehabilitation maintains or improves the species diversity and habitat value of the Yarraboldy Extension area, particularly the former Yarraboldy Open Cut Mine.
5. The mining leases over the rehabilitated landform can be relinquished and the security returned within a reasonable time after the end of the mine life.

1.4.3 Post Mining Land Use

The final land use has been designed by taking into account relevant government legislation and/or policies, current research, landholder preferences and is based on current, known industry best practice.

The Yarraboldy Extension area encompasses the footprint of the former Yarraboldy Open Cut Mine and is predominantly located within the Ben Bullen State Forest. Therefore, the Yarraboldy Extension area will be rehabilitated to a Class VII land capability which will support the development of native woodlands and forests vegetation for conservation purposes and the use of Industry & Investment NSW – Forests (I&I NSW – Forests).

The area within the eastern section of the original Pine Dale Coal Mine is to be returned to pasture suitable for agricultural purposes (Class IV land capability), consistent with landholder preferences, with the areas in the Western Section returned to Class VII land capability consistent with the requirements of Project Approval 10-0041.

Figure 1.4 presents the existing indicative rehabilitated vegetation cover within the area covered by this MOP.

1.5 HISTORY OF OPERATIONS

1.5.1 Introduction

The southern and western parts of the Pine Dale Coal Mine were originally associated with historical coal mining operations, particularly the former Wallerawang and Commonwealth Collieries (see **Figure 1.5**). The following subsections provide a summary of these operations and those associated with the existing Pine Dale Coal Mine.

1.5.2 Wallerawang Colliery

The Wallerawang Colliery commenced underground mining operations in 1910 as an extension to the first mine in the district. The colliery closed in 1987 due to a depletion of underground coal reserves.

A small open cut mine was operated on the Wallerawang Colliery site for approximately 2 years up until 1954, with a second smaller open cut operation undertaken for a similar period up until 1969. Both open cut operations fall within an area referred to as the Wallerawang Colliery Pit Top which is partly located in the western part of the Pine Dale Coal Mine and Yarraboldy Extension area.



Between 1987 and 1991, the majority of the surface infrastructure including the washery and conveyors were removed. The shafts and adits are reported to have been sealed during this period. Approximately 20ha of the surface area disturbed by the operation was rehabilitated in 1991 although the rehabilitation work proved largely unsuccessful as coarse reject from the washing operations was left on the surface and capped with only 0.1m of clay prior to seeding. Over time, the surface acidified and much of the vegetation died, resulting in bare areas susceptible to erosion.

Further rehabilitation work continued in 1994 with the removal of the bathhouse and office blocks. A program to remove approximately 150 000t of coal fines, generally located within the northern part of the former Wallerawang Open Cut (now referred to as the former Yarraboldy Open Cut Mine), was commenced. During this time, discharge water quality controls, fertilisation and noxious weed control programs were maintained. The coal fines recovery program was expanded in 1999 with the commencement of a briquette operation which was subcontracted to Yarraboldy Briquette Company Pty Ltd. This operation ceased in 2006.

1.5.2.1 Commonwealth Colliery

The Commonwealth Colliery operations incorporated two open cut mines including the Commonwealth Open Cut, located directly east of Pine Dale Coal Mine Area B, and the Commonwealth Extended Open Cut, located between Pine Dale Coal Mine Areas A and B.

Following cessation of mining operations at the Commonwealth Open Cut, the void filled with water to form a lake which is now known as Blue Lake. Blue Lake is located at the confluence of the Coxs River and Neubecks Creek, with overflow from the lake continuing down the Coxs River.

Further mining operations were later conducted in the late 1940s and early 1950s at a site known as the Commonwealth Extended Open Cut covering an area of approximately 16ha to the west of Blue Lake.

The void from the Commonwealth Extended Open Cut operations was approximately 15m deep along its southern boundary, however, from about 1975 onwards, the void became the principal site for the disposal of washery reject (“chitter”) from the Wallerawang Colliery washery. It is estimated that over 1Mt of reject was placed in the old Commonwealth Extended Open Cut. In the 1990s, the surface of the backfilled reject was reprofiled to its present configuration and mostly covered with a layer of clay and vegetated with pasture grasses.

1.5.2.2 Influence of Historic Operations and Relationship to Wallerawang Colliery Pit Top Rehabilitation

Though both the Wallerawang and Commonwealth Extended Open Cut sites have been partially rehabilitated, some coarse and fine rejects remain on the surface and are potentially acid generating and continue to pose a potential risk of acid runoff from the Wallerawang Colliery Pit Top Site. This risk has been substantially reduced by the rehabilitation works already undertaken by the Company on the Wallerawang Colliery Pit Top Site (see below).

Both the former Wallerawang and Commonwealth Collieries were located within CCL 770 which was renewed by Industry & Investment NSW - Mineral Resources (I&I NSW - MR). A number of special conditions were issued with the renewal of CCL 770, including the requirement to rehabilitate areas of surface disturbance associated with these historic activities.



A MOP for the rehabilitation of the Wallerawang Colliery Pit Top was subsequently submitted and accepted in August 2004 in compliance with these conditions. During the preparation of the 2004 MOP, it was recognised that there was the opportunity to use overburden from the, then proposed, Pine Dale Coal Mine for landform creation and as cover material. As such, all rehabilitation works and landform creation that did not require overburden from the Pine Dale Coal Mine operation were completed with remainder of the work being completed progressively as areas of the Pine Dale Coal Mine became available for rehabilitation.

1.5.2.3 Original Pine Dale Coal Mine

The Pine Dale Coal Mine has been operating since early 2006. The coal resource within the Pine Dale Coal Mine was exhausted in December 2010. The majority of the area has already been rehabilitated under the previous MOP, however, there are still some rehabilitation activities to be undertaken in the original Pine Dale Coal Mine footprint which are covered under this MOP.

1.5.2.4 Pine Dale Coal Mine - Yarraboldy Extension

As noted in Section 1.5.1.1, the Yarraboldy Open Cut Mine, forms part of the former Wallerawang Colliery. The Yarraboldy Open Cut Mine is within the area approved to be mined under Project Approval 10_0041 as part of the Pine Dale Coal Mine – Yarraboldy Extension.

1.6 PROPOSED AND FUTURE OPERATIONS

1.6.1 Introduction

As discussed in Section 1.2, the area of the MOP incorporates the Pine Dale Coal Mine and the Pine Dale Coal Mine – Yarraboldy Extension. Section 1.6.2 discusses the proposed operations within these areas during the term of this MOP while Section 1.6.3 discusses future operations outside the term of this MOP.

1.6.2 Proposed Operations

The Company proposes to undertake the following activities during the MOP period.

- Extraction of run-of-mine (ROM) coal at a rate of up to 350 000t of ROM coal per year within the Pine Dale Coal Mine – Yarraboldy Extension.
- Final rehabilitation of the original Pine Dale Coal Mine footprint (approximately 10.3ha remaining within Mining Area C to be backfilled / reshaped and revegetated and a further 2.8ha to be revegetated and approximately 21.4ha of infrastructure areas requiring minor reshaping and revegetation).
- Upgrade of the Pine Dale Coal Mine's access intersection with the Angus Place to Mt Piper Power Station Private Coal Haul Road.
- Decommissioning of the existing crushing facility within the original Pine Dale Coal Mine footprint and construction of a new crushing facility within the Pine Dale Coal Mine – Yarraboldy Extension area.



- Construction of an amenity bund immediately to the north of the Private Coal Haul Road (i.e. along the southern boundary of the Yarraboldy Extension).
- Extraction and emplacement of overburden and interburden material within mined out areas within the Yarraboldy Extension to create a stable and safe final landform.
- Final rehabilitation of the Pine Dale Coal Mine – Yarraboldy Extension (approximately 27ha) including the decommissioning of all associated infrastructure not beneficial to future land uses.

1.6.3 Future Operations

At the time of the writing of this MOP, there were no future operations approved associated with the Pine Dale Coal Mine. However, preliminary work to compile an *Environmental Assessment*, for a mine extension north of the Pine Dale Coal Mine – Yarraboldy Extension, to provide coal supply at significantly increased annual volumes for approximately a further 10 to 15 years, has commenced.

1.7 CONSENTS, LEASES AND LICENCES

The Pine Dale Coal Mine currently operates with the following approvals, leases and licences.

Project Approval 10_0041

This project approval (see **Appendix 1**) incorporates the original Pine Dale Coal Mine as well as the Pine Dale Coal Mine – Yarraboldy Extension. Granted by the Department of Planning (DoP). This project approval superseded DA 461-04 which was originally granted by Lithgow City Council (under delegated authority from the (then) Minister of Infrastructure, Planning and Natural Resources) on 14 November 2005 for the original Pine Dale Coal Mine. DA 461-04 will be surrendered to Lithgow City Council in accordance with Project Approval 10_0041.

Environment Protection Licence No. 4911 (annual anniversary date – 24 November)

This licence, (see **Appendix 3**) initially issued by the, then Department of Environment and Conservation, under the *Protection of the Environment Operations Act 1997* for the rehabilitation work being completed for the Wallerawang Colliery Pit Top, has been varied to include the original Pine Dale Coal Mine including the Pine Dale Coal Mine – Yarraboldy Extension (approved under Project Approval 10_0041). The licence permits mining of between 0 and 500 000tpa of coal and coal works of between 0 and 2 000 000tpa of loaded coal.

Mining Lease 1569 (dated 04 July 2007)

ML 1569 (see **Appendix 2**) incorporates approximately 161ha of land immediately north of the Pine Dale Coal Mine of which approximately 39.7ha is located within the approved Pine Dale Coal Mine (see **Figure 1.2**).

Mining Lease 1578 (dated 15 March 2006)

Mining Lease (ML) 1578 (see **Appendix 2**) incorporates 69.4ha of land within the boundary of the original Pine Dale Coal Mine (see **Figure 1.2**). ML1578 was granted following receipt of the original Development Consent for the Pine Dale Coal Mine from the Lithgow City Council on 14 November 2005.



Mining Lease Application 375 (dated 29 October 2010)

The Mining Lease resulting from MLA 375 incorporates a total area of 17.91ha within the western part of ML 1569 (see **Figure 1.2**).

Flood Control Works Licence No. 10CW801601 (dated 23 December 2005)

This licence was issued by the, then, Department of Natural Resources under Part 8 of the *Water Act 1912* for the construction of noise/flood bunding along the southern boundaries of the mining areas of the original Pine Dale Coal Mine.

Bore Licence 10BL165933 (dated 22 December 2005)

This licence was issued by the, then, Department of Natural Resources 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.

1.8 MINE DETAILS AND CONTACTS

Mr Hilton Goldfinch – Manager of Mining Engineering for the Pine Dale Coal Mine is the mine contact with regard to this MOP and is responsible for environmental management and ensuring compliance with legislative requirements. Mr Goldfinch can be contacted via the Pine Dale Coal Mine's Environmental Hotline on (02) 63551761. The contact details for the mine office are as follows.

| | |
|-------------------|--|
| Postal Address: | Enhance Place Pty Limited PO Box 202 WALLERAWANG NSW 2845 |
| Physical Address: | Pine Dale Coal Mine 1570 Castlereagh Highway LIDSDALE NSW 2790 |
| Tel: | 02 6355 7893 |
| Fax: | 02 6355 7894 |
| Email: | hilton.a.goldfinch@bigpond.com |

1.9 LAND OWNERSHIP

Details of land ownership in the vicinity of the Mine Site are shown on **Figure 1.6**.

The original Pine Dale Coal Mine Site is located on freehold land owned by either Enhance Place Pty Ltd or Mr G. Jenkins and Messrs G. & A. Jenkins. A small section is Crown Land. The bulk of the land within the Yarraboldy Extension area is Crown Land, principally the Ben Bullen State Forest. The remainder of the land is owned by Enhance Place Pty Limited.



1.10 STAKEHOLDER INVOLVEMENT AND CONSULTATION

The Company and its representatives have undertaken consultation with I&I NSW – MR and Forests during the preparation of the MOP. Relevant feedback associated with the *Environmental Assessment* for the Pine Dale Coal Mine – Yarraboldy Extension from various government agencies has also been incorporated into this MOP.

1.11 DOCUMENT PREPARATION

This document has been prepared by Mrs Alexandra Mayes and Mr Scott Hollamby, Senior Environmental Consultants with R.W. Corkery & Co. Pty. Limited. Peer review was undertaken by Mr Rob Corkery, Principal of the same Company.

Mine planning and operational information was provided on behalf of Enhance Place Pty Limited by the following individuals.

- Mr John Doherty – Director, Enhance Place Pty Limited.
- Mr Hilton Goldfinch - Manager of Mining Engineering for Pine Dale Coal Mine.
- Mr Philip Michael Saunders – Production Superintendent (Open Cut Examiner) for Pine Dale Coal Mine.



2. PRE-MOP ENVIRONMENT

Table 2.1 describes the elements of the existing environment within and surrounding the area covered by the MOP based on information drawn from the *Environmental Assessment* for the Pine Dale Coal Mine – Yarraboldy Extension, as well as earlier and subsequent studies. Particular emphasis is placed on those elements that will be disturbed during the life of the MOP (see **Map 3**). **Figures 2.1** to **2.5** present the pre-MOP environment, i.e. the status of the Pine Dale Coal Mine operations at the commencement of the MOP period. All references to “Mine Site” refer to the area of both the original Pine Dale Coal Mine and approved Yarraboldy Extension.

Table 2.1
Pre-MOP Environment

Page 1 of 2

| Environmental Aspect | Description of Pre – MOP Environment |
|----------------------|---|
| Flora | <ul style="list-style-type: none"> • Four vegetation communities exist within the Yarraboldy Extension area. One of these is classed as “Disturbed Lands” and incorporates the footprint of the former Yarraboldy Open Cut Mine (Figure 2.1). • A further three vegetation communities are located within the original Pine Dale Coal Mine together with areas rehabilitated following mining (Figure 2.1). • No native vegetation of types listed in Schedule 2 of SEPP 44 which provide potential Koala habitat exists within the Mine Site. • No threatened species are recorded on the Mine Site although two individuals of <i>Derwentia blakelyi</i> were removed during previous mining. • No Endangered / Threatened Ecological Communities, Critical Habitat or Endangered Populations listed under the <i>Threatened Species Conservation Act 1995</i> (TSC Act) have been recorded on the Mine Site. • No Threatened Species, Endangered Ecological Communities or Critical Habitat listed under the <i>Environmental Protection and Biodiversity Conservation Act, 2000</i> (EPBC Act) have been recorded on the Mine Site. |
| Heritage | <ul style="list-style-type: none"> • No sites of European significance are known to exist on the Mine Site. • No sites or places of indigenous cultural significance are known to exist on the Mine Site. • No locations of Potential Archaeological Deposits (PADs) have been identified on the Mine Site. |
| Fauna | <ul style="list-style-type: none"> • Four amphibian, 45 bird, 18 mammal and 6 reptile species were identified during a survey of the Yarraboldy Extension area. • Of these, three species are listed under the TSC Act including the Scarlet Robin, Gang-gang Cockatoo and the Grey-headed Flying Fox and one species under the EPBC Act (Grey-headed Flying Fox) (Figure 2.2). • Two threatened species have also previously been recorded during surveys of the original Pine Dale Coal Mine, namely the Glossy Black Cockatoo and Greater Broad-nosed bat. • No endangered fauna populations have been identified as occurring or likely to occur within the locality and none were recorded. • Relatively high densities of hollow bearing trees occur throughout most of the wooded habitats which cover approximately half of the Yarraboldy Extension area. |

Table 2.1 (Cont'd)
Pre-MOP Environment

Page 2 of 2

| Environmental Aspect | Description of Pre – MOP Environment |
|----------------------|---|
| Visibility | <ul style="list-style-type: none"> • The existing visual character of the Mine Site and surrounds is a combination of a rural landscape including grazing and State Forest and mining and energy-related industries. • The original Pine Dale Coal Mine operations are visible to varying degrees from surrounding vantage points. • The Yarraboldy Extension area is shielded to the north, east and partly to the west by intervening topography and forest areas. The amenity bund will also provide substantial shielding for views from the south. |
| Surface Water | <ul style="list-style-type: none"> • The Mine Site lies within the Neubecks Creek catchment which is a sub-catchment of the Upper Coxs River catchment (Figure 2.3). • The southern section of the Yarraboldy Extension area has been significantly disturbed through previous mining operations and subsequently, the former natural drainage lines within the area have been substantially altered. • The drainage lines that flow into the Mine Site area from the Ben Bullen State Forest to the north of the Project Site are all ephemeral. • The majority of any water flowing into the former Yarraboldy Open Cut Mine ultimately flows into the old Wallerawang Colliery underground workings via the mine entrances within the former mine itself. |
| Groundwater | <ul style="list-style-type: none"> • The primary water bearing zones are associated with the coal seams and the abandoned underground mine workings (Wallerawang Colliery) (Figure 2.4). Minor water bearing zones also occur within the interburden, however, these generally act as aquitards due to their reduced vertical permeability. • Groundwater levels in the old workings have been estimated to be between 880m AHD and 883.6m AHD. • No groundwater dependent ecosystems have been identified within the Mine Site. • Groundwater quality surrounding the Mine Site is variable with in both minor and major hydrochemical parameters including pH, salinity and cation and anion composition. |
| Soil | <ul style="list-style-type: none"> • All soil within the original Pine Dale Coal Mine Site has been stripped and either used for rehabilitation or stockpiled for use in future rehabilitation. • Approximately 10ha of the land has been disturbed as part of historical open cut mining operations within the Yarraboldy Extension area, with no soil resources available in this disturbed area. The remaining area has soil that is suitable for rehabilitation purposes (Figure 2.5). • Pre-mining land capability has been classified as Class IV and Class M within the existing Pine Dale Coal Mine and Class VII and Class M within the Yarraboldy Extension area (Figure 2.6). |



3. OPERATIONAL ISSUES WHICH MAY AFFECT REHABILITATION OUTCOMES

3.1 INTRODUCTION

The following sections outline the operational activities that may affect rehabilitation of the Mine Site. The *Environmental Assessment* for the Pine Dale Coal Mine – Yarraboldy Extension and environmental management plans prepared for the mine provide management, mitigation and monitoring measures relating to impacts from operational activities that may not directly affect rehabilitation at the Mine Site. Copies of the approved environmental management plans are retained on site by the Manager Mining Engineering and are available to all employees.

3.2 EXPLORATION

There are no exploration activities planned within the Mine Site during the term of this MOP. As no exploration activities are planned within the Mine Site during the term of this MOP, no rehabilitation mitigation measures are required in relation to exploration activities.

3.3 LAND PREPARATION

3.3.1 Introduction

Land preparation activities include the clearing of vegetation and the stripping of soil ahead of mining activities. If land preparation activities are not completed in the correct manner they can have a number of adverse effects on rehabilitation. Each activity is described in the following sections as well as the potential effects that these activities may have on rehabilitation and the mitigation measures that will be implemented to limit the effects of these activities on rehabilitation.

3.3.2 Vegetation Clearing

Vegetation will be removed prior to mining within each mining area, if the land is not already cleared. Approximately 11.2ha of forest community and 3.0ha of Open Cleared Lowland (**Table 3.1**) will be cleared during the MOP period. Vegetation clearing undertaken without appropriate controls and measures may affect rehabilitation in the following ways.

- Hollows in the existing vegetation not being retained to use in rehabilitation, which limits the initial habitat available for fauna within the rehabilitated areas.
- The soil profile is disturbed too much, thus reducing soil structure and the soil's ability to be effective in rehabilitation.
- The seed bank within the soil profile is removed or depleted, limiting the potential for the germination of endemic species from the seed bank within soil respread over rehabilitated areas.



Table 3.1
Vegetation Communities to be Cleared

| Community | Area to be Cleared (ha)* |
|---|---------------------------------|
| Community 1 – Stringybark-Scribbly Gum Forest | 9.9 |
| Community 2 – Mountain Gum Forest | 1.3 |
| Community 3 – Open Cleared Lowland with Scattered Trees | 3.0 |
| Community 4 – Disturbed Lands | Not Applicable |
| * As this MOP effectively incorporates the life of the approved operations, the areas also reflect the total areas to be cleared. | |

3.3.3 Rehabilitation Mitigation Measures for Vegetation Clearing

Prior to vegetation clearing, I&I NSW – Forests will be provided with the opportunity to recover any commercial timber within the areas of State Forest. The following clearing procedures will then be adopted to ensure that land clearing activities will not significantly impact on the rehabilitation of the Mine Site.

- The area of vegetation to be cleared will be clearly defined and all personnel involved in vegetation clearing made aware of the boundaries of clearing prior to removal.
- A pre-clearance inspection will be undertaken by suitably experienced personnel prior to commencement of clearing. The inspection will include a ground-based inspection for nests / hollows occupied by threatened species. In the event a threatened fauna species is identified, the tree will not be felled until the threatened fauna moves away from the area to be cleared or is appropriately relocated.
- Young plants may be transplanted and seed collected prior to or during vegetation clearing to assist in propagation of plants for use in rehabilitation.
- Clearing of the larger vegetation will then be undertaken using a bulldozer and / or excavator pushing with the blade positioned just above the ground to minimise soil disturbance.
- Smaller vegetation, i.e. groundcover and/or shrubs, will be retained and collected with topsoil during soil stripping activities to assist in stabilising soil stockpiles and maintaining a seed bank within the soil.
- When appropriate, and where weeds are sufficiently dense in areas to be cleared, weed spraying will be conducted prior to soil stripping activities.
- Vegetation of habitat value will specifically be set aside for use in rehabilitation and, where possible, directly placed onto areas awaiting rehabilitation.
- Remaining vegetation will be cut / broken into manageable pieces and either mulched for use in rehabilitation or used for other beneficial uses.



3.3.4 Soil Management

The stripping and either stockpiling or direct placement of soil on areas awaiting rehabilitation may have the following effects on rehabilitation if not completed correctly.

- Soil is stockpiled too high, which may affect soil structure and the biota in the soil.
- Soil is disturbed and/or compacted too much, therefore losing its structure.
- The incorrect soil type is placed on an inappropriate area of rehabilitation.
- Loss of the soil resource due to erosion of stockpiles.
- Loss of the soil resource due to inappropriate soil stripping techniques.
- Inadequate soil resources available for rehabilitation activities.

3.3.5 Rehabilitation Mitigation Measures for Soil Management

3.3.5.1 Soils Stripping Methods

Table 3.2 summarises the soil stripping methods that will be adopted to ensure that soil stripping does not significantly impact rehabilitation within the Mine Site. The soils shown within **Table 3.2** are located in the Yarraboldy Extension area only (see **Figure 2.5**) as all soils within the original Pine Dale Coal Mine have been stripped and either used on rehabilitation or have been stockpiled awaiting rehabilitation.

As the soils within the Mine Site generally have a relatively coarse texture, and are therefore prone to structural damage, handling of soils will be kept to a minimum with soil placed carefully to minimise reworking. Soil stripping in wet conditions will also be minimised and/or preferentially avoided.

3.3.5.2 Soil Stockpiling

The following soil stockpiling methods will be adopted to ensure that soil stockpiling does not significantly impact rehabilitation within the Mine Site.

- Whenever possible, topsoil and subsoil stripped from the operational areas will be directly transferred to areas which have been shaped to the final landform and are no longer required for operations.
- Topsoil and subsoil unable to be directly placed will be stockpiled within temporary stockpiles.
- When stockpiling is necessary, topsoil and subsoil will be stockpiled separately from each other and to heights no greater than 2m and 3m respectively.
- Stockpiles will be constructed with a slope no greater than 1:2 (V:H) and the surface left 'rough', in a micro sense, to assist in runoff control, seed retention and germination.



- Any stockpile that is to be retained in excess of 3 months and which has not naturally established a vegetation cover will be seeded using a non-persistent cover crop to reduce erosion potential and assist in the maintenance of the biological viability of the soil resource.
- Care will be taken to ensure that driving of machinery on the topsoil and subsoil stockpiles is kept to a minimum to maximise soil aggregation and prevent compaction, particularly when the stockpiles are moist.

Table 3.2
Soil Stripping Suitability and Procedures

| Layer (Thickness) | Material | Soil Stripping Suitability | Soil Stripping Procedures |
|---|--|--|--|
| Soil Mapping Unit 1 - Soils of the lower slopes, midslopes and upper slopes and crests | | | |
| 1 (0cm to 15cm) (Topsoil) | Silty clay loam. | Suitable for stripping for use as topsoil. Contains valuable seed, organic matter and nutrient reserves. Suitable macrostructure, texture, pH and salt levels. Layer contains low amounts of gravel. | Strip to a depth of 15cm from the current surface in all areas disturbed by mining and associated infrastructure development. |
| 2 (15cm to depth of bedrock) (Subsoil) | Light to medium clay, medium clay, medium to heavy clay, heavy clay. | Suitable for stripping for use as subsoil. Suitable texture, pH and salt levels. Layer contains gravel but levels are not limiting. | Strip all of the Layer 2 subsoil to the depth where bedrock or decomposing rock is encountered in all areas to be disturbed by mining or deeper disturbance. |
| Soil Mapping Unit 2 - Soils of the drainage depressions and associated terraces | | | |
| 1 (0cm to 15cm) (Topsoil) | Sandy clay loam to sandy clay. | Suitable for stripping for use as topsoil. Contains valuable seed, organic matter and nutrient reserves. Suitable macrostructure, texture, pH and salt levels. Layer contains variable but not limiting amounts of gravel. | Strip to a depth of 15cm from the current surface in all areas disturbed by mining and associated infrastructure development. |
| 2 (15cm to depth of bedrock) (Subsoil) | Clayey sand, sandy clay, medium to heavy clay. | Suitable for stripping for use as subsoil. Suitable texture, pH and salt levels. Layer contains gravel but levels are not limiting. | Strip all of the Layer 2 subsoil to the depth where bedrock or decomposing rock is encountered in all areas to be disturbed by mining or deeper disturbance. |
| Source: GCNRC (2010a) – Section 7 | | | |

3.3.5.3 Soil Inventory

A soil inventory will be maintained to ensure that there are adequate soils available for rehabilitation of the Mine Site. **Table 3.3** summarises the soil inventory for the term of this MOP. The soil inventory includes existing soil stockpiles to be used in rehabilitation within the original Pine Dale Coal Mine as well as soil to be stripped and reused in rehabilitation within the Yarraboldy Extension.



**Table 3.3
Soil Balance**

| | Topsoil | | | Subsoil | |
|---|---------|--|------------------------------|--|------------------------------|
| | Area | Yarraboldy Extension Area ¹ | Original Pine Dale Coal Mine | Yarraboldy Extension Area ¹ | Original Pine Dale Coal Mine |
| Units | ha | m ³ | m ³ | m ³ | m ³ |
| Stripping | | | | | |
| Year 0 (pre-MOP) | N/A | 0 | 7 500 | 0 | 30 000 |
| Year 1 | 8.4 | 12 600 | 0 | 71 400 | 0 |
| Year 2 | 4.2 | 6 300 | 0 | 35 700 | 0 |
| Year 3 | 2.3 | 3450 | 0 | 19 550 | 0 |
| Placement² | | | | | |
| Year 0 (pre-MOP) | N/A | 0 | 0 | 0 | 0 |
| Year 1 | 13.1 | 0 | 6 550 | 0 | 32 750 |
| Year 2 | 2.5 | 1 250 | 0 | 6 250 | 0 |
| Year 3 | 42.2 | 12 250 | 8 850 | 61 250 | 44 250 |
| Stockpile Balance | | | | | |
| Year 0 (pre-MOP) | N/A | 0 | 7 500 | 0 | 30 000 |
| Year 1 | N/A | 12 600 | 950 | 68 650 | 0 |
| Year 2 | N/A | 17 650 | 950 | 98 100 | 0 |
| Year 3 | N/A | 0 | 0 | 12 150 ³ | 0 |
| <p>Note 1: Assumed both soil mapping units will yield an <u>average</u> of 150mm of topsoil and 850mm of subsoil. 2: Assumed nominal replacement thickness, topsoil 50mm and subsoil 250mm. 3: In the event that additional subsoil material is available, the thickness of subsoil spread over selected areas will be increased such that all available subsoil is utilised in rehabilitation. N/A = Not Applicable</p> | | | | | |

3.4 CONSTRUCTION

3.4.1 Introduction

The principal construction activities that are planned during the term of this MOP that may affect rehabilitation include the following.

- Construction of amenity bund.
- Construction of Private Haul Road Intersection.
- Construction of water management structures.
- Relocation of the Crushing, Stockpiling and Maintenance area.

These activities are described in the following sections and the mitigation measures to be implemented to ensure that these activities do not significantly affect rehabilitation outcomes are summarised.



3.4.2 Amenity Bund

3.4.2.1 Overview of Amenity Bund Construction

An amenity bund will be constructed setback to the north of and approximately parallel to the Private Coal Haul Road. The amenity bund needs to be constructed in accordance with sound engineering and design procedures to avoid instability issues and to ensure the landform is effectively rehabilitated; it may affect the final landform of the Mine Site and thus the rehabilitation performance.

The amenity bund will be constructed during the initial 6 months of the MOP period using overburden / interburden. The final elevation of the bund will be approximately 935m AHD with batters of 1:1 V:H and seeded with a cover crop. At the end of mining within the Yarraboldy Extension, the amenity bund will be pushed and rehandled to the north to be incorporated into the final rehabilitated landform.

The potential risks to rehabilitation associated with the construction of the amenity bund include the following.

- Unsuitable material is used in the construction of the amenity bund, causing instability in the final landform, or water quality issues.
- The proliferation of weeds, if the amenity bund is not seeded appropriately.
- An unsuitable final landform if the amenity bund is not constructed with the appropriate volume of material.

3.4.2.2 Rehabilitation Mitigation Measures for Amenity Bund

The following mitigation measures will be implemented to ensure that that construction of the amenity bund does not affect rehabilitation.

- The amenity bund will be designed by an appropriately qualified person.
- Material to be used in the construction of the amenity bund will be chosen to ensure its geotechnical and geochemical suitability.
- Suitably qualified persons will be used to direct the construction of the amenity bund.

3.4.3 Private Coal Haul Road Intersection

3.4.3.1 Overview of Intersection Construction

An appropriate intersection with the Private Coal Haul Road will be constructed to provide safe ingress and egress for product coal trucks onto and off the Private Coal Haul Road. The intersection will be constructed within the MOP period and provide for an acceleration lane approximately 200m long and a deceleration lane for entering / exiting traffic. The Private Coal Haul Road will be left in situ for the use by other parties at the completion of mining and crossing of the Private Haul Road could continue.

From a rehabilitation perspective, the construction of safe ingress and egress from the Private Coal Haul Road, may allow unauthorised access to rehabilitated areas if the ingress and egress is not properly secured to only allow authorised access.



3.4.3.2 Rehabilitation Mitigation Measures of Intersection Construction

The following mitigation measures will be implemented to ensure that that construction of the ingress and egress to the Private Coal Haul Road does not affect rehabilitation.

- At the completion of mining and rehabilitation works, the ingress and egress to the Private Coal Haul Road will be appropriately secured to ensure that there is no unauthorised access onto the rehabilitated area.
- Appropriate water management infrastructure will be constructed to ensure that water from the Private Coal Haul Road is separated from the rehabilitated areas.

3.4.4 Water Management Infrastructure

3.4.4.1 Overview of Water Management Infrastructure Construction

A number of clean and dirty water dams and associated water management infrastructure will be constructed during the MOP period. The potential risks to rehabilitation associated with the construction of water management infrastructure include the following.

- Dams are not constructed appropriately causing possible water contamination issues in the rehabilitated landform.
- Water management infrastructure is not constructed in appropriate positions to allow effective water management of the rehabilitated area.
- Dirty water management infrastructure is not properly decommissioned at the end of mine life causing water quality issues on the rehabilitated landform.

3.4.4.2 Rehabilitation Mitigation Measures for Water Management Infrastructure

The following mitigation measures will be implemented to ensure that that construction of the water management infrastructure does not affect rehabilitation.

- All dams not to be retained for future land use will be drained and the water disposed of in accordance with the mine's licence conditions. The dams will then be filled/shaped in accordance with the final landform and topsoiled and seeded.
- All dams will be designed and constructed in accordance with the "Blue Book" (Soils and Construction Handbook, Landcom, 2004).

3.4.5 Relocation of the Crushing, Stockpiling and Maintenance Area

3.4.5.1 Overview of Crushing, Stockpiling and Maintenance Area Relocation

A new Crushing, Stockpiling and Maintenance Area, will be constructed in the southwestern corner of the Yarraboldy Extension area (**Figure 3.1**) during the first year of the MOP period. The existing Crushing, Stockpiling and Maintenance Area will be decommissioned during this time.

The potential risks to rehabilitation associated with the relocation of the Crushing, Stockpiling and Maintenance Area may include the following.

- Inadequate hydrocarbon/chemical management facilities are constructed, causing potential soil and water contamination of the area.



- All underground services are not surveyed during construction causing problems with locating and disconnecting these services during decommissioning.
- A contaminated site survey is not completed on the decommissioning of the existing Crushing, Stockpiling and Maintenance Area and any contaminated materials are not remediated, causing contaminated soils to be present within the rehabilitated landform.

3.4.5.2 Rehabilitation Mitigation Measures for Crushing, Stockpiling and Maintenance Area Relocation

The following mitigation measures will be implemented to ensure that the relocation of the Crushing, Stockpiling and Maintenance Area does not affect rehabilitation.

- Adequate hydrocarbon / chemical management facilities to appropriate standards will be constructed for the new Crushing, Stockpiling and Maintenance Area.
- All underground services installed in the new Crushing, Stockpiling and Maintenance Area will be surveyed and kept on an up-to-date infrastructure plan.
- A contaminated site survey will be completed as part of the decommissioning process for the existing Crushing, Stockpiling and Maintenance Area and any contaminated sites identified remediated appropriately.

3.5 MINING METHOD AND FEATURES

3.5.1 Overview of Mining Methods and Features

Mining will be undertaken using conventional open cut mining methods. The recovery of ROM coal from the Yarraboldy Extension area will generally be undertaken in a sequence of adjoining mining areas. Mining will commence north of the Private Coal Haul Road in the western section of the Yarraboldy Extension area, progressing to the east for the first 6 months. Mining will then progress in a northerly direction (**Figure 3.2**) for approximately 2 years.

The overburden and interburden will be removed using a combination of rip and push and blasting methods. Blasted / ripped rock will then be loaded by an excavator into a haul truck and transported to previously mined areas waiting to be backfilled.

Table 3.4 provides a summary of the expected material production schedule during the MOP term.

Table 3.4
Material Production Schedule

| Item | Unit | Year 1 | Year 2 | Year 3 ² |
|-----------------------|----------------|-----------|-----------|------------------------|
| Stripped Soil | bcm | 12 600 | 6 300 | 3 450 |
| Waste Rock | bcm | 1 160 000 | 1 160 000 | 1 160 000 ³ |
| ROM Coal ¹ | t | 275 000 | 350 000 | 175 000 |
| Processing Waste | m ³ | 0 | 0 | 0 |

1. As no coal processing (other than crushing) will be undertaken, ROM coal equates to 'product coal'.
2. Incorporates 6 months of mining and 6 months for final landform creation.
3. Includes handling of material within amenity bund to create final landform.



Without appropriate controls, the mining methods to be adopted could potentially have the following impacts on the rehabilitation of the Mine Site.

- Potentially acid-producing overburden / interburden is placed incorrectly and causes the production of acidic water or acidic soil which will not promote a growth medium (see Section 3.9).
- Overburden / interburden not placed in the appropriate areas to be commensurate with the proposed final landform.
- There is too much / not enough overburden / interburden to create the proposed final landform.
- The overburden / interburden material is not placed in a manner that will provide geotechnical stability to the final landform in the long term.

3.5.2 Rehabilitation Mitigation Measures for Mining Methods

The following mitigation measures will be implemented to ensure that the mining methods and features to be adopted do not affect rehabilitation.

- Appropriate mine planning processes will be adopted to ensure that the emplacement of overburden / interburden is commensurate with the final landform.
- Regular surveys of the overburden / interburden emplacement areas will be conducted to ensure they are in accordance with design.
- Appropriately trained and competent persons will be used to operate within the Mine Site.
- Areas will be progressively rehabilitated as they become available.
- As areas become available for rehabilitation, interburden will be preferentially placed at the base of the mining void, in particular any boulders or sandstone (to avoid exposure of large rocks on the final land surface).

3.6 COAL CRUSHING AND SCREENING

3.6.1 Overview of Coal Handling and Processing

As discussed in Section 3.4.5, the Crushing, Stockpiling and Maintenance Area (refer **Figure 3.1**) will be relocated to the Yarraboldy Extension area. ROM coal will be loaded using a front-end loader into a hopper feeding a crusher and screening system. Coal reduced to <50mm will then be transferred by an elevated conveyor system to a fixed stacker depositing coal onto the product stockpile. As only crushing operations will take place, there will be no coarse reject or fine tailings produced.

As there will be no coarse reject or fine tailings produced as part of crushing operations, management of these will not affect rehabilitation outcomes. However, the following activities associated with crushing operations may potentially have an effect on rehabilitation outcomes without the implementation of appropriate controls.

- Excess residue left on the coal stockpile footprints may impede the germination of vegetation on those areas.
- Potential hydrocarbon / chemical contamination of the Crushing, Stockpiling and Maintenance Area.



3.6.2 Rehabilitation Mitigation Measures for Coal Crushing and Screening

The following mitigation measures will be implemented to ensure that crushing operations do not affect rehabilitation.

- The footprints of the coal stockpiles will be graded to remove excess coal residue and capped with inert material prior to topsoiling.
- A contaminated site survey will be completed as part of the decommissioning process for the Crushing, Stockpiling and Maintenance Area and any contaminated materials identified remediated appropriately.

3.7 GEOLOGY AND GEOCHEMISTRY

The Pine Dale Coal Mine, including the Yarraboldy Extension is located along the western edge of the Permo-Triassic Sydney Basin, in a province referred to as the “Western Coalfield”. The uppermost units comprise shale, sandstone and conglomerate of freshwater origin from the Grose Sub-Group and Caley Formation, part of the Narrabeen Group. The Illawarra Coal Measures incorporate six coal seams and underlie the Narrabeen Group. The basement rocks comprise strongly deformed and folded quartzite, limestone and shale (**Figure 1.7**).

The resources within the original Pine Dale Coal Mine footprint have been exhausted. Of the six potentially commercial coal seams within the Illawarra Coal Measures, the Lithgow, Lidsdale and Irondale Seams are present within the Yarraboldy Extension area. The Lidsdale and Lithgow Seams are separated within the Yarraboldy Extension area by the Blackmans Flat Conglomerate which progressively thins in a northeasterly direction north of the mine to a point where the Lidsdale and Lithgow Coal Seams converge. The location at which the seams converge is locally referred to as “the convergence line” and is oriented in a northwest-southeast direction. The Irondale and Lidsdale Seams are separated by the Long Swamp Formation, a unit comprising shales, siltstones and sandstones. The Lithgow seam has been partially mined out by the former Wallerawang Colliery underground operations.

In summary, the stratigraphy and within the Yarraboldy Extension are as follows.

- Overburden (predominantly shales) – approximately 4.5m thick.
- Upper Irondale Seam – approximately 0.35m thick.
- Interburden (shale/sandstone) – approximately 2.5m thick.
- Irondale Seam – approximately 1.3m thick.
- Long Swamp Formation (shale/siltstone/sandstone) – approximately 17m thick.
- Lidsdale Seam – approximately 1.8m thick.
- Blackmans Flat Conglomerate (comprising sandstones) – approximately 3.5m thick (reducing northwards towards the convergence line).
- Lithgow Seam – approximately 2.4m thick.
- Underlain by Marrangaroo Conglomerate – 3m to 5m thick and marine sediments between 50m to 70m+ thick.



3.8 SPONTANEOUS COMBUSTION

3.8.1 Overview of Spontaneous Combustion Potential

Based on previous operations and the characteristics of the coal, there is limited potential for spontaneous combustion outbreaks to occur within the Mine Site. Therefore, it has been determined that there will be no effects to rehabilitation outcomes as a result of spontaneous combustion outbreaks on the Mine Site.

3.8.2 Rehabilitation Mitigation Measures for Spontaneous Combustion Potential

Although there is limited risk of a spontaneous combustion outbreak occurring within the Mine Site and subsequently no effects to rehabilitation, the following mitigation measures will be implemented to manage any potential or actual spontaneous combustion outbreaks.

- Each coal stockpile will be regularly monitored for the presence of spontaneous combustion.
- In the unlikely event localised spontaneous combustion is detected on a coal stockpile, the affected coal will be isolated, spread out and drenched in water. The coal will then either be processed or despatched as quickly as possible.

3.9 ACID MINE DRAINAGE

3.9.1 Washery Rejects and Surface Materials

As outlined within Section 1.5, historic washery operations were undertaken within the Wallerawang Colliery Pit Top area (incorporating the Pine Dale Coal Mine and Yarraboldy Extension Area) with coarse and fine reject material placed on and near the surface in a number of areas. As a result of washing coal, fines are separated and any fine pyritic materials are concentrated increasing the risk of the reject material becoming acid generating. Due to inappropriate placement and rehabilitation measures adopted by former operators of the Wallerawang Colliery, these areas were not successfully rehabilitated.

Testing of this material was undertaken as part of the studies for the existing Pine Dale Coal Mine to determine the net acid generation potential (RWC, 2004). Testing was also undertaken within the eastern part of the, now, Yarraboldy Extension Area but not the remaining Yarraboldy Extension area due to a briquetting operation being undertaken at that time. It was determined that the removal (and burial within the Pine Dale Coal Mine open cut) or covering of this material with inert overburden to form a water shedding cover was an appropriate rehabilitation and management measure.

No on-site coal washing is proposed to be undertaken during the term of this MOP and therefore no additional fines will be generated. However, similar to the areas within the existing Pine Dale Coal Mine, any existing washery rejects or carbonaceous material remaining within the Yarraboldy Extension area from historic operations will be placed at least 5m beneath the surface of the final landform.



Additionally, pH testing will be undertaken of any areas within the Yarraboldy Extension area that do not appear to contain rejects or carbonaceous material but are currently bare or contain very little vegetation or groundcover. Testing will include field pH test of at least 10 samples per hectare undertaken on a grid pattern. In the event that the pH of the material in these areas is less than 5.0 it will be treated as potentially acid producing and managed in the same manner as the washery rejects.

Similarly, pH testing of rehabilitated areas will be undertaken at a rate of 10 samples per hectare to confirm that the pH is above 5.0 and that these materials have not been placed near the surface.

3.9.2 Overburden and Interburden Materials

Experience at the Enhance Place Open Cut and Pine Dale Open Cut mines indicates that the overburden and interburden materials do not present an acid mine drainage problem. However, testing was also undertaken on samples collected from drilling of two piezometers located north of the Yarraboldy Extension area (RCA, 2010). The result of this testing recorded that the siltstone above the Middle River Seam (recorded elevation 955m AHD) and carbonaceous shales within / above the Lithgow Seam (recorded elevation 886m AHD) have high chromium oxidisable sulphur and net acidities. These strata could potentially result in acid generation if not managed appropriately. It is noted that the Middle River Coal Seam and upper strata are not likely to be encountered during mining within the Yarraboldy Area. It is also noted that, sandstone below the Lithgow Seam also recorded high chromium oxidisable sulphur and net acidity, however, this strata would not be disturbed.

When encountered, the strata identified as being potentially acid producing (principally carbonaceous shales associated with the Lithgow Seam) will be selectively stripped during mining and placed at the base of the open cut with a water shedding cover of inert overburden. Alternatively, the potentially acid producing strata will be mixed with the other strata which are identified as having a sufficiently high acid neutralising capacity to neutralise any acid produced. In this case, additional sampling and testing will be undertaken to confirm the ratio of the neutralising strata which is required to be mixed with the potentially acid producing strata. In both cases, no potentially acid generating materials will be placed within 5m of the surface of the final landform.

3.10 WATER MANAGEMENT AND EROSION AND SEDIMENT CONTROL

3.10.1 Overview of Erosion and Sedimentation Potential

The potential for erosion and sedimentation on rehabilitated areas will be high if the rehabilitation measures described in Section 3.10.2 are not implemented.

3.10.2 Rehabilitation Mitigation Measures for Erosion and Sediment Control

The indicative final landform for the Mine Site is shown in **Figures 3.3** and **3.4**. The following mitigation measures will be implemented to ensure that the potential for erosion and sedimentation on rehabilitated areas is minimised.

- The landform will be shaped so as to largely recreate the pre-mining landform and catchments.
- All slopes will be created to be water shedding to avoid ponding of water on the surface.



- Once shaping is completed, the overburden will be ripped along the line of the contours to break any compacted and/or smooth surfaces.
- The rehabilitated landform will be seeded with an appropriate seed mixture.
- Drainage lines within the final landform will be created to convey water from rehabilitated areas into existing natural drainage lines.

Monitoring and maintenance of rehabilitated areas will be conducted to ensure that erosion and sediment control measures are working adequately. Further information regarding erosion and sediment control and water management is provided in Sections 11.3 and 11.4.

