Section 2

Project Description

PREAMBLE

This section outlines the Proponent's objectives and plans for the development and operation of the Pine Dale Coal Mine – Yarraboldy Extension. The coal resource is described and the mining operation, its sequence and processing activities, are detailed. This section also describes the Project with respect to hours of operation, infrastructure and services, safety, waste management, coal transportation and rehabilitation. Details of potential alternatives are addressed at the end of the section.

The Project is described in sufficient detail to provide the reader with an overall understanding of the nature and extent of activities proposed, how the various activities would be undertaken and to enable an assessment of the potential impacts on the surrounding environment.

Details of the safeguards and mitigation measures that the Proponent would implement to protect and manage surface water, groundwater, soil, noise, air quality, Aboriginal heritage, flora and fauna and other components of the local environment are detailed in Section 4B of this document.

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2.1 INTRODUCTION

2.1.1 Objectives

The Proponent's primary objectives for the proposed Yarraboldy Extension are to:

- secure approval for the Project to ensure the ongoing operation of the Pine Dale Coal Mine and employment of current mine personnel whilst preparing the necessary documentation for the proposed long-term extension;
- maintain the Pine Dale Coal Mine's current ROM coal production level at up to 350 000tpa; and
- continue to supply up to 350 000tpa of coal to customers by public road and Private Coal Haul Road; and
- rehabilitate the previously mined areas within the extension area for return to State Forest capability.
- These objectives would be achieved by:
- undertaking activities in an environmentally responsible manner that enables compliance with all relevant requirements;
- mining of the resource in a manner that maximises the recovery of coal and reduces the volume of overburden/interburden required to be handled in the area of disturbance;
- ongoing monitoring and reviewing the environmental performance of the Proponent's activities; and
- consultation with surrounding residents and local community regarding the mine and community issues.

2.1.2 The Project Site Layout

Figure 2.1 displays the following principal components for the proposed Yarraboldy Extension.

- An open cut mining area incorporating the former unrehabilitated Yarraboldy Open Cut Mine.
- An amenity bund set back from the southern boundary of the Yarraboldy Extension area for visual and noise reduction purposes.
- Relocated Crushing, Stockpiling and Maintenance Area.
- Lay Down Area.
- Existing Administration and Ablutions Area.
- New intersection and crossing with the Private Coal Haul Road.
- Various internal access roads and water management structures.

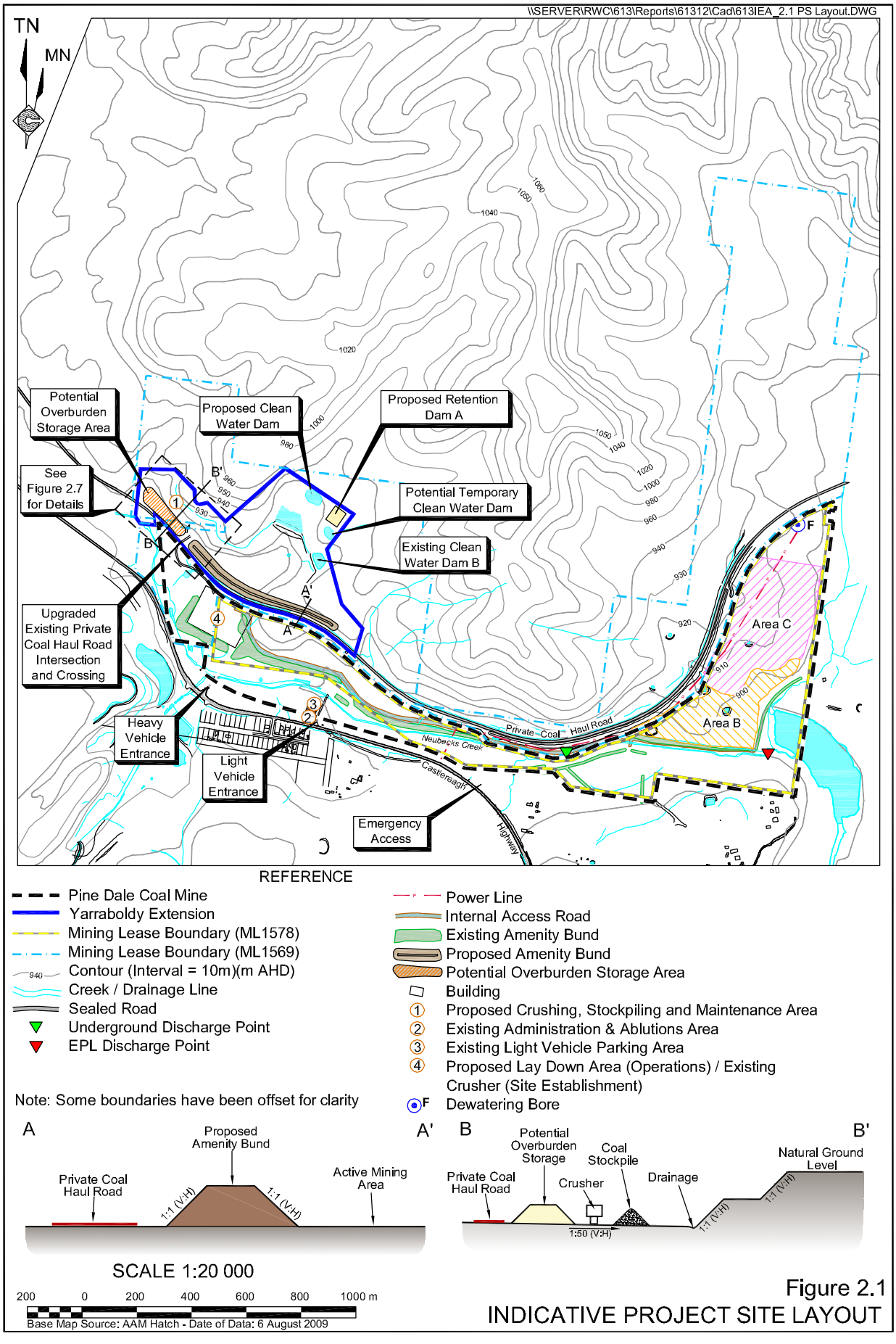


Figure 2.1
INDICATIVE PROJECT SITE LAYOUT

2.1.3 Outline of the Project

The Pine Dale Coal Mine - Yarraboldy Extension would involve the following principal components and activities.

- Extraction of run-of-mine (ROM) coal over 2½ years (which includes 6 months site establishment) using open cut mining methods at a rate of 350 000t of ROM coal per year. The Project life would be 3 years to allow for 6 months at the end of coal extraction to finalise rehabilitation on the site.
- Upgrade of the intersection with the Angus Place to Mt Piper Power Station Private Coal Haul Road.
- Continued transportation via public road of up to 100 000tpa of product coal to customers.
- Transportation via the Private Coal Haul Road of approximately 250 000tpa of product coal to customers.
- Continued importation via public road of up to 50 000tpa of alkaline boiler ash from the Oberon Timber Processing Works for use in rehabilitation of the Pine Dale Coal Mine and Yarraboldy Extension.
- Extraction and emplacement of overburden and interburden material within mined out areas to create a stable and safe final landform - effectively rehabilitating the areas associated with the former Yarraboldy Open Cut Mine within the extension area.
- Dewatering of groundwater within the underground workings and any inflows into the mine area. This water would be used for dust suppression with allowance for discharge into underground workings and / or Neubecks Creek, via the existing licenced discharge points, if required during any ongoing or significant rain events.
- Other ancillary activities, including equipment maintenance, clearing and stripping of the areas to be disturbed and rehabilitation activities.

2.1.4 Approvals Required

Based upon the current Project design and understanding of environmental issues, the Yarraboldy Extension would require the following approvals to proceed.

- Project Approval under the *Environmental Planning and Assessment Act 1979* as the Project, being for coal mining, is classified as a "Major Project" under *State Environmental Planning Policy (Major Development) 2005*. The issuing authority would be the Minister for Planning.
- A Mining Lease under the *Mining Act 1992* for a 0.5ha section of MLA 299. The issuing authority would be the Minister for Minerals and Forest Resources (I&I NSW).
- A variation to the Environment Protection Licence No. 4911 under the *Protection of the Environment Operations Act 1997*. The issuing authority would be the DECCW (Environment Protection and Regulation Group) (DECCW (EP&RG)).

- A Part 5 Licence under the *Water Act 1912* for interception and use of groundwater. The issuing authority would be the DECCW - NOW.

An access agreement would also be entered into with I&I NSW – Forests for the proposed activities located within the Ben Bullen State Forest.

2.1.5 Project Timetable

Based on current production rates, resources within the existing Pine Dale Coal Mine will be exhausted by about September 2010. It is expected that, once all necessary approvals for the Yarraboldy Extension are granted, preparation for mining within the Yarraboldy Extension area would commence immediately. It is anticipated that the Project would run over approximately a 3 year period providing for approximately 6 months for site establishment, during which time some coal would also be recovered, 2 years of open cut mining and 6 months for final landform creation.

2.2 GEOLOGICAL AND RESOURCE ASSESSMENT

2.2.1 Regional Geology

The existing Pine Dale Coal Mine and the Yarraboldy Extension are located along the western edge of the Permo-Triassic Sydney Basin, in a province referred to as the "Western Coalfield". The Western Coalfield mainly occupies an extensive plateau of erosion-resistant Triassic sandstone which is deeply dissected by numerous canyons and steep-sided valleys. The underlying Illawarra Coal Measures of Permian age are exposed in places along the western edge of the Western Coalfield and at deeper levels in the valleys of the Wolgan and Capertee Rivers.

The general stratigraphic sequence within the Western Coalfield is presented in **Table 2.1**. The uppermost geological units present in the Blackmans Flat area comprise shale (commonly carbonaceous), sandstone and conglomerate of freshwater origin of the Caley Formation and Grose Sub-Group of the Narrabeen Group. Red-brown to green coloured claystones are also present. Rocks assigned to the Narrabeen Group form the prominent cliffs and escarpments throughout the Blue Mountains area.

Table 2.1
General Stratigraphic Sequence – Western Coalfield, NSW

Age	Group	Sub-Group or Formation	Lithology
Triassic	Narrabeen Group	Grose Sub-Group	Quartz sandstone, conglomerate, minor red-brown and grey shale
		Caley Formation	Grey shale, quartz-lithic sandstone
Permian	Illawarra Coal Measures	See **Table 2.2**	
	Shoalhaven Group	Berry Formation	Dark grey marine shale
		Megalong Conglomerate	Conglomerate, pebbly sandstone
Carboniferous			Granite
Devonian			Quartzite, hornfels, slate
Source: Ward and Morris (1981)			

Rocks of the Narrabeen Group are underlain by the Illawarra Coal Measures, which in turn are underlain by the Berry Formation of the Shoalhaven Group. Both the Illawarra Coal Measures and Berry Formation are Permian in age (approximately 260 million years old) and outcrop beneath weathering cliff-forming sandstones of the Narrabeen Group.

Basement rocks in the region comprise strongly deformed and folded quartzite, limestone and shale of Early to Mid-Devonian age (approximately 390 million years old) that have been locally intruded by Carboniferous granites (approximately 340 million years old). The Permo-Triassic sequences unconformably overly these basement rocks.

The Illawarra Coal Measures within the Western Coalfield are divided stratigraphically into the Wallerawang, Charbon, Cullen Bullen and Nile Sub-Groups as shown in **Table 2.2**. Of these, coal within parts of the Wallerawang, Cullen Bullen and Charbon Sub-Groups are suitable for the development of commercially viable coal mines. Specifically, the six coal seams recognised to have commercial potential in the Wallerawang area in descending stratigraphic order are as follows.

- Katoomba Coal Seam (Wallerawang Sub-Group).
- Middle River Coal Seam (Wallerawang Sub-Group).
- Moolarben Coal Seam (Charbon Sub-Group).
- Irondale Coal Seam (Charbon Sub-Group).
- Lidsdale Coal Seam (Cullen Bullen Sub-Group).
- Lithgow Coal Seam (Cullen Bullen Sub-Group).

The Permo-Triassic stratigraphy of the Western Coalfield generally dips in a northeast direction at an average of 1.4^{o} and record tracings from the Western Main Colliery workings to the south of the Project Site, indicate that the Lithgow Seam dips to the east-northeast at a gradient ranging from less than 1^{o} to approximately 2^{o}.

2.2.2 Local Geology and Resources

Of the six potentially commercial coal seams the Lithgow, Lidsdale and Irondale Seams are present within the Yarraboldy Extension area. It is noted that within the Project Site the Irondale Seam comprises both the upper and lower seams. The approximate outcrops of these seams and the other three potentially commercial coal seams within the area, together with cross sections of the coal seams are shown on **Figure 2.2**.

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 Project Site 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 (see **Figure 2.2**). The Irondale and Lidsdale Seams are separated by the Long Swamp Formation, a unit comprising shales, siltstones and sandstones.

In summary, the stratigraphy and ash content within theYarraboldy Extension are as follows.

- Overburden (predominantly shales) – approximately 4.5m thick.
- Upper Irondale Seam – approximately 0.35m thick (20% ash).
- Interburden (shale/sandstone) – approximately 2.5m thick.
- Irondale Seam – approximately 1.3m thick (20% to 30% ash).
- Long Swamp Formation (shale/siltstone/sandstone) – approximately 17m thick.
- Lidsdale Seam – approximately 1.8m thick (19% ash).
- Blackmans Flat Conglomerate (comprising sandstones) – approximately 3.5m thick (reducing northwards towards the convergence line).
- Lithgow Seam – approximately 2.4m thick (18% ash).

Underlain by Marrangaroo Conglomerate – 3m to 5m thick and marine sediments between 50m to 70m+ thick.

Table 2.2
Stratigraphic Succession in the Illawarra Coal Measures - Western Coalfield

Sub-Group	Formation	Member	Lithology
Wallerawang Sub-Group	Farmers Creek	Katoomba Coal Member	Shale, claystone, coal; minor sandstone
		Burragorang Claystone Member	
		Middle River Member	
	The Gap Sandstone		Sandstone
Charbon Sub-Group	State Mine Creek Formation	Moolarben Coal Member	Shale, mudstone, coal
	Angus Place Sandstone	Ivanhoe Sandstone Member	Sandstone
	Baal Bone Formation		Shale, inter-laminated sandstone
	Glen Davis Formation (Upper Irondale Seam)		Coal, oil shale, minor shale, sandstone
	Newnes Formation		Shale, sandstone
	Irondale Coal Seam		Coal, minor shale
	Long Swamp Formation	Bunnyong Sandstone Member	Shale, siltstone, mudstone, minor inter-laminated sandstone
Cullen Bullen Sub-Group	Lidsdale Coal Seam		Coal, minor shale
	Blackmans Flat Conglomerate		Conglomerate, sandstone, shale
	Lithgow Coal Seam		Coal, shale, sandstone
	Marrangaroo Conglomerate		Conglomerate, sandstone
Nile Sub-Group	Gundangaroo Formation		Shale, sandstone, minor coal
	Coorangooba Creek Sandstone		Sandstone
	Mount Marsden Claystone		Claystone, limestone nodules

Geological unit present within proposed mine area Coal Seam present within proposed mine area

Source: Bembrick (1983)

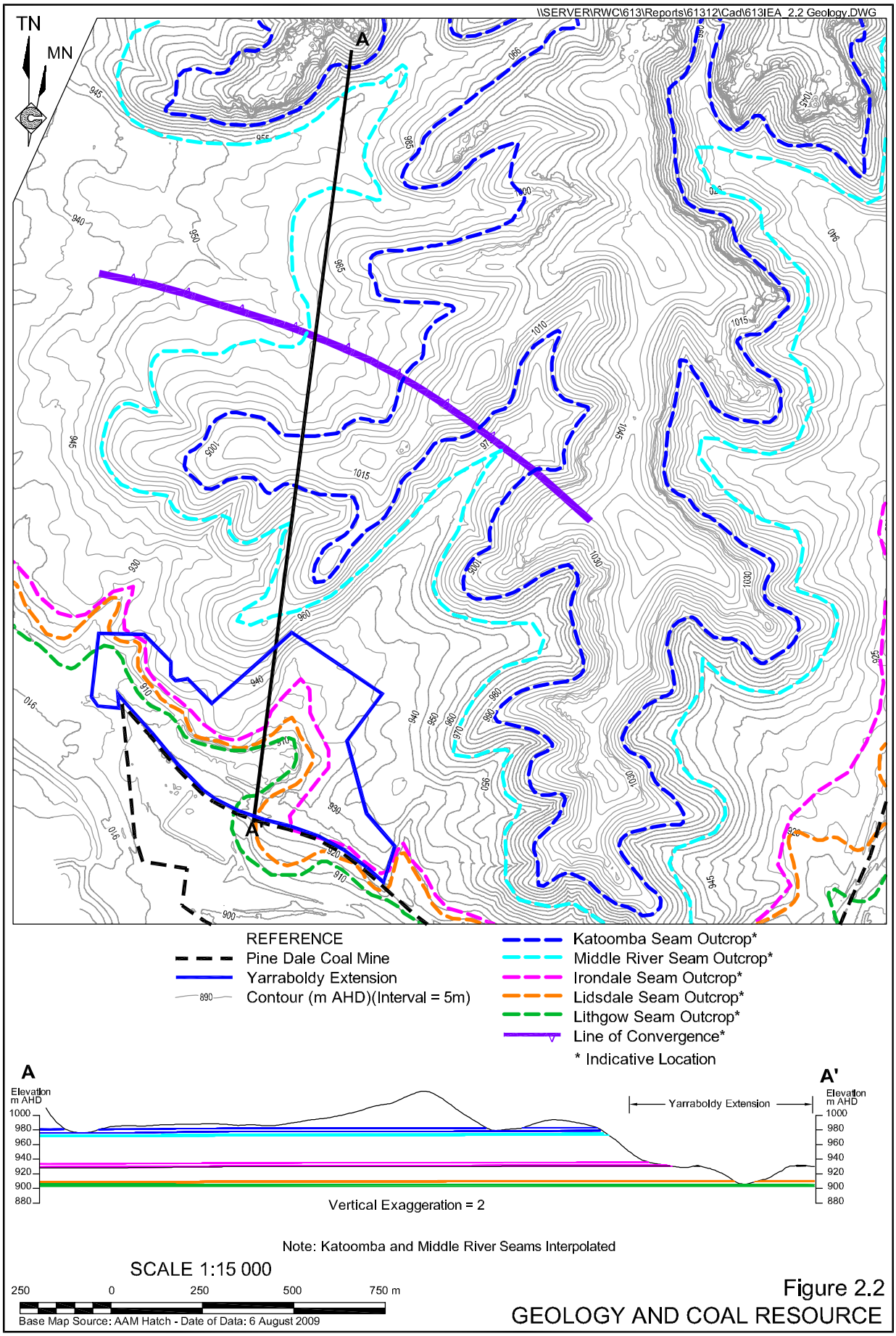


Figure 2.2
GEOLOGY AND COAL RESOURCE

2.2.3 Resource Assessment

Preliminary investigations and modelling of the coal resources indicate there is in the order of 800 000 tonnes of recoverable coal is present within proposed Yarraboldy Extension area. Estimated total resources within all of the Proponent's current mining and exploration tenements and tenement application areas exceeds 32 million tonnes of coal recoverable by open cut methods with potentially additional coal recoverable by underground mining methods. The total recoverable coal resource may vary with the different overburden/interburden coal stripping ratios and the prevailing coal price at the time of mining. The approximate volume of overburden/interburden to be handled and rehandled within the Yarraboldy Extension area is in the order of 3.5 million bank cubic metres (bcm).

2.3 MINE PLANNING

2.3.1 Introduction

The mine planning process for the Yarraboldy Extension considered economic, geological, geotechnical and environmental factors to determine the viability and design of the Project. The following sections summarise each of these considerations.

2.3.2 Economic Considerations

As has been the case at the Pine Dale Coal Mine to date, the extent of open cut mining is ultimately determined by economic aspects such as coal price and mining costs at the time, with both coal price and mining costs determining the limit of the economic stripping ratio, i.e. the volume of overburden and interburden above and between the various coal seams which must be removed to access each tonne of coal. This, in turn, is determined by coal seam thickness and the depth of cover.

The average overburden/interburden to coal stripping for the Yarraboldy Extension is in the order of 4.5 to 4.8 bcm of overburden/interburden per tonne of coal. This stripping ratio is in the lower range which would allow for economic recovery of coal with a buffer against potential fluctuations in coal prices.

It is noted that the recovery of the coal within Yarraboldy Extension area would provide continued economic benefits to the Proponent, the State (through provision of royalties) and flow-on benefits to local and regional suppliers, industry and communities.

Other economic factors considered in the development of the Pine Dale Coal Mine - Yarraboldy Extension include the following.

i) Coal Ash Content. The coal seams are moderate in ash (see Section 2.2.2) and when crushed and sized, the coal is suitable as a thermal coal product without the requirement of further beneficiation. By avoiding the need to wash the coal the production process is significantly simplified, improving the economic basis for the mining operations within the Yarraboldy Extension area.

ii) Proximity to customers. The Pine Dale Coal Mine – Yarraboldy Extension is located close to a number of customers including two power stations. Product coal can be transported by public road or Private Coal Haul Road over short distances to the power stations. Other customers also exist which can only be supplied by public road.

iii) Continued Supply of Coal to Delta Electricity. The continuation of mining in the Yarraboldy Extension area would provide the opportunity for Enhance Place Pty Limited to continue to offer coal for supply to Delta Electricity.

2.3.3 Geological and Geotechnical Considerations

The local geology and resources are discussed in detail in Section 2.2.2. The coal resource within the Yarraboldy Extension is minable by open cut methods and there are no geological impediments to the continued mining of the coal resource in the Yarraboldy Extension area. However, appropriate design and operational controls would be required as a result of the previous underground coal mining within the Lithgow Seam.

The geometry of the high wall adjacent to the Private Coal Haul Road would also be constrained by the thickness and geotechnical characteristics of the materials used in the construction of the haul road.

Details of the mine design criteria developed as a result of these considerations are provided in Section 2.5.6.

2.3.4 Environmental Considerations

Although the limits of the Yarraboldy Extension area have been set with economic and geological considerations in mind, the following environmental considerations have also influenced the overall mine planning process.

- **Rehabilitation of the former Yarraboldy Open Cut Mine**

  The Project would include mining the coal resource left in the area of the former Yarraboldy Open Cut Mine. The former Yarraboldy Open Cut Mine is currently unrehabilitated with approximately 10ha of bare earth / coaly residue and additional areas of disturbance. This has left not only an eyesore but also unproductive land with a range of safety issues. In mining the remaining coal resources, the Proponent would clean up the site and subsequently rehabilitate it to current standards. This would create a net environmental benefit as a result of the Project.

- **Noise**

  It has been determined that, in order to mitigate noise impacts on the residents of Blackmans Flat, an amenity bund would be constructed in the initial phases of the Project. It is noted that the mining path results in operations progressively moving away from Blackmans Flat, thus reducing potential noise impacts.

- **Ecological Considerations**

  The Yarraboldy Extension has been designed to limit the clearing of vegetation by centring on areas within the previously disturbed footprint of the former Yarraboldy Open Cut Mine. Known populations of *Bursaria spinosa* which provides habitat for the State and Commonwealth listed Purple copper butterfly have also been avoided.

  As a result, following revegetation of the area, it is considered that there is likely to be a net improvement in the biodiversity and habitat value of the area compared to its currently degraded state.

2.4 INFRASTRUCTURE

2.4.1 Introduction

It is noted that, whilst mining in the Yarraboldy Extension area, the Proponent proposes to utilise the existing buildings established for the current Pine Dale Coal Mine operations. The principal additional infrastructure and site establishment works would include the following.

- Surveying and pegging of the approved mining boundary and leases.
- Fencing of the active mine areas within the Yarraboldy Extension area.
- Progressive construction of an amenity bund utilising overburden / interburden from the Yarraboldy Extension area. It is estimated that the construction of the amenity bund would be completed within the first 6 months of the Project.
- Establishment of a new Crushing, Stockpiling and Maintenance Area.

The following subsections summarise the proposed and existing infrastructure, utilities and services to be utilised as part of the Project.

2.4.2 Utilities and Services

2.4.2.1 Power and Diesel Consumption

Power to the existing site office and amenities would continue to be provided from the transformer located adjacent to the office whilst power for the crushing plant would be supplied using diesel generators. Diesel pumps would also be utilised for dewatering of the Wallerawang underground workings, water inflows to the mine workings and to supply any make-up water required for dust suppression. Back-up diesel generators would also be made available in the event of an extended power failure.

2.4.2.2 Fuel Storage

Diesel fuel requirements for all on-site mobile equipment to recover 350 000tpa of ROM coal per annum would continue to be stored by a 30 000 litre fuel tank. The fuel tank would be located adjacent the new workshop and would either be a self-bunded tank or a tank within a bunded steel container with lockable doors.

2.4.2.3 Communications

On and off-site communications would continue to be undertaken utilising the existing Telstra telephone lines to the mine office and crib room buildings. The existing two-way radio network would also continue to be used as the primary means of communication between the various items of mining equipment required for safe coal mining and processing.

2.4.2.4 Water

Reticulated potable and ablutions water would continue to be supplied to the site through the established connection with the Lithgow mains water supply system. Water required for dust suppression would be sourced from 'dirty water' within the in-pit sump or the sediment retention dam and, if required, make-up water would be pumped from the underground workings. It is estimated that in the order of 75ML of water would be used per year for dust suppression.

2.4.2.5 Sewage

The existing pump-out septic system would continue to be used for the existing ablutions. The existing system has a total capacity that adequately provides for the existing and ongoing workforce.

2.4.2.6 Consumables Storage and Maintenance

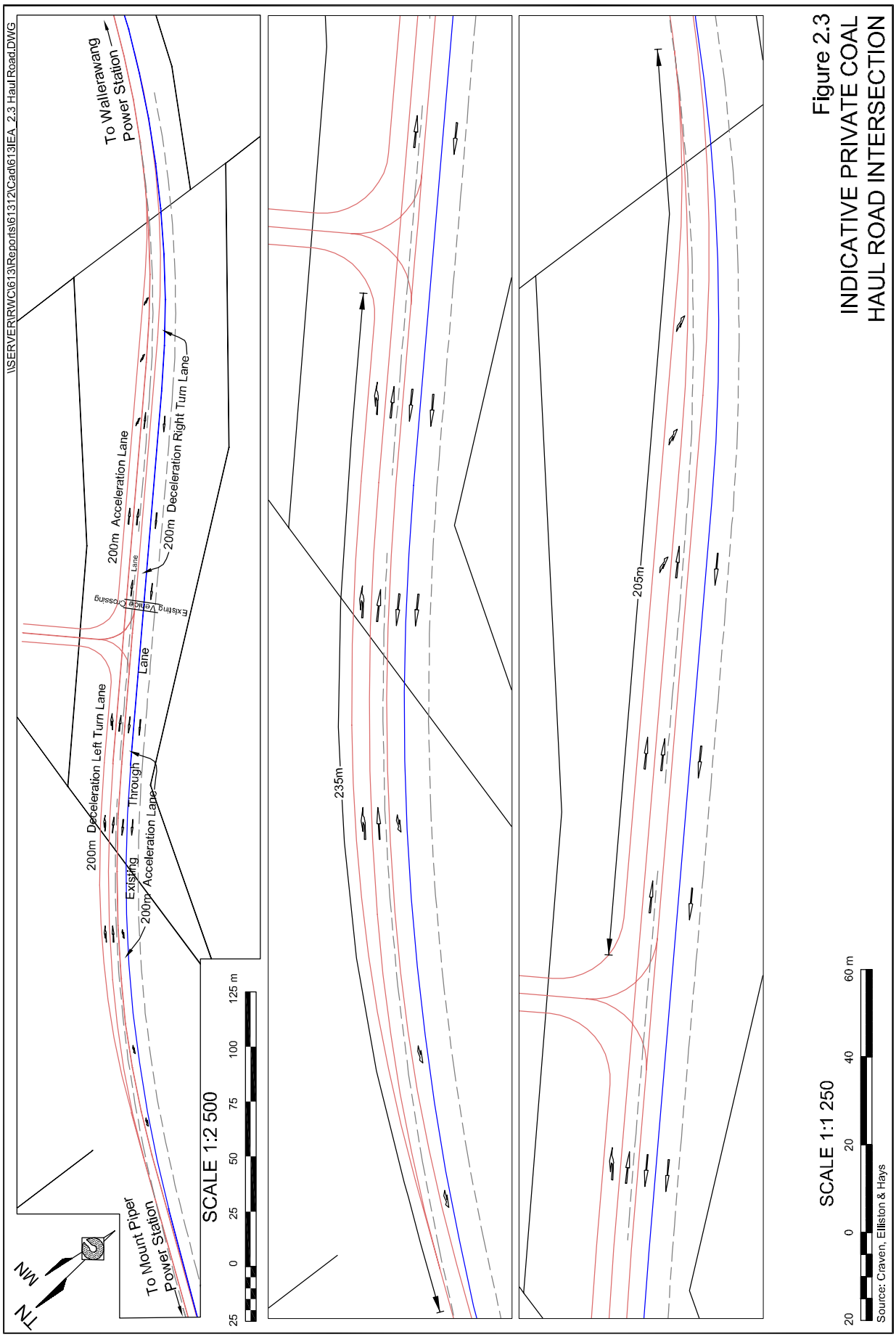
A workshop area would be established within the Yarraboldy Extension area for storage and maintenance activities. The workshop area would likely consist of a compacted pad with shipping containers and a temporary shelter. Importantly, the workshop area would have a properly designed and constructed drainage system and incorporate adequate hydrocarbon management and storage facilities. Existing storage and maintenance facilities would be retained until such time as the new workshop area is established during site establishment.

2.4.3 Internal Transport

The existing access road between current operations and the Yarraboldy Open Cut Mine and the Private Coal Haul Road crossing would be upgraded as the principal vehicle access from the existing Pine Dale Coal Mine to the Yarraboldy Extension area. Upgrade works would include pavement strengthening and widening and would be undertaken during the construction of the required intersection for coal trucks to enter / exit the Private Coal Haul Road. (see Section 2.4.4).

2.4.4 Coal Transport Infrastructure

Up to 100 000tpa of product coal would continue to be transported via public road (Castlereagh Highway) with the remaining approximately 250 000tpa transported via the Private Coal Haul Road. The existing public road and heavy vehicle intersection with the Castlereagh Highway are currently considered adequate for the continued level of vehicle movements (see Barnson, 2010).


\\SERVER\RWC\613\Reports\61312\Cad\613IEA_2.3 Haul Road.DWG
To Wallerawang Power Station
200m Acceleration Lane
200m Deceleration Right Turn Lane
Existing Through Lane
Existing Vehicle Crossing
200m Deceleration Left Turn Lane
Existing Through Lane
200m Acceleration Lane
To Mount Piper Power Station
SCALE 1:2 500
25 0 25 50 75 100 125 m
235m
205m
SCALE 1:1 250
20 0 20 40 60 m
Source: Craven, Elliston & Hays
Figure 2.3
INDICATIVE PRIVATE COAL HAUL ROAD INTERSECTION

However, an appropriate intersection with the Private Coal Haul Road would be required to provide safe ingress and egress. The intersection would be constructed during site establishment and provide for approximately 200m long acceleration and deceleration lanes for entering / exiting traffic (see **Figure 2.3**).

2.4.5 Amenity Management Structures

The existing amenity bunding surrounding the existing Crushing, Stockpiling and Maintenance Area and adjacent to the internal haul road would be retained for the duration of the proposed extension. In addition, an amenity bund would be constructed setback to the north of and approximately parallel to the Private Coal Haul Road (see **Figure 2.1**). This amenity bund would be constructed during the initial 6 months of the Project using overburden / interburden. The final elevation of the bund would be approximately 935m AHD with batters of 1:1 V:H.

2.4.6 Water Management Structures

Water management infrastructure would be designed and constructed for the Yarraboldy Extension to divert clean water away from operational areas, wherever possible, and to manage dirty water runoff and groundwater inflow in the active mining areas. These water management structures would be designed and constructed with reference to Volume 2E of the guideline document "*Soils and Construction: Managing Urban Stormwater*" (DECC, 2008).

A Sediment Retention Dam A with a capacity of approximately 12.6ML (based on the 90th percentile design storm event) would be constructed in the northeastern part of the Yarraboldy Extension area to manage 'dirty water' runoff and water inflows collected in the active sump for the Project. Mining would encroach upon the location of the proposed Retention Dam A during the final months of extraction activity. When this occurs, an additional dam would be constructed within the previously mined area of the Yarraboldy Extension and all water would be transferred to this dam prior to decommissioning of the Retention Dam A and mining through the area.

In addition, a dewatering bore may be installed within the existing Pine Dale Coal Mine mining Area C to dewater the water within the Wallerawang underground workings within the Yarraboldy Extension area (dewatering Hole F) (see **Figure 2.4**). This bore would also be used to supply any required make-up water for dust suppression. Dewatering of the Wallerawang underground workings and supply of make-up water may alternatively be undertaken via the existing Underground Discharge Point, EPL LDP4 (see **Figure 2.4**) using a diesel-powered pump.

Sections 2.5.9, 4B.1 and 4B.2 provide further details relating to groundwater and surface water management.

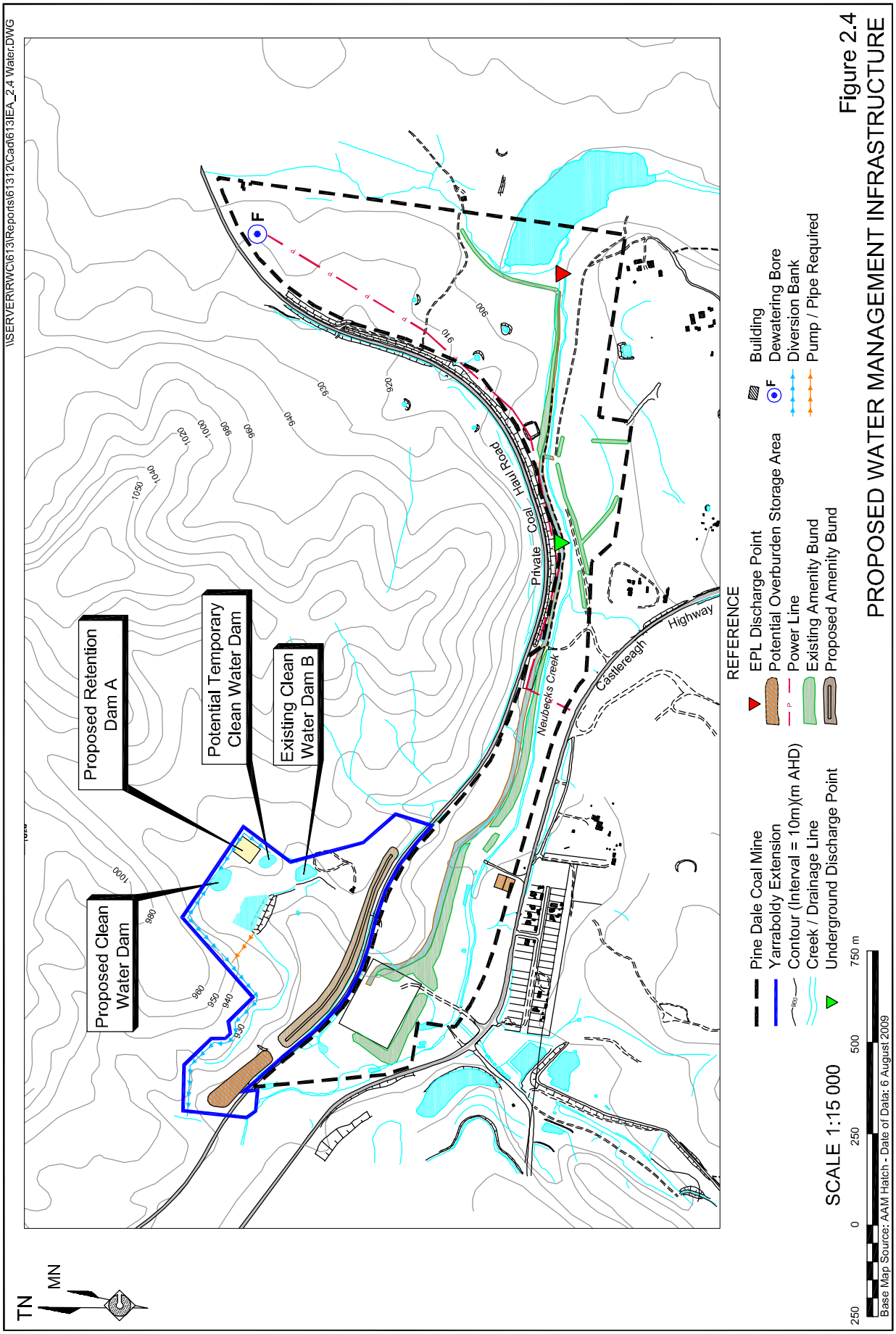


Figure 2.4
PROPOSED WATER MANAGEMENT INFRASTRUCTURE

2.5 MINING OPERATIONS

2.5.1 Introduction

Mining would continue to be undertaken using conventional open cut mining methods. This would involve the sequential removal and stockpiling of vegetation and soil, removal of overburden and interburden materials and the recovery of ROM coal.

This section presents information relating to the mining operations for the Yarraboldy Extension, including the mining sequence, vegetation clearing, soil removal, overburden and interburden removal, mine design, mining operations and mining rates.

2.5.2 Mining Sequence

The recovery of ROM coal from the Yarraboldy Extension area would generally be undertaken in a sequence of adjoining mining areas. Mining would commence north of the Private Coal Haul Road in the western section of the Yarraboldy Extension area, progressing to the east for the initial 6 month site establishment period. During this initial period, the amenity bund would be constructed utilising overburden / interburden. Mining would then progress in a northerly direction (see **Figure 2.5**) for approximately 2 years.

2.5.3 Vegetation Clearing

Vegetation would be removed prior to mining within each mining area, if the land is not currently cleared. The area of vegetation to be cleared would be clearly defined and all personnel involved in vegetation clearing made aware of the boundaries of clearing prior to removal. Large trees containing hollows would be visually inspected by suitably trained personnel for occupied nests/hollows prior to clearing. In the event a threatened fauna species is identified, the tree would not be felled until the threatened fauna moves away from the area to be cleared or is appropriately relocated.

Clearing of the larger vegetation would then be undertaken using a bulldozer and / or excavator pushing with the blade positioned just above the ground to minimise soil disturbance. The smaller vegetation, i.e. groundcover and/or shrubs, would 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 would be conducted prior to soil stripping activities.

Following removal, vegetation would be cut into manageable pieces and / or mulched for use in rehabilitation. Vegetation of habitat value (e.g. large tree trunks, hollows and brush containing native seed) would specifically be set aside for use in rehabilitation and, where possible, directly placed onto areas awaiting rehabilitation. Any excess timber not required for rehabilitation would be used for other beneficial uses, such as provision to Delta Electricity for use as biomass at the local power stations or used as fencing materials or firewood.

It is noted that, prior to vegetation clearing, Industry and Investment NSW – Forests would be provided with the opportunity to recover any commercial timber within the areas of State Forest. The Gundungurra Tribal Council Aboriginal Corporation has also indicated an interest in transplanting young plants and collecting seed prior to or during vegetation clearing campaigns to assist in propagation of plants for use in rehabilitation.

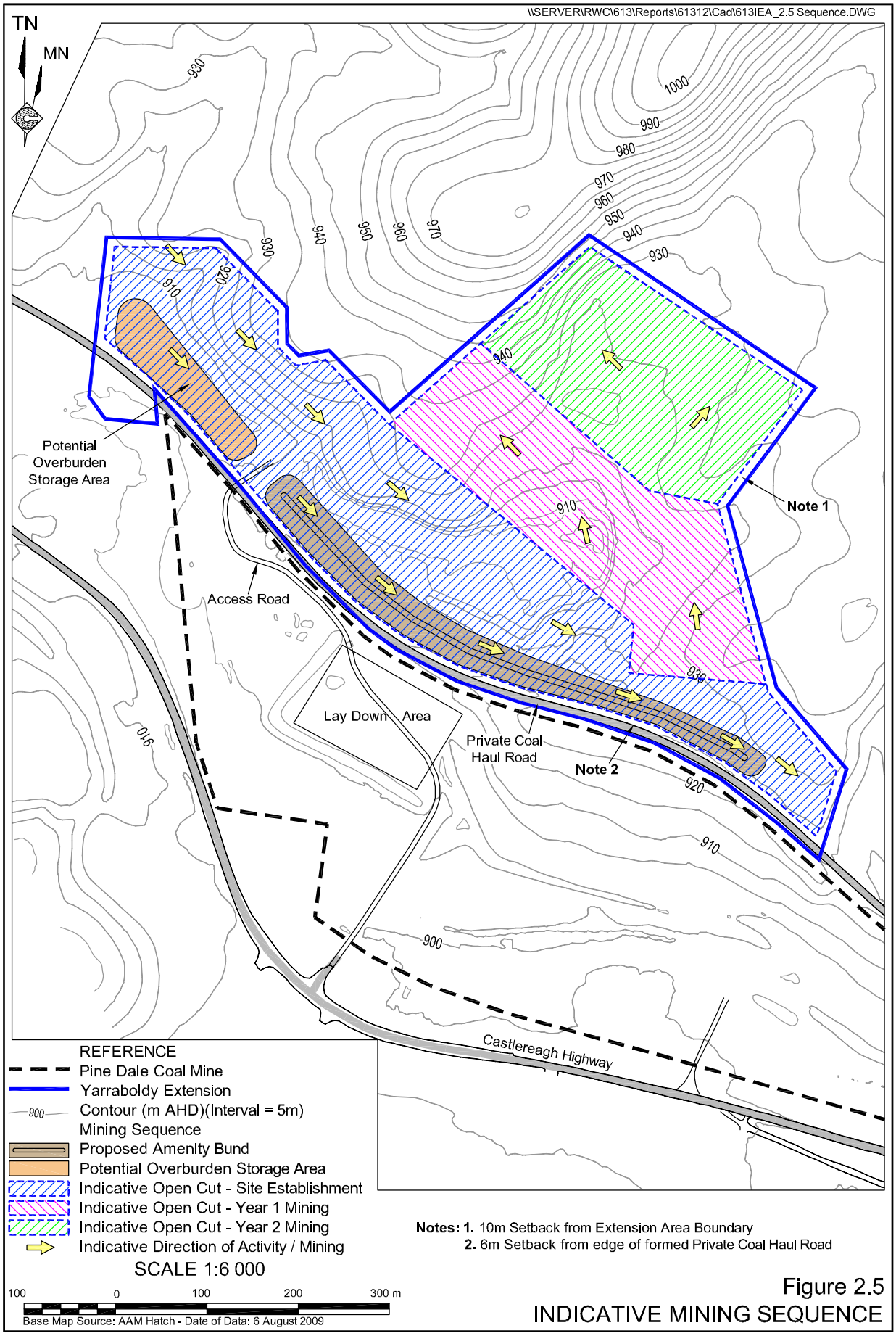


Figure 2.5
INDICATIVE MINING SEQUENCE

2.5.4 Soil Removal

2.5.4.1 Introduction

The soil materials within the proposed areas of disturbance were assessed by Geoff Cunningham Natural Resource Consultants (GCNRC, 2010a) to determine:

- their suitability for use as a final cover material on the post-mining landform; and
- the requirement for specific stripping and stockpiling or erosion control measures.

The assessment was based on field and laboratory examinations of key physical and chemical attributes and is described in greater detail in Section 4B.11. The following subsections provide a summary of the soil characteristics, stripping suitability and stockpiling methods.

2.5.4.2 Soil Stripping

Following removal of the larger vegetation, the Proponent would progressively remove any available topsoil and subsoil from the mining areas. The two soil mapping units identified within the Yarraboldy Extension area by GCNRC (2010a) are described in Section 4B.11. As soil material is scarce within the Yarraboldy Extension area, as much topsoil and subsoil material as possible would need to be recovered from areas that are undisturbed or relatively undisturbed from previous mining activities. **Table 2.3** provides a summary of the soil stripping suitabilities and procedures for managing topsoil and subsoil for each of the soil mapping units.

Table 2.3
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 to15cm) (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 to15cm) (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			

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

2.5.4.3 Soil Stockpiling Methods

Whenever possible, topsoil and subsoil stripped from the operational areas would 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 would be stockpiled within temporary stockpiles within the Yarraboldy Extension area.

When stockpiling is necessary, topsoil and subsoil would be stockpiled separately from each other and to heights no greater than 2m and 3m respectively. Stockpiles would 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 would be retained in excess of 3 months which has not naturally established a vegetation cover would 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 would also 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.

2.5.5 Overburden and Interburden Management

The overburden and interburden would be removed using a combination of rip and push and blasting methods. On average, each blast within overburden or interburden would fragment between approximately 50 000bcm (approximately 110 000t) and 100 000bcm (approximately 220 000t) resulting in between approximately two and four blasts per month depending on the depth and nature of the overburden / interburden being encountered at that time. Blasts would be undertaken over an area of approximately 6 000m^2 and up to a depth of approximately 18m with a Maximum Instantaneous Charge (MIC) of up to 350kg (depending on distance to nearest receiver and established site laws).

Blasted / ripped rock would then be loaded by an excavator into a haul truck and transported to previously mined areas waiting to be backfilled. During the initial 6 months, approximately 175 000m^3 of overburden/interburden would also be utilised to construct the portion of the amenity bund above the existing ground level.

Experience with overburden and interburden material at the existing Pine Dale Coal Mine indicates the likelihood of potentially acid forming materials is generally limited, however, some areas adjacent the former Yarraboldy Open Cut Mine may contain acid producing material. Any material suspected of being acid producing would be placed at least 5m beneath the surface of the final landform. Further details relating to final landform creation are presented in Section 2.12.5.

2.5.6 Mining Methods and Design Criteria

As each coal seam is encountered within the open cut mine, the seam would be ripped using a bulldozer and loaded into haul trucks using an excavator or front-end loader. Although the coal has historically been rippable, in the event the coal presents more competent, it may require limited blasting to condition prior to loading into haul trucks for transport to the ROM coal stockpile.

The following mine design criteria would generally be adopted.

- Operational Face Height:..... 15m
- Operational Mining Area Length: 200m
- High Wall Angle:..... max 75°
- Working floor width: 100m

It is noted that the high wall on the bench above goaf areas encountered in the underground workings of the Lithgow Seam would generally be retained at 45° (1:1 V:H).

The geometry of the high wall adjacent to the Private Coal Haul Road would also be constrained by the thickness and geotechnical characteristics of the materials used in the construction of the haul road. It is understood, coarse coal refuse or chitter was used to construct sections of the Private Coal Haul Road. Based on previous geotechnical investigations and experience within the existing Pine Dale Coal Mine, the following design would generally apply to this high wall.

- Faces excavated in chitter and soil at 45° (1:1 V:H).
- A 2m wide bench at the base of chitter to direct water away from the working face.
- Faces excavated in overburden from base of chitter to roof of Lidsdale Seam at 2.5:1 (V:H).
- Faces excavated in material from the roof of the Lidsdale Coal Seam to the floor of Lithgow Coal Seam at 4:1 (V:H).

2.5.7 Mining Equipment

Table 2.4 presents a list of the typical types and numbers of items of mobile equipment which are likely to continue to be utilised in the Yarraboldy Extension area. The equipment to be utilised in the Yarraboldy Extension area would not greatly differ from that which is currently in use at the existing Pine Dale Coal Mine although emphasis would be placed upon ensuring the sound power levels of the various items of equipment are consistent with those used in the proposed noise modelling. Any decommissioned equipment would be replaced with equipment of similar capacity and sound power level.

Other mobile equipment that would continue to be used on site includes mobile lighting plants, tyre handler, fork lift service, maintenance trucks and personnel transport vehicles.

Table 2.4
Indicative Earthmoving and Mobile Equipment

Equipment	Number	Use	Estimate Average Use at Maximum Production
Bulldozer Komatsu 475 / Cat D9	4	Vegetation clearing and grubbing, soil stripping, overburden/interburden ripping and pushing, ripping of coal and rehabilitation works.	75% of Operational Hours
Excavator 200t Komatsu PC2000-8/ 120t Hitachi 1200-5 / 30t PC300-6	3	Soil stripping, overburden/interburden and coal removal, loading of haul trucks.	75% of Operational Hours
Drilling Rig e.g. Ingersoll Rand DM25	1-2*	Drilling blast holes.	50% of Operational Hours (100% when in use - contract only)
Haul Truck Komatsu HD1500	4	Overburden/interburden handling and on-site transport of coal and overburden/interburden.	80% of Operational Hours
Front-end Loader Cat 988 / Komatsu WA500	2	Stockpiled coal handling, rehabilitation and topsoil management.	30% of Operational Hours
Water Cart Komatsu 510M. 50 000L	1	Dust suppression (and fire response)	50% of Operational Hours (pending weather conditions)
Self Bunded Mobile Fuel Tanker e.g. 8 000L	1	Refuelling (diesel) of mobile and stationary plant.	10% of Operational Hours
Road Grader Champion 700 Series	1	Internal access road maintenance.	50% of Operational Hours
Rubber-tyred dozer	1	Construction of the amenity bund.	50% of Operational Hours
*A second drill rig would only be used under 'emergency' circumstances – eg. following an extended period of wet weather which has delayed operations.			

2.5.8 Mining Rate

Coal mining would continue at the currently approved rate of approximately 350 000tpa of ROM coal to supply 350 000tpa to customers.

2.5.9 Water Management

It is estimated that approximately 8 800ML of water is present in the entire former Wallerawang Colliery underground workings (within the Lithgow Coal Seam) situated down dip of the Project Site. Based on drilling undertaken in April 2010, it is expected that only approximately 24ML of this water may be encountered while operating in the northern parts of the Yarraboldy Extension area. In any event, in order to safely recover coal within these areas, water from these sections of the underground workings would be dewatered prior to open cut mining in those areas. Dewatering may be undertaken either through the installation of a dewatering bore located within the existing mining Area C (see **Figure 2.1**) or via the existing Underground Discharge Point, EPL – LDP4 (see **Figure 2.4**). As discussed in Section 2.4.2.4, make-up water may also be sourced from the underground workings. It is expected that the maximum pumping rate would be in the order of 10ML per day, however, it is acknowledged that pumping at that rate would only occur on a limited number of days per year.

As discussed in Section 2.4.6, diversion banks would be installed to divert clean water away from the active operations and therefore minimise the volume of water required to be managed. Where the diversion of clean water is not possible due to site topography, clean water dams would be constructed to capture this water. The water from these dams would be subsequently pumped back into the clean water diversion drains at a point where surface topography allows for the natural downhill flow of water. All surface water runoff within the active areas of the Yarraboldy Extension and any groundwater inflows would be directed to and captured within the mine sump and pumped as required to the 12.6ML Retention Dam A. If necessary, water from the underground workings may also be pumped and stored within Retention Dam A (see **Figure 2.6**).

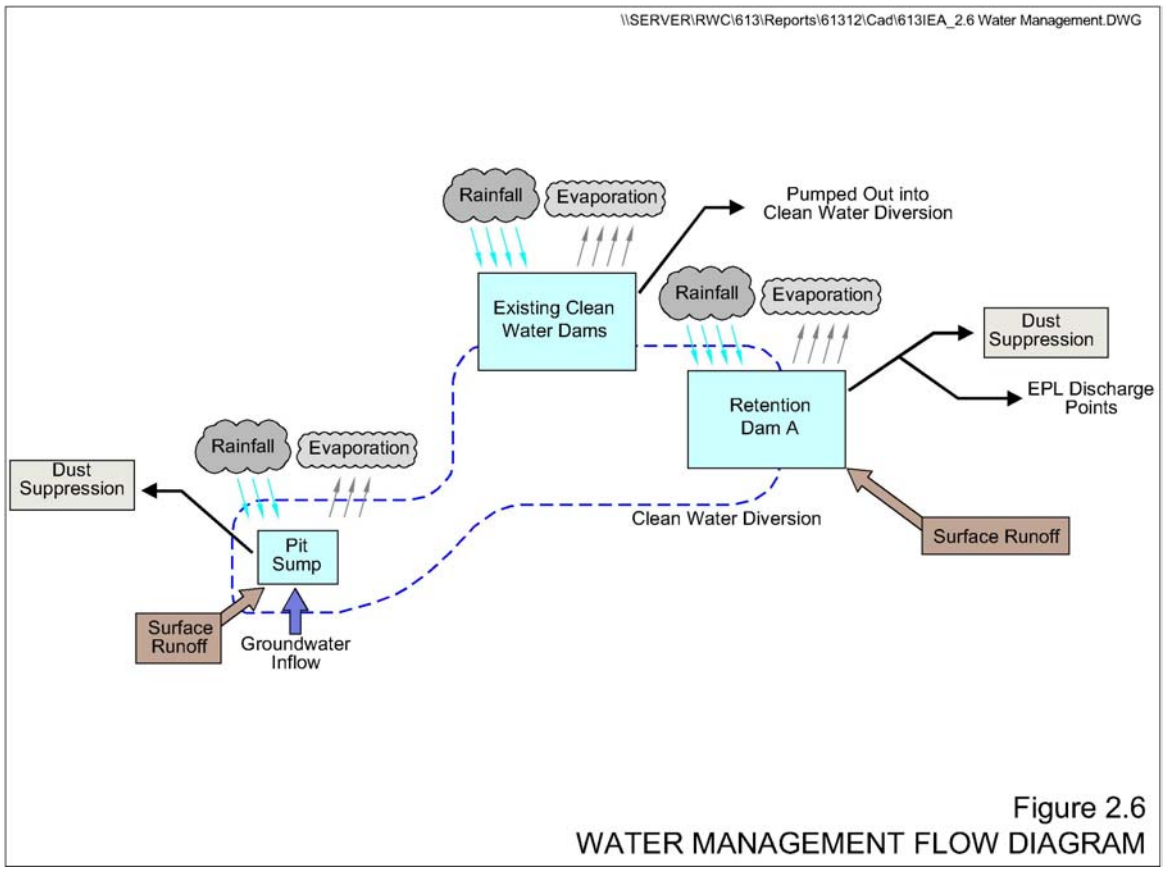


Figure 2.6
WATER MANAGEMENT FLOW DIAGRAM

In the event of excessive volumes of water resulting from ongoing or significant rain events, the, excess water would be treated, if required and appropriately discharged to Neubecks Creek and / or the underground workings via the existing licenced discharge points. Water would be discharged within the water quality parameters set out within the existing Pine Dale Coal Mine's Environment Protection Licence. Further details relating to water management are provided in Section 4B.1 and 4B.2.

2.6 CRUSHING AND STOCKPILING OPERATIONS

Figure 2.7 shows the layout of the proposed Crushing, Stockpiling and Maintenance area. It is noted that, whilst the new Crushing, Stockpiling and Maintenance area is being established, the existing crushing and stockpiling facilities would continue to be utilised. Following establishment of the new area, ROM coal would then be transported by haul trucks to the ROM

coal stockpile within the new Crushing, Stockpiling and Maintenance Area. This coal stockpile would have a capacity of approximately 20 000t. Crushing would be undertaken in the same manner as for the existing Pine Dale Coal Mine with ROM coal loaded using a front-end loader into a hopper feeding a crusher and screening system. Coal reduced to <50mm would then be transferred by an elevated conveyor system to a fixed stacker depositing coal onto the product stockpile. Importantly, the new and old Crushing and Stockpiling and Maintenance areas would not be operated concurrently with the existing crushing plant decommissioned following establishment of the new plant.

The crushing plant would operate at a rate of up to approximately 400t per hour for around 13 days per month producing an average of approximately 30 000t of product coal per month.

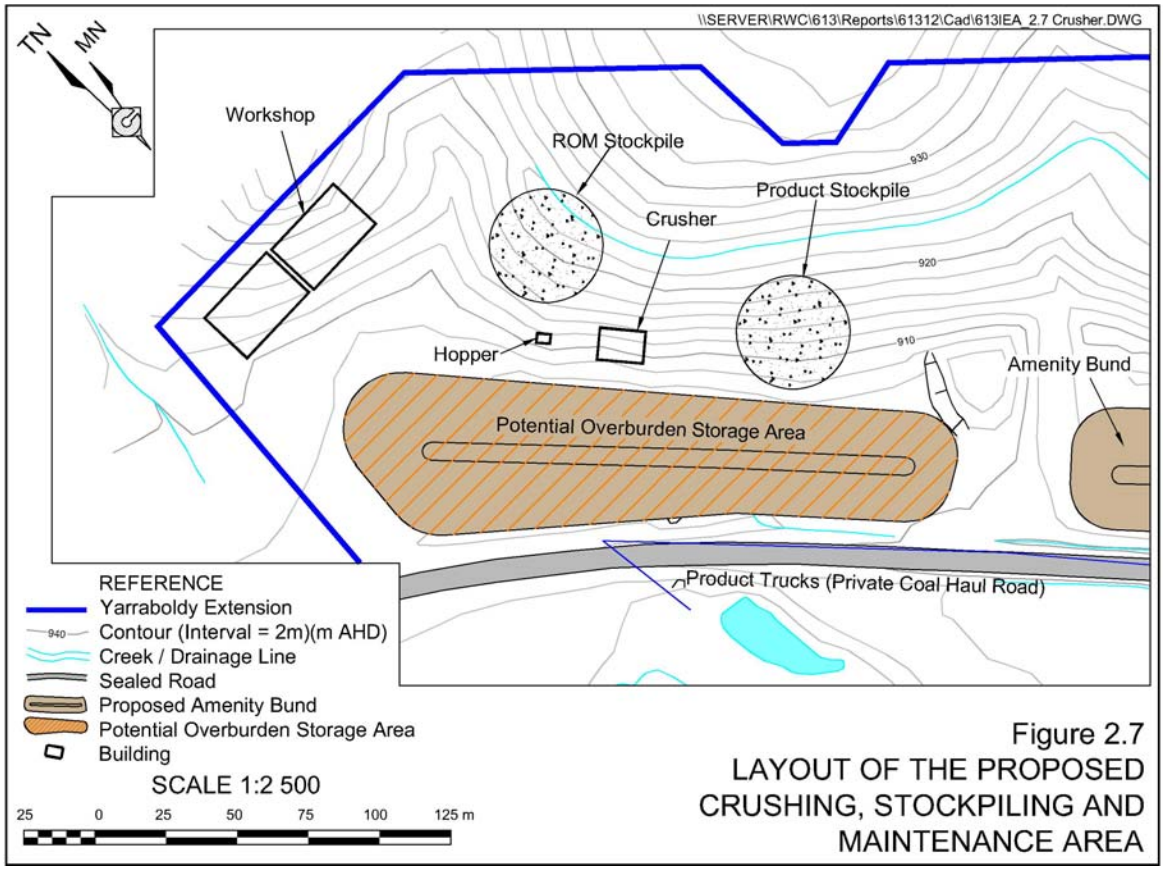


Figure 2.7
LAYOUT OF THE PROPOSED CRUSHING, STOCKPILING AND MAINTENANCE AREA

2.7 TRANSPORTATION

Product coal would continue to be stockpiled and loaded into road registered trucks for transportation to customers. Up to 100 000tpa of product coal would continue to be transported via the existing heavy vehicle access road and subsequently the public road network. Of this, the majority of the product coal would be transported to customers to the west via the Castlereagh Highway (trucks would turn right out of the heavy vehicle access road). A small amount of product (up to 30 000tpa) may also be transported east along the Castlereagh Highway (trucks would turn left out of the heavy vehicle access road) to meet customer requirements.

The remaining 250 000tpa of product coal would be transported via the Private Coal Haul Road. It is noted that, in the event that less than 100 000tpa is transported via the public road network, the additional coal may be transported via the Private Coal Haul Road. Road trucks transporting coal via the Private Coal Haul Road would enter and exit the haul road via the proposed new intersection (see **Figure 2.3**).

Up to 50 000tpa of boiler ash would also continue to be received from the Oberon Timber Processing Works for use in rehabilitation of the Pine Dale Coal Mine and Yarraboldy Extension. This equates to a total of up to 150 000tpa of material transported to or from the mine via public roads.

The type of product trucks utilising the public road network would remain similar to the existing truck configurations, typically consisting of semi-trailers, rigid-bodied tip trucks and truck and dog trailers with average pay loads in the order of 30t to 35t. Based on a maximum of 100 000tpa of coal transport and receipt of 50 000tpa of boiler ash, the average number of daily truck despatches would be 18 truck loads (36 movements) (based on conservative average load of 30t, 6 days per week, 46 weeks per year). As product demand varies from day to day, during a peak day, a maximum of 100 truck loads (200 movements) per day and up to 10 loads (20 movements) per hour could still occur via the heavy vehicle intersection. This maximum would also include any service trucks or trucks carrying boiler ash.

The type of product trucks utilising the Private Coal Haul Road would be of similar configurations to those utilising the public road network, however, road trucks with configurations providing a larger pay load capacity (such as B-Doubles) may also be utilised. Based on 250 000tpa of coal transport, the average number of daily truck despatches via the Private Coal Haul Road would be 18 truck loads (36 movements) (based on an average loads of 50t, 6 days per week, 46 weeks per year). It is expected that transport via the Private Coal Haul Road may also experience similar peaks as transport via the public road, i.e. in the order of 100 truck loads (200 movements) per day.

The front-end loader loading product coal would be fitted with weigh cells to ensure that road-registered trucks and are not overloaded.

There is expected to be no change to the volume of light vehicle movements from the light vehicle entrance with an estimated 19 to 22 return light vehicle trips (38 to 44 movements) per day.

2.8 HOURS OF OPERATION AND PROJECT LIFE

2.8.1 Hours of Operation

The hours of operation for the Yarraboldy Extension are not proposed to change from those currently approved for the existing Pine Dale Coal Mine other than that routine maintenance would not be limited to 16 Sundays per year. Rather, it is proposed that maintenance could occur 7 days per week with any maintenance activities occurring during the night-time period being either inaudible or non-intrusive at all surrounding residences. **Table 2.5** presents the proposed hours of operation for the Yarraboldy Extension.

2.8.2 Life of the Project

The life of the Yarraboldy Extension would be 3 years. This allows for the initial 6 months to construct the amenity bund (and recover some coal) 2 years of open cut coal mining, with an additional 6 months being allowed for final landform creation after all coal has been extracted from the Yarraboldy Extension area

Table 2.5
Proposed Hours of Operation

Activity	Hours of Operation	Day
Land preparation, overburden/interburden removal, construction activities	7:00am to 6:00pm 7:00am to 3:00pm	Monday to Friday Saturday
Clearing/topsoil and subsoil removal	7:00am to 6:00pm	Monday to Saturday
Overburden/interburden/ coal removal	7:00am to 6:00pm	Monday to Saturday
Drilling	7:00am to 6:00pm	Monday to Saturday
Blasting[1]	10:00am to 3:00pm	Monday to Friday
ROM coal haulage	7:00am to 6:00pm	Monday to Saturday
Coal Processing	7:00am to 6:00pm	Monday to Saturday
Product transportation	7:00am to 8:00pm	Monday to Saturday
Maintenance	24hrs	Monday to Sunday[2]

Notes: 1 Blasting may occur outside these times in the event of a misfire or for safety reasons.
2 Maintenance during night time hours to be limited to activities that are either inaudible or non-intrusive at surrounding residences.

2.9 EMPLOYMENT

The Pine Dale Coal Mine currently employs 12 full-time personnel on site, including the Operations Manager, open cut examiner and plant operators, and provides an additional seven full-time equivalent jobs for truck drivers transporting coal to customers. As there would be no increase in production rates for the Yarraboldy Extension, the number of employees would remain the same as for the existing Pine Dale Coal Mine operations.

Additional contract personnel would also continue to be brought onto site from time to time to perform specific short-term roles such as equipment maintenance.

2.10 WASTE MANAGEMENT

2.10.1 Introduction

The principal wastes that would be generated during the proposed operations within the Yarraboldy Extension and the management of these wastes, would be consistent with those currently produced from the existing Pine Dale Coal Mine.

As such, wastes would include the following.

- General domestic type wastes from the on-site office, amenities, ablution and first aid facilities and routine maintenance consumables.
- Hydrocarbons including waste oil.
- Sewage.
- Scrap steel and other wastes remaining from equipment maintenance and former open cut mining operations.

No wastes from the crushing of the coal would be produced as the crushing facility which would be utilised for the Project would not produce any coarse reject or fine tailings.

2.10.2 Domestic Type Waste and Maintenance Consumables

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) would continue to be disposed of in closed garbage bins located adjacent to the amenities building. The bins would continue to be collected weekly by licensed waste contractors and the contents disposed of at Council's Waste Depot. All recyclable waste would be placed in separate bins for collection and recycling.

2.10.3 Waste Hydrocarbons

Routine maintenance of mobile mining and earthmoving equipment would continue to be undertaken within the Crushing, Stockpiling and Maintenance Area or at equipment maintenance facilities away from the Project Site. Routine maintenance, particularly of the excavators and dozers, may also be undertaken on a maintenance pad within the Yarraboldy Extension area closer to the active mining area. Any hydrocarbons from equipment maintenance undertaken on the site would be collected in drums and removed from site for disposal at a licensed waste recycler.

2.10.4 Sewage

The existing pump-out septic system would continue to be used for the existing ablutions and would be pumped as required by a licensed waste contractor. The existing septic system has a total capacity that adequately provides for the current workforce and would remain adequate throughout the life of the Yarraboldy Extension.

2.10.5 Remnant Mining Debris and Scrap Steel

All remnant mining debris encountered within the Yarraboldy Extension area and any scrap steel from equipment maintenance would be collected and separated as recyclables and waste. Recyclables would be sold to a local scrap metal dealer, whereas all other solid waste would be transported to Council's Waste Depot, as required.

2.11 SAFETY/SECURITY MANAGEMENT

The Proponent proposes to continue to maintain and improve upon the existing Health and Safety Management System prepared for the Pine Dale Coal Mine. This system includes identification of roles and responsibilities, investigation of near misses and safety incidents and regular review and auditing of the safety system. This system would be reviewed and updated as required for the proposed extension.

As for the existing mining operations, the Proponent would also continue to adopt the following procedures to maintain a level of safety and security appropriate for the proposed activities.

i) Maintain existing fencing around the perimeter of the Project Site and install additional temporary fencing as required to isolate the proposed mining, processing and haulage activities from grazing stock and unauthorised individuals.

ii) Install safety signage around the Project Site perimeter fence.

iii) The entrance gates adjacent to the intersections of the mine access roads with the Castlereagh Highway would be maintained and locked at times when there are no authorised personnel on site.

iv) All non-mine employees and visitors entering and departing the Project Site would be required to register their time of arrival and departure in the site Visitors' Book or through managed electronic media. Short-term sub-contractors would also have to undergo an induction to the mine site.

v) Install appropriate surface and groundwater management controls to ensure that the stability of the high wall is maintained.

2.12 REHABILITATION, FINAL LANDFORM AND LAND USE

2.12.1 Introduction

An important part of the Project would be the progressive rehabilitation of completed mine areas. The rehabilitation process for the Yarraboldy Extension area would focus principally on the rehabilitation of the former Yarraboldy Open Cut Mine, an area historically disturbed and left in an unsatisfactory condition. Rehabilitation activities within the existing Pine Dale Coal Mine would also be completed concurrently with the commencement of mining within the Yarraboldy Extension area.

Rehabilitation activities would be in accordance with the Rehabilitation Environmental Management Plan (REMP) to be submitted and approved after the approval of the *Environmental Assessment* but prior to the commencement of mine related activities. The REMP would be written in accordance with the Draft REMP Guidelines (V2), June 2010.

Rehabilitation would be conducted with reference to the following documentation.

- Mine Rehabilitation – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth Government, 2006).
- Mine Closure and Completion - Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth Government, 2006)
- Strategic Framework for Mine Closure (ANZMEC, 2000).

2.12.2 Rehabilitation Objectives

In the short to medium term, the Proponent's objectives would be to stabilise all earthworks, drainage lines and disturbed areas no longer required for mine-related activities in order to minimise erosion and sedimentation.

In the longer term, the Proponent's rehabilitation objectives are as follows.

- Rehabilitation is undertaken in an economic manner.
- The former Yarraboldy Open Cut Mine is successfully rehabilitated.
- The existing Pine Dale Coal Mine is successfully rehabilitated.
- Rehabilitation improves the species diversity and habitat value of the Yarraboldy Extension area, particularly the former Yarraboldy Open Cut Mine.
- The rehabilitated landform is safe, sustainable, stable and suitable for its intended long term use.
- The rehabilitated landform requires low levels of maintenance.
- 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.

2.12.3 Rehabilitation Completion Criteria

The rehabilitated landform would be monitored against the following rehabilitation criteria during each stage of the rehabilitation hierarchy.

- The rehabilitated landform is based on recognised mine closure criteria and rehabilitation outcomes.
- The rehabilitated landform integrates rehabilitated native vegetation with undisturbed native vegetation to provide larger areas and wildlife corridors.
- The rehabilitated landform is suitable for the proposed subsequent land use and as far as possible is compatible with the surrounding land fabric and land use requirements.
- The rehabilitated landform addresses the limitations on the use of rehabilitated land.
- The rehabilitated landform is sustainable in terms of the intended land use.
- The rehabilitated landform is stable and the maintenance needs are no greater than those of surrounding land.
- All waste substances that have the potential to affect land use or result in pollution are securely and safely contained.
- The rehabilitated landform provides for fauna habitat.
- The rehabilitated landform addresses heritage issues.
- The rehabilitated landform is clean and tidy, and free of rubbish, metal and derelict equipment/structures.
- The rehabilitated landform does not cause unacceptable air and water pollution, or other environmental effects outside the disturbance footprint.

Each of the above issues would be considered by I&I NSW – Mineral Resources when assessing the Proponent's application for lease relinquishment.

2.12.4 Integration of Rehabilitation with Biodiversity Offsets

As part of developing the Biodiversity Offset Strategy for the Project, consideration would be taken as to how rehabilitated areas would be integrated with these areas. This would include the planting of specific species associated with any identified Biodiversity Offset Areas as summarised below in Section 2.12.6. Once the Biodiversity Offset Strategy is developed, integration with rehabilitated areas would be detailed in subsequent REMPs.

2.12.5 Rehabilitation Domains

Figure 2.8 illustrates the conceptual rehabilitation domains based on the proposed Project Site layout. The domains are as follows.

Domain 1 – Infrastructure Areas

This domain would include the crushing and workshop area, the administration area and any hardstands or roads.

Domain 2 – Overburden and Waste Emplacements

This domain would include all overburden emplacement areas both in pit and out of pit, including the amenity bund.

Domain 3 – Water Management Infrastructure

This domain includes all clean and dirty water dams, diversion drains and associated infrastructure.

The proposed measures to be implemented to meet medium and long term rehabilitation objectives for each domain as outlined in Section 2.12.2 are as follows. These measures would be refined further in the REMP.

- During clearing operations for the establishment of infrastructure areas, any large trees and shrubs (>0.3m in height) would be cleared using a bulldozer with the blade positioned just above the ground to minimise soil disturbance. Groundcover would be retained with any soil and subsequently collected with topsoil during the soil stripping operation to maintain an endemic seed bank and essential nutrients for rehabilitation.
- Once felled, all logs, branches etc. would be mulched and/or cut/broken into manageable lengths (where appropriate) and would generally be directly placed on selected rehabilitation areas or stockpiled adjacent to the temporary soil stockpiles for use in subsequent rehabilitation activities.
- Whenever possible, soil would not be removed in wet conditions in order to avoid breakdown of the soil structure.
- Soil would be stripped to the nominated depths referred to in **Table 2.3**.

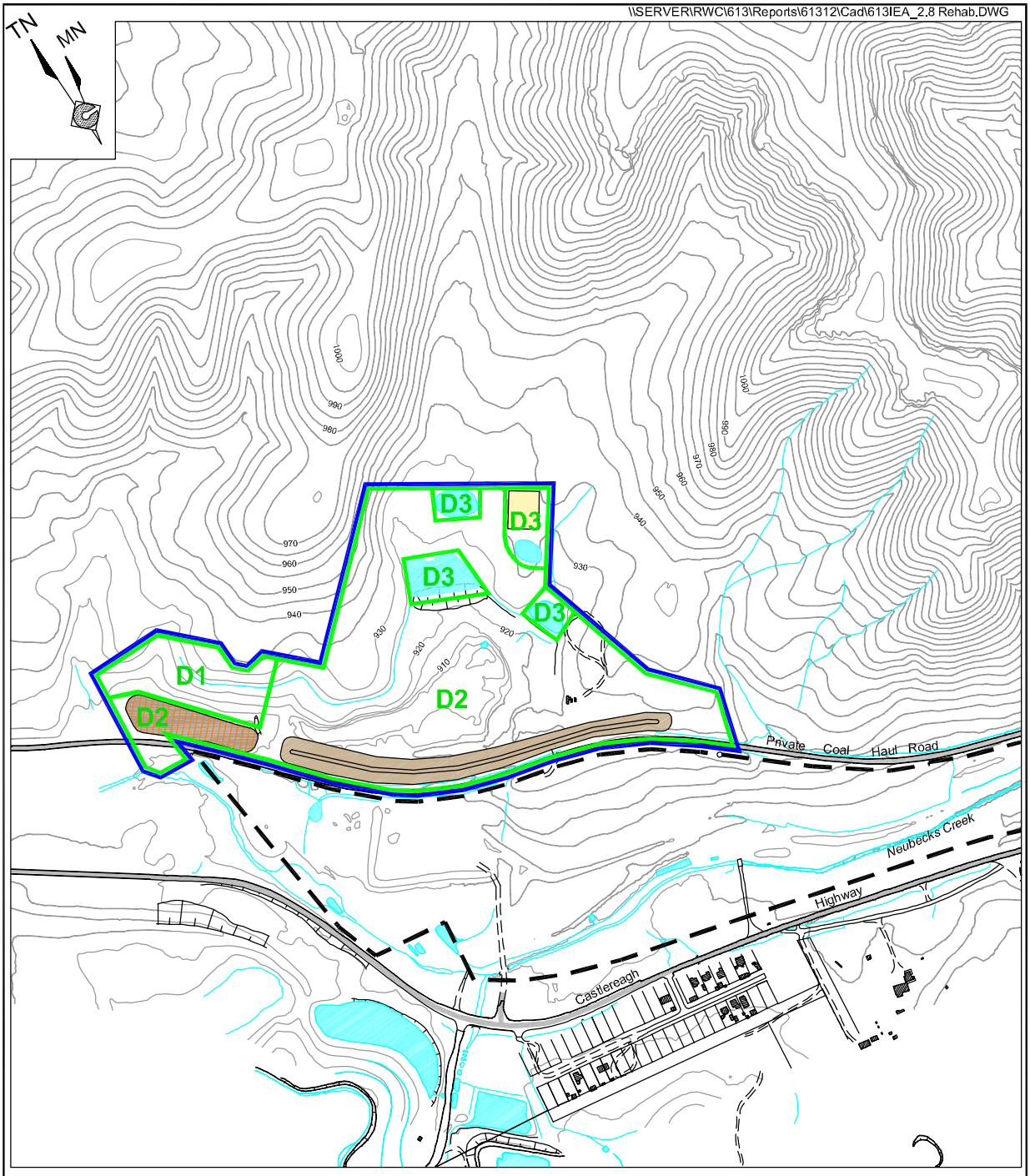


Figure 2.8
INDICATIVE REHABILITATION DOMAINS

- As areas become available for rehabilitation, interburden would 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), followed by any shaley interburden. The shaley interburden would then be covered by a minimum of 2m of overburden material (to avoid the potential oxidation of the small levels of sulphur within the interburden).
- The landform would be shaped so as to largely recreate the pre mining landform.
- Once shaping is completed, the overburden would be ripped along the line of the contours to break any compacted and/or smooth surfaces.
- All slopes would be created to be water shedding to avoid ponding of water on the surface.
- The rehabilitated landform would be seeded with an appropriate seed mixture in comprising of the species as specified in **Table 2.6**.
- Inspection and completion of maintenance, as required, of rehabilitated areas until lease relinquishment.

2.12.6 Rehabilitation Procedures

Within the Yarraboldy Extension area, where appropriate, stripped topsoil and cleared vegetation would be replaced upon the final shaped landform and, where required, a seed mix sown to stabilise the soil. Species selected for revegetation would target the existing vegetation communities with particular emphasis on species of conservation or biodiversity significance. A summary of key species that would be utilised for long-term rehabilitation within the Yarraboldy Extension area is provided in **Table 2.6**.

Table 2.6
Potential Species for Long-Term Rehabilitation – Yarraboldy Extension Area

Type	Scientific Name	
	Slopes	**Drainage Line / Flat Areas**
Trees	• *Eucalyptus rossii* (Scribbly Gum). • *Eucalyptus sparsifolia* (Narrow-leaf Stringybark). • *Eucalyptus rubida* subsp. *rubida* (Candlebark). • *Eucalyptus bridgesiana* (Apple Box). • *Eucalyptus polyanthemos* (Red Box).	• *Eucalyptus dalrympleana (Mountain Gum).* • *Eucalyptus polyanthemos (Red Box).* • *Eucalyptus macrorhyncha* (Red Stringybark).
Shrubs	• *Acacia dealbata* (Silver Wattle). • *Bursaria lasiophylla* (Hairy Native Blackthorn). • *Bursaria spinosa* (Native Blackthorn). • *Cassinia arcuata* (Chinese Shrub).	• *Acacia dealbata (Silver Wattle).* • *Cassinia laevis (Cough Bush).* • *Acacia ulicifolia* (Prickly Moses).
Source: GCNRC (2010b)		

Within the existing Pine Dale Coal Mine, the species utilised for long-term rehabilitation would remain consistent with those currently utilised (see **Table 2.7**). These species have been selected to provide pastures on the nominated areas of the Pine Dale Coal Mine intended for agricultural activities with occasional shade trees.

Table 2.7
Species for Long-Term Rehabilitation – Existing Pine Dale Coal Mine

Species	Rate (kg/ha)	Fertiliser
Cool Season		
Cereal Rye Grass	20	
Perennial Rye Grass	10	
Highlands Bent	10	Starter 15
Phalaris (Sirosa)	5	or
Seaton Park Sub-clover	6	Grower 11 (or equivalent)
Red Clover	6	400kg/ha
Currie Coxsfoot	6	
Warm Season		
Japanese Millet	20	Starter 15
NZ Rye	10	Or
Rhodes Grass	10	Grower 11 (or equivalent)
White Clover (Haifa)	4	400kg/ha
Note: Legumes would be inoculated with their appropriate rhizobia immediately prior to sowing Source: 2005 Mining Operations Plan		

All revegetation activities would continue to be undertaken in consultation with I&I – NSW Mineral Resources and Forests NSW.

2.12.7 Rehabilitation with Alkaline Boiler Ash

Boiler ash from the Oberon Timberworks may be imported onto the Project Site to assist in rehabilitation activities in areas that may considered to have acid producing potential. GHD (2005) outlines the process of using the boiler ash on rehabilitated areas as follows.

Ash would be spread over topsoil and tyned into the surface. The area would then be left fallow until at least one significant rainfall event to allow for a chemical reaction of alkaline (ash) and acid elements. The pH of the soil would be monitored to ensure a near neutral pH prior to sowing.

The characteristics of the boiler ash that may be used in rehabilitation as described in GHD (2005) would generally be the following.

- A pH of between 11.0 and 13.0.
- Contains a moderate amount or organic carbon.
- The ash does contain some metallic elements as summarised in **Table 2.8**. However, when the ash is subject to leachate testing which simulate the worst possible conditions that may be encountered, metal concentrations are all below the DECCW's allowable concentrations in leachate for inert waste as outlined in DECCW's *Waste Classification Guidelines, 2009*. (**Table 2.8**).

Table 2.8
Typical Chemical Characteristics of Oberon Boiler Ash

Element	*Concentration in Ash (mg/kg)	*Maximum Concentration in Leachate from Ash (mg/L)	#Allowable Concentration in Leachate for Inert Waste (mg/L)
Lead	7.5	<0.01	5^
Nickel	56	<0.01	2+
Chromium	17	0.15	5^
Molybdenum	2.7	0.3	5+
Selenium	-	0.013	1^
Mercury	<0.01	0.003	0.2^

* Source: GHD (2005)
# Source: DECCW (2009)
^ See *Hazardous Waste Management System: Identification and Listing of Hazardous Waste – Toxicity Characteristics Revisions, Final Rule* (USEPA 1990) for Toxicity Characteristics Leaching Procedure levels.
+ Calculated from *Australian Drinking Water Guidelines* (NHMRC 1994).

GHD (2005) noted that considering the above results are based on a worst case leaching test that there would be little likelihood that any metal concentration would exceed allowable limits if boiler ash was to be used in rehabilitation activities, especially as the ash would be mixed with soil.

Any residual alkalinity from the use of boiler ash in rehabilitation activities would be managed within the dirty water management system.

2.12.8 Rehabilitation Monitoring

Rehabilitation monitoring would be conducted in accordance with the Project's monitoring plan. The performance indicators to be monitored and the frequency of monitoring would be specified in the REMP.

2.12.9 Rehabilitation Maintenance

The Proponent's commitment to effective rehabilitation would involve progressive completion of rehabilitation and an ongoing maintenance program. This would include re-seeding and re-topsoiling and/or the application of composted mulch if monitoring identifies deficiencies in rehabilitated areas. Drainage controls would be maintained and temporary fences installed to exclude grazing by native or domestic fauna.

The Proponent would take the necessary precautions to prevent the excessive development of weeds within the rehabilitated areas. The appropriate weed eradication methods and programs would be undertaken in consultation with I&I - NSW.

2.12.10 Site Decommissioning

In the event future mining operations were not likely to proceed, all buildings would be dismantled and removed from site for re-use elsewhere. If the buildings cannot be re-used elsewhere, recyclable materials within the buildings would be removed and recycled, with the remaining materials disposed of appropriately according to their waste category. All footings from buildings would also be removed and then the area ripped, topsoiled and seeded to blend in with the final landform.

The crushing facility would be dismantled and either sold to another operation for re-use or the materials dismantled and disposed of or recycled appropriately.

All dams not to be retained for future land use would be drained and the water disposed of in accordance with the site's licence conditions. The dams would then be filled in and topsoiled and seeded and incorporated into the final landform.

The existing and proposed amenity bunds would also be pushed out to blend into and create the final landform (see Section 2.12.5).

All fuel and chemical storage facilities would be pumped out and the facilities removed from site. The areas where these facilities were located as well as any maintenance areas would be tested for contaminated soil and remediated appropriately based on the extent of any contamination.

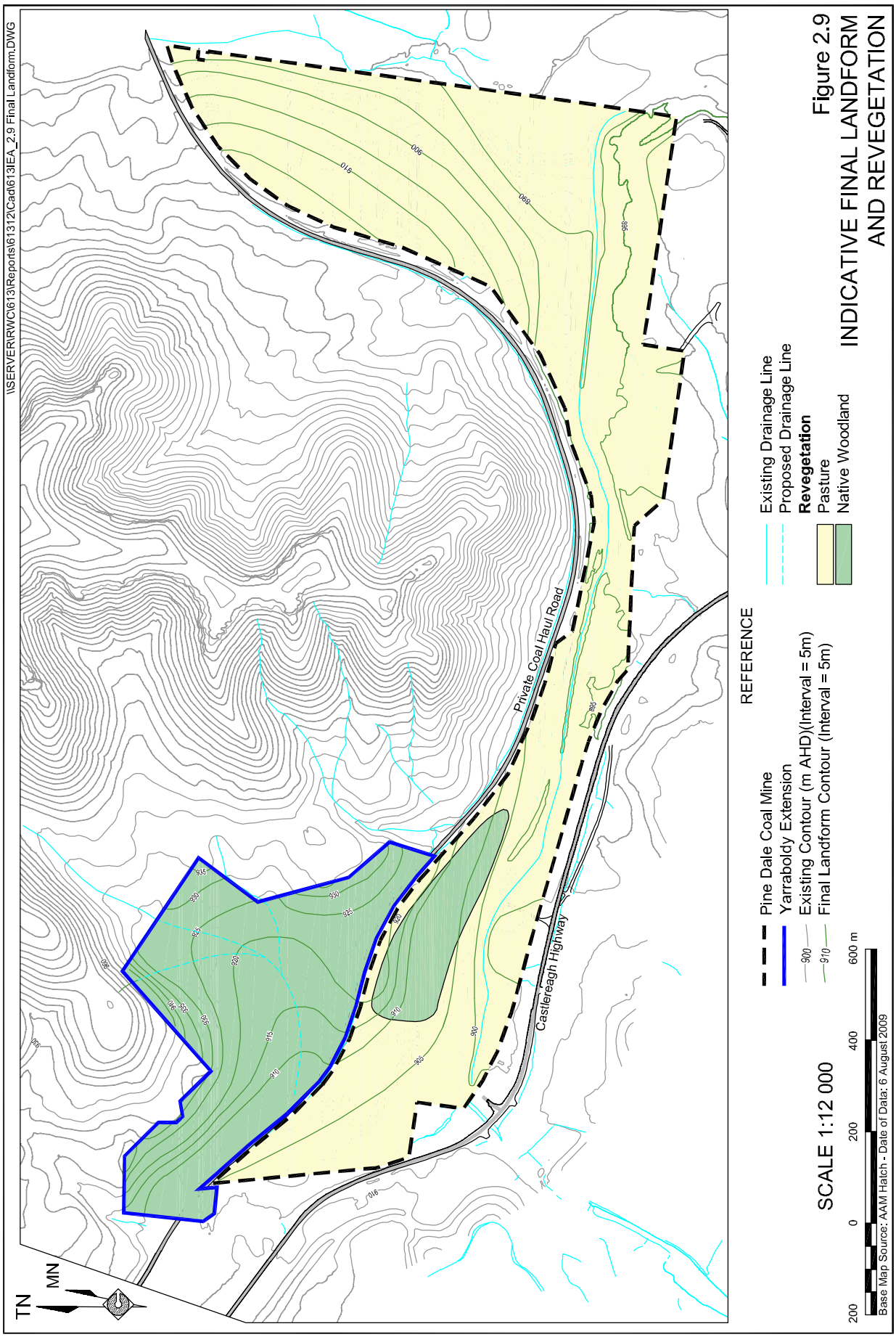
All bitumen and concrete access road or pads would be removed from site and disposed of at an appropriate facility. The areas would then be rehabilitated to blend in with the final landform.

2.12.11 Final Landform

Figure 2.9 illustrates the proposed indicative final landform for the Project in the event that the long-term extension is not approved.

The Proponent would aim to re-create a final landform with features and general characteristics similar to the existing landform including the reconstruction of drainage lines generally in the locations of the pre-mining drainage. The process to create the final landform would typically be as follows.

- As mining areas become available for rehabilitation, interburden and overburden would be preferentially placed at the base of the mining void, in particular any boulders or sandstone followed by any shaley interburden.
- The shaley interburden would then be covered by a minimum of 2m of overburden material (to avoid the potential oxidation of any localised small concentrations of sulphur within the interburden).
- Interburden and overburden would be placed and shaped with bulldozers and excavators so as to largely re-create the pre-mining landform.
- Once shaping is completed, the overburden would be ripped using a suitably sized and stable machine along the line of the contours to break any compacted and/or smooth surfaces (to assist integration of the subsoil and overburden materials).
- All slopes would be water shedding to avoid ponding of water on the surface.


\\SERVER\RWC\613\Reports\61312\Cad\613IEA_2.9 Final Landform.DWG
Figure 2.9
INDICATIVE FINAL LANDFORM AND REVEGETATION
REFERENCE
Pine Dale Coal Mine
Yarraboldy Extension
Existing Contour (m AHD)(Interval = 5m)
Final Landform Contour (Interval = 5m)
Existing Drainage Line
Proposed Drainage Line
Revegetation
Pasture
Native Woodland
Private Coal Haul Road
Castlereagh Highway
SCALE 1:12 000
200 0 200 400 600 m
Base Map Source: AAM Hatch - Date of Data: 6 August 2009
TN
MN

2.12.12 Final Land Use

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

The Yarraboldy Extension area is located predominantly within the footprint of the former Yarraboldy Open Cut Mine which is within the Ben Bullen State Forest. Therefore, the principal aim of the final land use for the rehabilitated area would be for vegetation conservation and the use of I&I NSW – Forests. Ongoing consultation would be undertaken with I&I NSW – Forests and Mineral Resources throughout the rehabilitation process to ensure that the rehabilitation meets their respective requirements.

The area within the existing Pine Dale Coal Mine would be returned to pasture suitable for agricultural purposes consistent with the currently approved rehabilitation plan and landholder preferences.

Figure 2.9 illustrates the indicative rehabilitated vegetation cover within and surrounding the Project Site.

It is noted that the only final land use alternative to restoring the Yarraboldy Extension to vegetation conservation and the use of Forests NSW, would be to provide pasture suitable for agricultural purposes. This final land use has been ruled out, as the land on which the Yarraboldy Extension is situated is predominantly within the Ben Bullen State Forest. Forests NSW would have a preference for the end land use to complement forestry practices in the future. This proposed final land use then also offers the opportunity for vegetation conservation.

2.13 PROJECT ALTERNATIVES

An analysis of any feasible alternatives to carrying out the Project as proposed has been undertaken as part of the Project design and assessment process. The consideration of feasible alternatives to the activities proposed related principally to the size and location of extension area.

As discussed in Section 2.3.4, the location of the Yarraboldy Extension area was selected so as to maximise the inclusion of previously disturbed land and hence minimise the area of vegetation clearing. Populations of *Bursaria spinosa,* which provides habitat for the State and Commonwealth Listed Purple copper butterfly, have also been avoided.

Alternative locations of the extension area could therefore potentially result in additional vegetation clearing or impacts upon fauna habitat. Additionally, alternative locations may not enable the complete rehabilitation of the former Yarraboldy Open Cut Mine.

Larger extension areas were also considered, however, this would also result in additional vegetation clearing and extend the life of the project. The Proponent considers that the current project life provides sufficient time for potential future mining operations to be appropriately assessed and considered.

2.14 POTENTIAL FUTURE MINING ACTIVITY

A significant volume of additional coal reserves are present within the area north of the Pine Dale Coal Mine. Investigations have commenced in order to lodge an additional Project Application for a long-term extension covering an area of approximately 220ha to provide for the continuation of mining to the north of the Yarraboldy Extension area for up to 20 years (see **Figure 1.6**). It is intended that the long-term extension would be developed as an open cut and high-wall mining operation with an annual production between 1.65Mt and 2.5Mt of ROM coal. It is proposed that a coal handling and preparation plant would also be constructed together with re-instatement of the former Wallerawang rail spur from Lidsdale siding with load-out infrastructure. Both washed export quality coal, transported by rail to a sea port, eg. Port Kembla, and domestic quality coal, transported via public and private road, would be produced.