Mining Operations Plan

Rocglen Coal Mine

November 2015 to October 2020

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Whitehaven Coal Limited

Gunnedah NSW

Version: Amendment A

Mining Operations Plan

Rocglen Coal Mine

November 2015 to October 2020

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Rocglen Coal Mine	
Mining Operations Plan	
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Name of Authorisation / Authorisations Holder(s)	Whitehaven Coal Mining Limited
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APPENDICES

1 INTRODUCTION

This Mining Operations Plan (MOP) has been prepared by SLR Consulting Australia (SLR) in conjunction with Whitehaven Coal Limited (Whitehaven) for the Rocglen Coal Mine (Rocglen) in the Gunnedah Basin of northern New South Wales (NSW). It has been prepared in line with Project Approval (PA) 10_0015, which was issued by the former NSW Department of Planning and Infrastructure (DP&I) under Part 3A (now repealed) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on the 27 September 2011 for the Rocglen Coal Mine Extension Project. Modification 1 (MOD 1) to the PA was granted by the Department of Planning and Environment (DP&E) on 10 November 2014.

This MOP has been prepared in accordance with the *Mining Operations Plan (MOP) Guidelines* (Department of Industry, Division of Resources and Energy (DRE, 2013). It has also been prepared to meet the relevant requirements of PA 10_0015, the *Rocglen Coal Mine Extension Project Environmental Assessment* (GSS Environmental 2011), including the Statement of Commitments, and relevant mineral authorities (Mining Lease (ML) 1620 and ML 1662).

The MOP covers the period between **November 2015** and **October 2020**. At this stage the effective end of mine life at Rocglen is 2020. Following consultation between the NSW Department of Industry, Skills and Regional Development – Division of Resources and Energy (DRE) and Whitehaven, it was determined that a MOP covering rehabilitation and closure will be submitted to the DRE in mid - 2016.

1.1 History of Operations

The Rocglen Coal Mine (previously known as Belmont Coal Project) was originally granted PA 06_0198 on 15 April 2008 under Part 3A (now repealed) of the *EP&A Act*. ML 1620 was subsequently issued for the Rocglen operation in June 2008 and coal production commenced in late 2008. In summary, approximately 1.5 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal is approved to be mined within the open cut pit using truck and excavator method. The coal is transported approximately 30 kilometres by road to the Whitehaven Coal Handling and Preparation Plant (CHPP) for selective washing and subsequent transport by rail to the Port of Newcastle or by road to domestic customers.

On 27 May 2010, an approval was issued under Section 75W of Part 3A of the EP&A Act to modify PA 06_0198 (PA 06_0198 MOD 1). This modification permitted Whitehaven to undertake unplanned emergency earthworks to stabilise the eastern highwall following slipping adjacent to a fault structure in the north eastern portion of the approved open cut pit. It was determined that stabilisation works were required to ensure the long-term stability and safety of the highwall, which would in-turn enable on-going extraction efforts at the northern end of the approved open cut.

Following further drilling and definition of the local geological features, as well as additional reviews of the mine plan, Whitehaven proposed to expand operations at Rocglen in order to maximise resource recovery and allow for improved mine progression. Whitehaven received PA 10_0015 on 27 September 2011 under Part 3A of the EP&A Act for the Rocglen Coal Mine Extension Project. Approval was issued for a modification to PA 10_0015 (MOD 1) on 10 November 2014 for the Rocglen Mine Extension Project, with this modification relating to coal haulage. The Rocglen Coal Mine Extension Project has been fully integrated with the previously approved mining operation (PA 10_0015), enabling Whitehaven to operate Rocglen under a single PA over the life of the Project.

ML 1662 was issued on 9 January 2012 to cover the Rocglen Coal Mine Extension Project, specifically the water management and overburden emplacement activities proposed to occur outside the bounds of ML 1620.

Further details regarding the approved operation are provided in **Section 2.1.**

Previous MOPs are listed in **Table 1**. This MOP Amendment (Amendment A) replaces the Rocglen Coal Mine MOP (November 2015 to October 2020). This amendment has been prepared to address changes to sequencing of disturbance and minor updates due reconciliation of domain areas.

Table 1 Rocglen History of MOPs

Mining Operations Plan	Date Granted	Expiry	Status
Rocglen Coal Mine MOP – November 2015 to October 2020	30 October 2015	30 October 2020	Current
Rocglen Extension MOP (as amended)	21 October 2011	30 October 2015	~~Current~~ Superseded
Rocglen MOP (as amended)	12 June 2008	1 October 2012	Superseded

1.2 Relevant Consents, Authorisations and Licences

Table 2 lists the approvals, leases and licences held for Rocglen at the time of MOP preparation.

Table 2 Approvals, Leases and Licences

Regulatory Authority	Instrument	Date of Issue	Expiry Date	Comments
NSW Department of Industry, Skills and Regional Development – Division of Resources and Energy	Exploration Licence EL 5831	06 Apr 2001	5 Apr 2018	Incorporated an area excised for Mining Lease 1620.
	ML 1620	10 Jun 2008	9 Jun 2029	Issued for the original Rocglen Coal Mine Project.
	ML 1662	9 Jan 2012	9 Jan 2033	Issued for the Rocglen Coal Mine Extension Project.
NSW Department of Planning and Environment	PA 10_0015	27 Sep 2011	31 Dec 2022	PA issued for Rocglen Coal Mine Extension Project (the original PA was surrendered). Approval term is until 31 December 2022.
NSW Department of Planning and Environment	PA 10_0015 (MOD 1)	10 November 2014	31 Dec 2022	MOD 1 issued for to allow for a modification to coal haulage.
NSW Department of Planning and Environment	PA 10_0015 (MOD 2)	24 August 2015	31 Dec 2022	MOD 2 issued to allow for changes to receipt of reject.
NSW Environment Protection Authority	EPL 12870	31 Jul 2008	-	Includes two licensed surface water discharge points.
Commonwealth Department of the Environment	Environment Protection and Biodiversity Conservation Act Approval (EPBC 2010/5502)	21 Dec 2011	16 Nov 2025	Approval related to listed threatened species and communities and listed migratory species.

Regulatory Authority	Instrument	Date of Issue	Expiry Date	Comments
Department of Primary Industries – Water (DPI Water)	Water Licences 90BL254855 90BL254856 90BL254857 90BL254858 90BL254859 90BL110883 90BL104367 90BL102845	Various	-	Groundwater monitoring bores.

1.3 Land Ownership and Land Use

1.3.1 Land Ownership

The Rocglen PA Area (see **Plan 1**) covers an area of approximately 460 hectares within the Parish of Tulcumba, County of Nandewar and Local Government Area of Gunnedah. It incorporates all or part of the following land parcels:

- Lot 1 in DP 787417;
- Part Lot 1 in DP 1120601;
- Lot 4 in DP 1120601; and
- Public roads and road reserves.

The schedule of Lands attached to PA 10_0015 is reproduced in **Table 3**.

Table 3 Schedule of Lands

Area	Land Title Reference	Land Ownership
Mine site area, including the proposed Wean Road diversion	Lots 1 and 4 in DP 1120601. Lot 1 in DP 787417.	Freehold (Whitehaven).
Coal haulage route	Lots 23 and 28 in DP 754929. Council roads and road reserves, including: • Shannon Harbour Road (SR 93); • Hoad Lane (SR 95); • Blue Vale Road (SR 7); and • Kamilaroi Highway (SH 29).	Freehold Council / Crown
Wean Road	Wean Road (SR 6).	Council / Crown

Land ownership within and surrounding Rocglen is shown on **Plan 1**. As evident, Whitehaven currently owns all freehold land within the Rocglen PA Area, being Lot 1 in DP 787417 and Lots 1 and 4 in DP 1120601, as well as the surrounding properties identified as “Glenroc”, “Costa Vale”, “Yarrawonga”, “Yarrari”, “Belah”, “Brentry”, “Stratford” and that part of the “Roseberry” property contained within the bounds of Rocglen. The remaining surrounding properties are privately owned.

The Vickery State Forest adjoining Rocglen to the west is owned by the Crown. The remaining land within and surrounding Rocglen occurs as public road reserves.

Rocglen is located in an area that is removed from any urban areas and has a relatively low density of surrounding residences. Within a distance of four kilometres from the external boundaries of Rocglen there are 12 dwellings, six of which are owned by Whitehaven and are hence classified as project-related. The privately-owned "Roseberry" residence is also considered project-related in accordance with a negotiated agreement between the landholder and Whitehaven. Of the non-project related residences, "Retreat" and "Penryn" are the closest residences to the north at approximately four kilometres from the Northern Emplacement Area, and "Surrey" is the closest residence to the south at approximately 3.2 kilometres from the Western Emplacement Area.

Rocglen is located in an area that is relatively isolated from other mining or extractive industry operations. At the time of preparing this MOP, the nearest operational mine is Whitehaven's Tarrawonga Coal Mine at approximately 15 kilometres north-west of Rocglen. Other mines within the vicinity are either closed and rehabilitated (former Vickery Mine), are currently undergoing final rehabilitation (former Canyon Coal Mine) or are yet to commence (approved Vickery Coal Project).

1.3.2 Land Use

Previous and Existing Land Use

The majority of Rocglen, being that area within ML 1620 and ML 1662, is utilised for the open cut coal mining and mining-related activities permitted under PA 10_0015. The majority of the Rocglen PA area has been disturbed by historic land clearing, long-term agricultural production and/or coal mining. Successive years of such disturbance have limited the presence of remnant vegetation to relatively small scattered areas, isolated stands and individual trees.

The Vickery State Forest adjoins Rocglen to the west and is declared under the *Brigalow and Nandewar Community Conservation Area Act 2005* to be within Community Conservation Area (CCA) Zone 4 Vickery. Approximately 3.5 kilometres to the east of Rocglen is the CCA Zone 2 Kelvin. In accordance with the *Brigalow and Nandewar Community Conservation Area Act 2005* this land, which was formally known as the Kelvin State Forest, is reserved under the *National Parks and Wildlife Act 1974* as Aboriginal area.

The Whitehaven Regional BioBank Site provides for the long-term conservation of approximately 1,500 hectares of land owned by Whitehaven to the east of Rocglen. This area of land has been registered as a BioBank Site under Part 7A of the *Threatened Species Conservation Act 1995* (TSC Act). It is being actively managed via a *BioBanking Management Plan* with in-perpetuity management funding, and has the highest level of conservation status outside of National Parks via a *BioBanking Agreement* registered on the land title in-perpetuity.

The remaining land area within the vicinity of Rocglen is characterised by traditional agricultural production comprising a combination of livestock grazing and crop cultivation.

Proposed Land Use

Section 4.2 of this MOP outlines the proposed final land use. The post-mining landform has been developed and refined in order to ensure that a low maintenance, stable and safe landform remains that blends in with the surrounding topography and can support a mixture of rehabilitated bushland with areas of grazing consistent with the pre-mining conditions.

1.4 Stakeholder Consultation

1.4.1 Stakeholders and the Consultative Process

Whitehaven has developed and continues to utilise a number of mechanisms for on-going consultation with local and State government agencies, surrounding residents, the wider community and other relevant stakeholders. These mechanisms were the foundation of the consultation process undertaken throughout all stages of the Rocglen Coal Mine Extension Project assessment and approval process in 2011. The *Rocglen Coal Mine Extension Project EA* (GSSE 2011) and subsequent EA Modification (MOD1) addressed the mine plan on which this MOP is based, along with the proposed mining and rehabilitation activities and proposed environmental management. Stakeholders involved in this consultative process include:

- Whitehaven Coal Limited;
- Federal, State and local government agencies (as they are now known):
  - Commonwealth Department of Sustainability, Environment, Water, Population and Community (SEWPaC);
  - NSW Department of Planning and Environment (DP&I);
  - NSW Office of Environment and Heritage (OEH);
  - NSW Environment Protection Authority (EPA);
  - NSW Department of Primary Industries – Water (DPI Water);
  - NSW Department of Industry, Skills and Regional Development – Division of Resources and Energy (DRE)
  - NSW Roads and Maritime Services (RMS);
  - Namoi Catchment Management Authority (CMA); and
  - Gunnedah Shire Council (Council).
- Registered Aboriginal Parties (RAPs);
- Surrounding residents and the wider community; and
- Service providers, including Essential Energy.

In response to consultation activities, and within the constraints of mine planning and mine optimisation, significant improvements were made to the conceptual post-mining landform. Specific attention was given to the re-shaping and blending of emplacement areas with surrounding landforms, including the adjacent Vickery State Forest, and minimising the size of the final void. No agreements in relation to post-mining land use and rehabilitation are applicable to Rocglen.

Whitehaven will undertake on-going consultation with relevant government agencies and other stakeholders during the preparation and/or revision of management plans and monitoring programs referenced in this MOP. The mechanisms used by Whitehaven for such consultation include, but are not limited to, the following:

- Written, email and verbal correspondences as required;
- Rocglen Community Consultative Committee (CCC), which comprises representatives from local government and the community;
- Community newsletters distributed to surrounding residences as appropriate; and

- Consultation with RAPs in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (NSW Department of Environment, Climate Change and Water 2010).

1.4.2 Rocglen Coal Mine Extension Project Consultations

Extensive stakeholder consultation was undertaken throughout all stages of the Rocglen Coal Mine Extension Project assessment and approval process as described above. Rocglen engaged with the local communities and stakeholder groups to consult regarding issues addressed in this MOP including final land use options and rehabilitation expectations.

Key issues associated with final land use and rehabilitation addressed in the Rocglen Coal Mine Extension Project EA consultation process included:

- The configuration options for the final landform and final void;
- Development of a rehabilitation strategy for the site including the post mining land use and the post mining landforms for the project;
- The proposed methods of rehabilitation, land uses and final landforms in relation to current land uses and landforms;
- Impacts of clearing, access and rehabilitation on the current and proposed long−term land uses;
- Reject disposal and the methods for rehabilitation and long term land uses; and
- Justification of the final landform.

All issues raised in the consultation process for the Project EA were comprehensively addressed in the approval process and are reflected in the commitments in the Project EA Statement of Commitments and PA 10_0015 conditions. Consultation was also undertaken for the Rocglen Coal Mine Extension Project EA MOD 1.

1.4.3 Rocglen MOP Consultation

Complimentary to the extensive consultation undertaken throughout all stages of the Rocglen Coal Mine Extension Project and Whitehaven's on-going consultation activities, specific consultation was undertaken with DRE during the preparation of this MOP. Rocglen have liaised with DRE regarding the final landform prior to submission of the MOP for approval.

2 PROPOSED MINING ACTIVITIES

2.1 Project Description

Whitehaven gained PA 10_0015 in September 2011 to expand operations at the Rocglen Coal Mine in order to maximise resource recovery and allow for improved mine progression. Components of the approved operation are:

- **Land Preparation** – removal of topsoil and subsoil using open bowl scrapers and placement directly onto reshaped overburden emplacement areas awaiting rehabilitation or in designated stockpile areas.
- **Overburden Removal and Placement** – removal of overburden and interburden material from within the open cut pit and transportation to designed out-of-pit emplacement areas and in-pit emplacement areas.
- **Coal Mining by Open Cut Mining Methods** – extraction of coal by open cut mining methods within an area of approximately 164 hectares. This involves the extraction of three separate coal seams, being the Upper Glenroc, Lower Glenroc and Belmont seams, at a production rate up to 1.5 Mtpa.
- **Coal Mining by Auger Mining Methods** – extraction of additional coal reserves that are uneconomical to extract by open cut mining methods using auger mining techniques. No auger mining is planned during the MOP period.
- **On-Site Coal Processing** – transfer of mined coal by haul truck to an on-site coal handling and processing area located immediately south of the limit of open cut pit for crushing, screening and loading into trucks for transport off-site.
- **Transportation** – transportation of crushed and screened coal approximately 30 kilometres to the Whitehaven CHPP for selective washing, stockpiling and dispatch by both rail and road.
- **Rejects Placement** – acceptance of reject material from the Whitehaven CHPP for placement in the mined-out areas of the open cut.
- **Surface Water Management** – operation and maintenance of an engineered surface water management system to ensure the effective management of all surface water on site. This also helps to minimise the risk for any off-site impacts and ensure the water demands of the Project can be met at various stages of the mine life.
- **Progressive Rehabilitation** – progressive rehabilitation of disturbed areas to ensure that, where practicable, completed mining and overburden emplacement areas are quickly shaped, top-dressed and vegetated to provide a stable landform.
- **Removal of "Glenroc" Building Improvements** – removal of the unoccupied "Glenroc" dwelling to cater for the expanded mining operation (to date, outbuildings have been removed, residence still remains).

2.2 Asset Register

The asset register (**Table 4**) provides a summary of the key features of each primary domain (see **Section 5)**, and principal activities required for decommissioning and rehabilitation.

The areas for each domain at the end of the MOP represent the footprint for each domain depicted on **Plan 3E**.

Table 4 Asset Register

Domain	Area (ha)	Major Assets
Domain 1 – Infrastructure	~~32.4~~ 51.6	Infrastructure at site includes: • Workshop; • Administration Area; • ROM pad and plant; • Truck loading bin; • Weighbridge; • Laydown Areas; and • Internal haul roads.
Domain 2 – Overburden and Waste Dumps	~~32.2~~ 32.7	Overburden is blasted and loaded into trucks for transfer and placement in one of the two out-of-pit emplacement areas (Northern and Western Emplacement Areas) or in-pit within completed sections.
Domain 3 – Void/Active Mining Areas	~~106.6~~ 109.0	Open cut mining is undertaken within the MOP footprint. Open cut mining methods involves coal extraction by excavator loading into haul trucks for transport to the ROM stockpile. All mining equipment is to be removed at closure.
Domain 4 – Water Management Areas	~~11.0~~ 12.0	Major water management features at site include: • Mine water dams; • Sediment dams; • Conveyance channels; • Contour banks; and • Drop structures.
Domain 5 – Rehabilitation	~~144.1~~ 139.5	Two post rehabilitation land uses are to be developed at Rocglen, Pasture and Bushland. The western slope and plateau / ridge of both the northern and western emplacement areas will be planted with locally occurring tree and shrub species with the objective of re-establishing bushland areas, while the slopes of the final void, the northern and eastern slopes of the northern emplacement area, and the eastern slopes of the western emplacement areas will be seeded in accordance with the objective of returning the area to pasture.
Domain 6 – Soil Stockpiles	~~9.5~~ 23.3	There are several soil stockpiles shown on **Plan 3E** at the site.

This asset register is intended to provide a suitable level of context for the Rehabilitation Cost Estimate (RCE). The RCE provides for third party rates to undertake the following:

- Decommissioning and demolition of all surface infrastructure;
- Rehabilitation of all areas disturbed by mining as depicted in **Plan 3E** with the exception of some dams that will be retained for post mining use; and
- Mobilisation costs, project management and contingencies.

A copy of the RCE will be submitted to DRE on finalisation of this MOP.

2.3 Activities over the MOP Term

The following section outlines the activities planned at Rocglen throughout the MOP term.

2.3.1 Exploration

No exploration is proposed for Rocglen during the MOP period. Previously Whitehaven has undertaken exploration activities within the Rocglen PA Area for the purposes of geotechnical, geological and hydrogeological investigations.

Following the completion of exploration activities, all disturbed land, including bore holes, access tracks, drill pads and survey lines, are required to be decommissioned and rehabilitated in accordance with requirements of DRE.

2.3.2 Construction

The current and future mining operations will maximise the use of existing infrastructure and facilities, including mine site entrance and internal access roads, site facilities area, coal handling and processing area and water management system, where possible. No construction activities will be undertaken at Rocglen during the MOP term, with the exception of upgrades to the surface water management system which is outlined in **Section 3.2.2** and the *Water Management Plan*.

2.3.3 Land Preparation

Land preparation refers to the sequential clearing of vegetation and stripping of soil material prior to the removal of overburden and subsequent coal extraction. The land preparation activities at Rocglen are illustrated on **Plans 3A** to **3E** and described below.

Vegetation Clearing

Clearing of vegetation during the MOP term will continue to be undertaken using a progressive campaign approach, with the extent of clearing undertaken in each campaign just sufficient for the subsequent year of mine development. Where practical, the clearing campaigns, particularly the removal of trees, will be scheduled in the late summer to autumn period in order to minimise the potential impacts on fauna that may utilise the area scheduled for disturbance.

Clearing of larger vegetation will be undertaken by chainsaw felling or bulldozer pushing. Smaller vegetation, such as pasture, crop stubble and/or shrubs, will be retained and collected with topsoil during soil stripping activities. Where required, weed spraying will be conducted prior to soil stripping activities.

If appropriate, felled logs and branches may be retrieved for farming practices. The remainder will be placed on mined-out surfaces at Rocglen that have been shaped as part of the on-going rehabilitation program and are to be restored to bushland, or stockpiled for use in subsequent rehabilitation activities. The use of the clearing debris in rehabilitation assists in vegetation establishment, provides fauna habitat and assists in reducing erosion. Temporary diversion banks and catch drains will be installed prior to any clearing activities (where necessary) to prevent erosion and sedimentation.

Soil Stripping and Stockpiling

Soil materials at Rocglen will be stripped, handled and stockpiled in a manner that minimises the potential for soil loss and structural deterioration. Topsoil and subsoil will continue to be stripped and transported separately using open bowl scrapers and placed either:

- Directly on mined, backfilled and reshaped areas awaiting rehabilitation; or
- In designated topsoil and subsoil stockpile areas adjacent to the areas of surface disturbance.

The designated Eastern and Western Soil Stockpile Areas (see **Plan 2**) were sited on available and previously disturbed land at Rocglen, with consideration in the annual mine sequencing given to minimising the haul distances for placement and subsequent respreading. Soil windrows have been positioned along the realigned Wean Road to assist in visually screening the mining operations. Positioning of soil windrows as a visual screen will continue during this MOP term.

Topsoil stockpiles will continue to be limited in height to a maximum of three metres. While there is generally no strict requirement on limiting the height of subsoil stockpiles, a maximum height of three metres is good practice.

Whitehaven will continue to implement the following additional handling techniques to minimise soil deterioration, where practicable:

- Soil material will not be stripped in either an excessively dry or wet condition;
- If mining sequencing, equipment scheduling and weather conditions permit, stripped material will be placed directly onto reshaped emplacement areas and spread immediately to avoid the requirement for stockpiling;
- The surface of soil stockpiles will be left coarsely textured in order to promote infiltration and minimise erosion until vegetation is established;
- Where long-term stockpiling is planned (greater than three months) the stockpiles will be seeded and fertilised as soon as possible to reduce erosion loss, improve structure and water permeability, increase soil aeration and assist in maintaining the soil's biological viability. A sterile annual cover crop will be sown. A rapid growing annual pasture species will provide competition for emerging weed species and enhance the desirable micro-organism activity in the soil;
- Prior to re-spreading stockpiled material onto completed mining or overburden emplacement areas, an assessment of weed infestation on stockpiles will be undertaken to determine if individual stockpiles require herbicide application and/or 'scalping' of weed species prior to spreading; and

- Where natural protection from surface runoff flows is not available or achievable, protective earthworks, such as contour banks, and/or straw bale protection will be installed. Silt fencing (or similar) will be installed immediately downslope of any stockpile area potentially susceptible to erosion and maintained until the stockpile is considered stable with an effective vegetation cover.

2.3.4 Mining Operations

Plans 3A to **3E** show the intended annual sequencing of mine development over the MOP term. The annual sequencing of coal mining was developed in order to ensure the efficient mining of coal, minimise haul lengths and permit effective overburden emplacement (both out-of-pit and in-pit) to enable the progressive formation of the post-mining landform and reduce the amount of disturbed land at any one time. Most importantly, the annual mine sequencing was refined in order to ensure that following completion of coal extraction the size of the final void remaining at mine closure is minimised, the low walls and highwall can be appropriately battered and rehabilitated to ensure a stable landform, and is located and shaped to minimise possible geotechnical and safety issues.

Whitehaven will continue to extract coal using the approved open cut mining methods currently used at the site. This involves the extraction of three separate coal seams, being the Upper Glenroc, Lower Glenroc and Belmont Seams, within the open cut pit using haul back mining methods at a production rate of up to 1.5 Mtpa.

Overburden and interburden is generally blasted and then removed by excavators and haul trucks. Where the overburden overlying the uppermost coal seam is sufficiently weathered, it will be ripped and removed by scraper and/or pushed up by bulldozer and loaded into haul trucks by an excavator.

To remove the coal, benches are developed along the length of coal seams by blasting and removal of the overburden and interburden. As sufficient coal is exposed, it is ripped, excavated and transported to the ROM coal pad within the on-site coal handling and processing area.

Mining Equipment

The typical equipment fleet and ancillary equipment used at the operation is listed in **Table 5**.

Table 5 Typical Equipment Fleet

Item	Number	Level/Function
Excavator (Hitachi EX1900)	1	Overburden and coal loading
Excavator (Hitachi EX3600-6)	1	Overburden loading
Excavator 30 tonne	1 (part-time)	Drainage, windrows
Rear Dump Truck (CAT 785)	5	Overburden/coal haulage
Rear Dump Truck (CAT 777F)	3	Overburden/coal haulage
Bulldozer (CAT D10T	2	Overburden/rip/push, clearing, emplacement maintenance
Bulldozer (CAT D11R)	2	Overburden rip/push
Grader (CAT 16M)	1	Road maintenance
Drill Rig Terex SKF50	1	Campaign blasthole drilling
Water Truck (30,000 litre)	1	Dust suppression
Water Truck (15,000 litre)	1	Dust suppression
Crushing Plant	1	Coal size reduction

Item	Number	Level/Function
Wheel Loader (CAT 988H)	2	Feeding/processing plant/product truck loading
Diesel-powered Lighting Tower	12*	Light for evening, night operations
Fuel/Service Truck	1	Equipment refuelling/servicing
Forklift/Tyre Handler	1	Equipment handling

* Not all necessarily in operation at any one time and a number are below ground level

Blasting

Blasting will continue to be undertaken in accordance with Rocglen's *Blast Management Plan,* which incorporates a *Blast Monitoring Program* (June 2013) and was approved by DP&I (now DP&E) on 21 June 2013. These documents were developed on the basis of blasting occurring within the confines of the following limits:

- Blasting may only take place between the hours of 9:00 am and 5:00 pm Monday to Saturday; and
- A maximum of one blast a day on site (unless an additional blast is required following a blast misfire).

Blast design and implementation will continue to be undertaken by a suitably qualified blasting engineer and/or experienced and appropriately certified shot-firer.

Section 3.2.7 contains the environmental mitigation controls and management strategies employed by Whitehaven to minimise blasting and vibration issues/impacts. The *Blast Management Plan* (June 2013) should be referred to for further details.

2.3.5 Overburden Emplacement

Production wastes comprise overburden (including interburden) from the development of the open cut and reject material from processing of coal at the Whitehaven CHPP.

Overburden

Following ripping or blasting, haul trucks will transport the overburden material to the nominated out-of-pit or in-pit emplacement to form the final landform. **Plans 3A** to **3E** shows the location of the two out-of pit emplacement areas, known as the Northern and Western Emplacement Areas.

Prior to mine commencement, representative samples of overburden materials were analysed by the Australian Laboratory Services (ALS) and each sample exhibited a negative Net Acid Producing Potential (NAPP). This indicates that the materials would not be a source of acid leachate generation when exposed. Given this negative NAPP, there are no specific handling and emplacement requirements for these materials.

The location and configuration of the Northern and Western Emplacement Areas have been developed and refined, in conjunction with the annual sequencing of coal extraction and progressive rehabilitation, in order to minimise haul lengths and ensure the entire footprint is maintained upon Whitehaven-owned land, as well as to ensure that the post-mining landform blends in with the surrounding topography.

Northern Emplacement Area

The Northern Emplacement Area is approved to accommodate approximately 12 Mbcm (15 Mlcm) of overburden material. It has an approved footprint of approximately 75 hectares and an approved

maximum elevation of 50 metres above pre-mining landform, which is consistent with the height of the adjacent ridge to the west of Rocglen at around 340 metres AHD. The batter slopes will be maintained at a vertical to horizontal ratio of approximately 1 to 6 (1V:6H), which is approximately 10 degrees.

Minor amounts of overburden emplacement will occur in this area during the MOP term.

Western Emplacement Area

The Western Emplacement Area is approved to accommodate approximately 9 Mbcm (12 Mlcm) of overburden. It has an approved footprint of approximately 75 hectares and an approved maximum elevation of approximately 50 metres above pre-mining landform, which is consistent with the height of the adjacent ridge to the west of Rocglen at around 340 metres AHD. The batter slopes will be maintained at a maximum vertical to horizontal ratio of 1 to 4 (1V:4H), which is 14 degrees.

Overburden emplacement will occur in this area during the MOP term.

In-Pit Emplacement

As described in the mining sequencing in **Section 2.3.4**, during the MOP term, the bulk of the overburden material will be transferred within the active open cut to in-pit emplacement within and over finished areas of the open cut. The in-pit emplacement will eventually connect the Western and Northern Emplacement Areas to form the final landform.

2.3.6 Coal Processing and Transport

The on-site coal handling and processing area covers approximately three hectares and comprises the following key components:

- ROM coal stockpile area/pad;
- Product coal stockpile area/pad;
- Conveyors;
- Coal loading hopper;
- Primary crusher;
- Size reduction screen; and
- Product bin and batch weight system.

The mined coal is transferred by haul truck to the coal handling and processing area located immediately south of the limit of the open cut pit for crushing, screening and loading into trucks for transport off-site to the Whitehaven CHPP. The on-site coal handing and processing area has the capacity to store up to 150,000 tonnes of ROM coal in stockpiles, with a smaller area designated to the stockpiling of crushed coal up to 30,000 tonnes.

ROM coal is either loaded directly into the coal loading hopper or placed in one of several ROM coal stockpiles (representing different quality coal). A front-end loader is used to place coal from the ROM pad into the coal loading hopper for transfer into the crusher, through the size reduction screen and into the product bin. From the product bin, coal is loaded into trucks and transported approximately 30 kilometres to the Whitehaven CHPP for selective washing, stockpiling and dispatch via rail to the Port of Newcastle or via road to domestic customers.

Coal Stockpiles

The on-site coal handing and processing area has the capacity to store up to 150,000 tonnes of ROM coal in stockpiles, with a smaller area designated to the stockpiling of product coal up to 30,000 tonnes.

ROM coal is placed in one of three stockpiles within the coal handling and processing area:

- Clean bypass coal – coal only requiring on-site crushing and screening prior to dispatch;
- CHPP feed coal – coal requiring on-site crushing and screening followed by further beneficiation at the Whitehaven CHPP prior to dispatch; and
- High ash coal – coal generally obtained from the roof or floor of the coal seams and therefore diluted by the adjacent overburden/interburden layer and requiring on-site crushing and screening.

2.3.7 Coal Reject

Reject material from the Whitehaven CHPP will be returned via truck to nearby Whitehaven pits including Rocglen for disposal. All reject material will be co-disposed in the pit void with waste rock material. Methods for disposal may include the construction of small cells within the spoil, mixing of reject material at an active dump or any other method assessed as suitable.

2.3.8 Waste Management

Wastes produced at the mine or CHPP during the reporting period remain unchanged from those identified in the last reporting period and are comprised of:

- General domestic-type wastes from on-site buildings and routine maintenance consumables;
- Oils and other hydrocarbons;
- Sewage;
- Overburden and interburden;
- Coal rejects from any coal preparation undertaken; and
- Mine equipment tyres.

All general wastes are collected on-site and placed into large storage receptacles. A local industrial waste collector collects this waste. The mine maintains a recycling program for office and general recyclables (paper, cardboard, bottles, cans etc.) at the site office and crib room.

Waste oils from maintenance activities are pumped from equipment to bunded bulk storage tanks. When breakdown maintenance is undertaken away from the workshop, oil is pumped from the equipment to a tank on the service truck from which it is subsequently transferred to the bulk storage tank.

Waste oil and filters stored at the maintenance workshop are collected and disposed of by a licensed contractor. Runoff from the concrete vehicle and equipment wash pad is directed to an oil separator and containment system for subsequent pump out and disposal.

Sewage is managed via onsite facilities serviced by licenced contractors. The site is not connected to the mains sewer.

Mine equipment tyres areas disposed of in pit with records of disposal maintained.

Overburden and reject are managed in accordance with **Section 2.3.5** and **Section 2.3.7**, respectively.

2.3.9 Temporary Stabilisation

Temporary stabilisation of areas will be undertaken on an as needs basis during the MOP period. This may include the use of sediment fences for sheet flow over disturbed areas. Temporary seeding of disturbed areas using hydromulch will be considered where areas are to remain disturbed during the MOP period with this acting as an erosion and sediment control.

2.3.10 Progressive Rehabilitation and Completion

During the MOP term, Whitehaven will continue to adopt a progressive approach to the rehabilitation of disturbed areas within Rocglen to ensure that, where practicable, completed mining and overburden emplacement areas are quickly shaped, top-dressed and vegetated to provide a stable landform. The progressive formation of the post-mining landform and the establishment of a vegetative cover will reduce the amount of disturbed land at any one time and also reduce the visibility of mine-related activities from surrounding properties and roads. Early reshaping and revegetation of the external batter slopes of the emplacement areas is particularly important and has been targeted as a priority.

As outlined in **Section 7.2,** disturbed areas will generally undergo rehabilitation within one year of overburden emplacement and reshaping.

By the end of the MOP term approximately ~~141.1~~ 139.5 ha of Rocglen would be in a phase of rehabilitation.

2.3.11 Material Production Schedule

The material production schedule for the duration of the MOP period is listed in **Table 6**.

Table 6 Material Production Schedule during the MOP Term

Material	Unit	Year 1 (November 2015 – October 2016)	Year 2 (November 2016 – October 2017)	Year 3 (November 2017 – October 2018)	Year 4 (November 2018 – October 2019)	Year 5 (November 2019 – October 2020)
Stripped topsoil	m^3	40,000	40,000	40,000	40,000	
Overburden	Mbcm	4	4	4	4	3
ROM Coal						
Upper Glenroc Seam	Mt	0.1	0.1	0.05		
Lower Glenroc Seam	Mt	0.1	0.1	0.05	0.7	0.6
Belmont Seam	Mt	0.8	0.8	0.7		
Total	Mt	1.0	1.0	0.8	0.7	0.6
Coarse/Fine Reject	Mt	0.7	0.7	0.7	0.7	0.7
Product Coal	Mt	0.8	0.8	0.6	0.6	0.5

3 ENVIRONMENTAL ISSUES MANAGEMENT

3.1 Environmental Risk Assessment

To identify activities, processes and facilities within Rocglen that require control strategies to ensure environmental protection and compliance with lease, licence and PA conditions, an Environmental Risk Assessment (ERA) was carried out for the preparation of the EA. The risk assessment process was undertaken in accordance with the frameworks detailed in *Australian Standard/New Zealand Standard (AS/NZS) 31000:2009 Risk Management – Principles and Guidelines*, *MDG1010 Risk Management Handbook for the Mining Industry* (NSW Department of Primary Industries 1997) and *Handbook (HB) 203: 2006 Environmental Risk Management – Principles and Process* (Standards Australia/Standards New Zealand 2006).

The completed risk assessment is provided in **Appendix B** while **Section 3.2** provides proposed risk management measures for the site.

The assessment identified 15 risks, with these identified as low risks based on current controls. The risk assessment was prepared to be in accordance with the risks to rehabilitation section from the MOP guidelines.

3.2 Environmental Risk Management

Rocglen has an established Environmental Management System (EMS) which provides a framework to ensure the effective management of environmental issues and compliance with regulatory requirements for all mining and mining-related activities of the Rocglen operation. It also provides a means for continued improvement in environmental performance.

As part of this EMS, a comprehensive set of approved environmental management plans has been developed and implemented at Rocglen in accordance with the PA 10_0015 and EPL 12870. These plans are reviewed and updated, as necessary, to reflect operational changes and incorporate additional/amended requirements.

The environmental management plans are backed by an environmental monitoring network, which includes monitoring of meteorological conditions, air quality, noise, blasting, surface water and groundwater. Monitoring results are reported to the Rocglen CCC, in the AEMR/Annual Review and EPL Annual Return. Monthly EPL monitoring data is also published on the Whitehaven website.

At the time of preparing this MOP, the environmental management plans and monitoring programs implemented at Rocglen included:

- *Environmental Management Strategy;*
- *Heritage Management Plan;*
- *Blast Management Plan* (incorporating a *Blast Monitoring Program*);
- *Noise Management Plan* (incorporating a *Noise Monitoring Program*);
- *Road Traffic Noise Management Plan;*
- *Road Closure Management Plan;*
- *Water Management Plan;*
- *Air Quality and Greenhouse Gas Management Plan;*
- *Blast Management Plan; and*
- *Whitehaven Regional Biodiversity Offset Management Plan.*

Current versions of management plans are available on the Whitehaven website. The environmental management controls within the below sub-sections have been primarily drawn from the EA Statement of Commitments, along with PA 10_0015, EPL 12870 and the above listed management plans.

3.2.1 Air Quality and Greenhouse Gas

Air quality and greenhouse gas at Rocglen will continue to be managed in accordance with the approved *Air Quality and Greenhouse Gas Management Plan* (including a monitoring program) prepared in accordance with Condition 17 of Schedule 3 of PA 10_0015. The air quality criteria for Rocglen, are outlined in the *Air Quality and Greenhouse Gas Management Plan.* Key air quality controls are outlined in the headings below:

Vegetation Clearing and Soil Stripping

- Cleared trees and branches will be retained for use in stabilising slopes identified for restoration of rehabilitated woodland.
- Where practicable, soil stripping will be undertaken when there is sufficient soil moisture to prevent dust lift-off and at times that avoid periods of high winds.
- Land disturbance, including groundcover removal, will be limited in advance of mining activities consistent with operational requirements.
- Groundcover will be removed with the topsoil, as opposed to prior to topsoil removal.
- Where long-term stockpiling of soil materials is planned (typically greater than three months) the stockpiles will be seeded and fertilised as soon as possible.

Drilling and Blasting Activities

- Water injection will be used on the drilling rig.
- Coarse aggregates will be used for blast hole stemming at all times.
- Where practicable, blasting will be restricted during unfavourable weather conditions.
- When necessary, dust aprons will be lowered during on-site drilling.

Overburden Ripping and Placement

- Where practicable, ripping of softer overburden material will be avoided during high wind periods.

Crushing and Screening

- When necessary, water will be applied to the coal at the feed hopper, crusher and at all conveyor transfer and discharge points. No coal processing is undertaken at site.
- Some flexibility does exist to enable cessation of coal processing activities during periods of concurrent high winds and temperatures that have the potential to cause coal dust dispersal independent of water applications.

Internal Transport

- As required, internal roads will be watered, with emphasis on those subject to frequent trafficking.
- The speed of all on-site vehicles and equipment will be restricted.
- All internal roads will be clearly defined to control their locations.
- As roads within Rocglen become obsolete, they will be promptly ripped and revegetated.

External Transport

- All trucks hauling product coal and coal rejects between Rocglen and the Whitehaven CHPP will be required to be fitted with roll-over tarpaulins.
- All trucks transporting coal will be well maintained to ensure optimal operation, which will minimise the potential for noise emissions.

Monitoring

Air quality monitoring will continue to be undertaken at Rocglen in accordance with the approved *Air Quality and Greenhouse Gas Management Plan* throughout the MOP term.

Greenhouse Gas Management

Rocglen forms part of the Whitehaven Group's National Greenhouse and Energy Reporting Scheme (NGERS) reporting requirements.

3.2.2 Surface Water (including Erosion and Sedimentation)

Surface water at Rocglen will continue to be managed in accordance with the approved *Water Management Plan*, which includes a *Surface Water Monitoring Program* and an *Erosion and Sediment Control Plan*. These documents have been prepared in compliance with *Managing Urban Stormwater Volume 1: Soils and Construction* (Landcom 2004) (the "Blue Book") and *Managing Urban Stormwater Volume 2E: Mines and Quarries* (DECC 2008). The surface water criteria adopted at Rocglen, along with the surface water mitigation and management measures that will be implemented during the MOP term are summarised below.

General

- All efforts will be undertaken to ensure that any water discharged from Rocglen via the licenced discharge points (LDPs) meets the quality limits imposed on the site's EPL.
- Dirty water generated from disturbed areas will be captured and diverted using contour banks and drop structures in a manner that minimises the potential for concentrated overland flow and subsequent erosion. This water will be channelled through a series of sediment basins to reduce sediment loads prior to discharge.
- Water generated within the open cut pit, primarily as a result of rainfall/runoff and some groundwater seepage, will be managed within the open cut via in-pit sumps. This water will be directed to and contained within these in-pit sumps until it is necessary to pump the water to the Mine Water Dam (constructed as a 'turkeys nest' to receive mine water only).
- Clean water diversions will be used wherever possible upstream of disturbance areas to minimise the amount of dirty water to be contained and treated within the dirty water management system.
- Progressive rehabilitation of all re-shaped surfaces will be undertaken to assist in reducing the total suspended solids (and possible high pH and salinity) in runoff from disturbed areas. This will also reduce the dependence on sediment controls and generally assist in improving water quality.
- Water collected in the open cut extraction pit and/or dirty water dams will be used, as much as possible, for dust suppression purposes. This is the preferential use of water on-site to minimise the chance of pollution to downstream waterways.
- Sediment control structures will be maintained to ensure the design capacities are preserved for optimum settling rates. This will be most critical for those 'end-of-line' sediment basins that discharge from Rocglen.

- Drainage lines impacted upon by the mining operation will be rehabilitated post-mining generally in accordance with Section 5.3.3 of *Managing Urban Stormwater Volume 1: Soils and Construction* (Landcom 2004) and the *Guidelines for Controlled Activities – In-Stream Works* (DWE 2008) for watercourse rehabilitation and riparian zone rehabilitation.
- Controlled discharge of treated water (settled and/or flocculated) will be undertaken to draw down the water storage within all the dirty water dams on-site, which will provide the capacity to contain the majority rainfall events and reduce uncontrolled overflow discharge.

Monitoring

Surface water monitoring will continue to be undertaken at Rocglen in accordance with the approved *Surface Water Monitoring Program* (part of the *Water Management Plan)* throughout the MOP term. Water monitoring results will be reported to the Rocglen CCC and in the AEMR/Annual Review and EPL Annual Return. Any exceedance of the surface water quality criteria at the licensed discharge points will be reported to the relevant agencies in accordance with the *Water Management Plan*.

3.2.3 Groundwater

Groundwater at Rocglen will continue to be managed in accordance with the approved *Water Management Plan*, which includes a *Groundwater Monitoring Program*. The groundwater mitigation and management measures that will be implemented during the MOP term are summarised below.

General

- All hydrocarbon products will be securely stored.
- With the exception of some maintenance activities on mobile equipment, all maintenance works requiring the use of oils, greases and lubricants would be undertaken within designated areas of Rocglen.
- All water from wash-down areas and workshops would be directed to oil/water separators and containment systems.
- All storage tanks will be either self-bunded tanks or bunded with an impermeable surface with a capacity to contain a minimum of 110 percent of the largest storage tank capacity.

Monitoring

Groundwater monitoring will continue to be undertaken at Rocglen in accordance with the approved *Groundwater Monitoring Program* (part of the *Water Management Plan)* throughout the MOP term. Monitoring of groundwater levels, conductivity and pH will continue to be undertaken on a quarterly basis, with other chemical parameters monitored bi-monthly. Water monitoring results will be reported to the Rocglen CCC and in the AEMR/Annual Review and EPL Annual Return.

3.2.4 Land Contamination

The mitigation and management measures that will be implemented during the MOP term to minimise the risk of land contamination are summarised below.

General

- See General controls listed in **Section 3.2.3**.

Waste Oils and Grease

- Waste oils and grease from routine maintenance of mining and earthmoving equipment will be removed from the equipment to bunded storage tanks by oil evacuation pumps.

- Waste oils and grease stored at the maintenance workshop will be collected by a licensed waste recycling contractor approximately once every two months.

Hydrocarbon-Contaminated Water

- Any hydrocarbon-contaminated water will be collected in the oil/water separator and regularly removed from site by a licensed contractor.

3.2.5 Acid Mine Drainage

Prior to mine commencement, representative samples of overburden materials were analysed by the Australian Laboratory Services (ALS) and each sample exhibited a negative Net Acid Producing Potential (NAPP). This indicates that the materials would not be a source of acid leachate generation when exposed. On this basis, acid mine drainage is not considered a potential risk during the MOP term.

3.2.6 Flora and Fauna

The mitigation and management measures that will be implemented during the MOP term to minimise the risk of impact to threatened flora and fauna, including threatened species habitat and ecological communities, are summarised below.

General

- All efforts will be made to avoid disturbance of the vegetation communities within Rocglen and to maintain and enhance as much of the existing remnant vegetation on-site as possible.
- The minimal practicable amount of clearing will be undertaken as a general objective, particularly within those areas that currently contain identified threatened species or ecological communities.
- Weed control practices will be implemented to minimise the spread of exotic species.
- A tree felling protocol will be implemented in order to minimise harm to fauna species during clearing activities.
- Where possible, tree felling will be supervised by a suitably qualified and experienced ecologist.
- Where trees are to be removed an assessment of the surrounding level of tree hollow provision will be undertaken by a suitably qualified and experienced ecologist in order to determine the need for local supplementing of tree hollows (using salvaged tree hollows or nest boxes).
- Mature and hollow-bearing trees will be retained wherever feasible within the site.
- Vegetation to be removed will be clearly marked in the field using temporary fencing (flagging tape or similar) so that the boundaries are clearly established and to minimise the potential for equipment to accidently enter areas to be retained.
- Regular monitoring of the vegetation within Rocglen will be undertaken in order to enable effective management with regards to rehabilitation (planting), regeneration, watering, fencing and weed control.
- Specialist ecologists will be engaged to conduct pre-clearing inspections for fauna impact mitigation, as required.

Weed Control

- Control practices implemented to minimise the spread of weed species will include:
  - Campaign weed spraying prior to the stripping of topsoil;
  - Equipment coming to site to be clean and free of soil/plant material prior to entry, or subject to clean down at the workshop facilities area;

- Herbicide spraying or scalping weeds off topsoil stockpiles prior to re-spreading; and
- Rehabilitation inspection to identify potential weed infestations.

Fauna Monitoring

Fauna monitoring will continue to be undertaken at Rocglen and is currently completed annually by a qualified ecologist with results reported in the AEMR/Annual Review.

3.2.7 Blasting and Vibration

Blasting and vibration at Rocglen will continue to be managed in accordance with the approved *Blast Management Plan* prepared in accordance with Condition 12 of Schedule 3 of PA 10_0015. The blasting and vibration criteria adopted at Rocglen, along with the mitigation and management measures that will be implemented during the MOP term, are summarised below.

Road Closures

- For all blasts within 500 metres of Wean Road, the road will be closed (typically for a period of 10 minutes) with blast notice boards updated at least 24 hours prior to each blast.
- Wean Road will be inspected following the blast and any rock fragments removed prior to re-opening.
- The distance flyrock travels (if any) beyond the designed blast envelope will be monitored to identify if further safeguards are required.

Consultation

- Landholder notification of proposed blasting will be undertaken in accordance with the Blast Management Plan.
- Blast notice boards are updated for each blast.

Monitoring

Blast monitoring will continue to be undertaken at Rocglen in accordance with the approved *Blast Management Plan* throughout the MOP term. Blast monitoring results will be reported quarterly to the Rocglen CCC and annually in the AEMR/Annual Review and EPL Annual Return. Any exceedances of the criteria will be reported to the relevant agencies in accordance with Condition 6 of Schedule 5 of PA 10_0015 and condition R2 of the EPL 12870.

3.2.8 Noise

Noise emissions at Rocglen will continue to be managed in accordance with the approved *Noise Management Plan* (incorporating a *Noise Monitoring Program*) and *Road Traffic Noise Management Plan prepared in accordance with PA 10_0015*. The noise criteria adopted at Rocglen, along with the noise mitigation and management measures that will be implemented during the MOP term, are detailed in the *Noise Management Plan.*

General Operation

- Employees, contractors and sub-contractors will be advised of noise compliance limits prior to their work commencing. Employees, contractors and sub-contractors will be expected to take practical measures to limit noise generation during their activities where possible.
- Prior to being brought on-site, all earthmoving equipment will be tested to ensure sound power levels are consistent with the previous assessments undertaken for the EA.
- Site personnel will be required to pay due attention to site weather conditions and modify or stand down from operational activities if directed by mine management.

- Where possible, equipment with lower sound power levels will be used on site in preference to more noisy equipment.
- All equipment used on-site will be regularly serviced to ensure the sound power levels remain at or below the levels used in the modelling undertaken by Acousticians.
- Mid-high frequency reverse beepers are fitted to on-site mobile mining equipment.
- The on-site road network will be maintained to limit vehicle body noise.

External Transport

- All transport activities, including coal haulage between Rocglen and the Whitehaven CHPP, will continue to be undertaken strictly in accordance with the PA.
- The haul route between Rocglen and the Whitehaven CHPP is fully sealed and will continue to be maintained under an existing contribution plan with Council.
- Drivers will be instructed to operate in accordance with the *Transport Policy* and *Code of Conduct*, which identify aspects such as travelling speeds, general behaviour, avoidance of exhaust brakes, load coverage, complaints and disciplinary procedures.
- All trucks transporting coal will be well maintained to ensure optimal operation, which will minimise the potential for noise emissions.

Monitoring

Noise monitoring will continue to be undertaken at Rocglen in accordance with the approved *Noise Monitoring* Program (part of the *Noise Management Plan*) throughout the MOP term. Noise monitoring results will be reported to the Rocglen CCC and in the AEMR/Annual Review and EPL Annual Return. Any exceedances of the criteria will be reported to the relevant agencies and any affected landowners in accordance with PA 10_0015 and EPL 12870.

3.2.9 Visual Amenity and Lighting

The mitigation and management measures that will be implemented during the MOP term to protect visual amenity and minimising lighting impacts are summarised below.

- A progressive approach to the rehabilitation of disturbed areas will be adopted to ensure that, where practicable, completed mining and overburden emplacement areas are quickly shaped, top-dressed and vegetated.
- Strategically placed bushland tree lots will be integrated into the post-mining landform to break-up the landform and provide visual texture.
- A vegetated earthen bund of appropriate height will be maintained between the realigned Wean Road and the active pit area to provide an effective visual screen from Wean Road. In addition, a strip of bushland will be maintained in the post-mining landform to screen the view of the final void and generally improve the visual amenity from Wean Road.
- The requirements of the *Australian Standard AS 4282 1997 – Control of Obtrusive Effects of Outdoor Lighting* will be taken into consideration when placing lights required when working outside of daylight hours.

3.2.10 Heritage (Aboriginal and Non-Indigenous)

Aboriginal cultural heritage and non-Indigenous heritage will continue to be managed in accordance with the approved *Heritage Management Plan*.

Aboriginal Heritage

Field survey undertaken in 2010 by RPS archaeologists, together with site officers of four local RAP's, for the Rocglen Coal Mine Extension Project identified three stone artefact sites:

(i) RPS Rocglen IF1 – a chalcedony flake with a banded quartz vein located within a large cluster of eucalypt trees. This site was unable to be located during a salvage and has been left in-situ;

(ii) RPS Rocglen AS1 – scatter containing flake pieces comprising mudstone, chert and grey silcrete located in an area of exposed B Horizon soils. This site has since been salvaged; and

(iii) RPS Rocglen AS2 – scatter containing flaked pieces of greenstone and chert located in exposed soils adjacent to an inundated area. This site has since been salvaged.

In addition, two scarred trees identified on the AHIMS as NPWS #20-4-0195 and NPWS #20-4-0194, recorded by Appleton (2007), are located on the eastern side of Wean Road reserve.

The location of the three stone artefact sites and the two scarred trees is shown on **Plan 1C**.

The Aboriginal heritage impact mitigation and management measures that will be implemented during the MOP term are summarised below.

- Liaison will continue to be undertaken with the RAP's and other interested parties until all issues in relation to the management of Aboriginal cultural heritage have been resolved.
- All efforts will be made to minimise disturbance within Rocglen.
- If it is suspected that Aboriginal cultural heritage material has been encountered, work will cease immediately in that locale. The EPA and relevant Aboriginal stakeholder groups will be notified. Works will only recommence when an appropriate and approved management strategy has been agreed to by all of the relevant stakeholders.
- In the event that skeletal remains are uncovered during operations, work will stop in the vicinity immediately and the NSW Coroner's Office and NSW Police contacted. If skeletal remains are deemed to be of Aboriginal origin, a representative of the local Aboriginal Community and the EPA will be consulted.

Non-Indigenous Heritage

No non-Indigenous heritage items were identified during the field surveys and investigations for the Rocglen Coal Mine Extension Project. However, the following mitigation and management measures will be implemented during the MOP term:

- The approved *Heritage Management Plan* will continue to be implemented.
- If a potentially significant non-Indigenous heritage material is uncovered during site works, work will cease in that area immediately. An archaeologist will be contacted to assess the significance of the remains and works will only recommence when an appropriate and approved management strategy is instigated.

3.2.11 Spontaneous Combustion

The coal at Rocglen has a low percentage of inorganic sulphur and hence a low potential for exothermic oxidation reactions. The short residence time of ROM coal stockpiles at the mine also minimises the potential for spontaneous combustion incidents.

The mitigation and management measures that will be implemented during the MOP term to further minimise the potential for spontaneous combustion are summarised below.

- Any observed indications of spontaneous combustion will be investigated by excavation to identify and extinguish the source via water saturation with the sites water cart or fire tender.
- Should any outbreaks of spontaneous combustion occur during mining operations, details on the materials involved, presence of pyrites, location, date, time and climatic conditions will be recorded on surveyed plans.
- Accumulations of coal, coal rejects and other carbonaceous material will be buried under a minimum of three metres of inert overburden material.

3.2.12 Bushfire

The mitigation and management measures that will be implemented during the MOP term to minimise the potential for bushfire hazard and/or incidents are summarised below.

- The existing firebreaks around Rocglen will be appropriately maintained in consultation with the NSW Rural Sire Service.
- Fire-fighting equipment, as well as earthmoving equipment and a water truck, will be maintained on site.
- Vegetation will be cleared away from around blast sites for a distance of greater than 20 metres.
- Blast design and implementation will be undertaken by a suitably qualified blasting engineer and/or experienced and appropriately certified shot-firer.
- Water truck/cart will be available to douse any fire ignited or smouldering vegetation.
- Refuelling will be undertaken within designated fuel bays or within cleared area of Rocglen.
- No smoking policy will be enforced in designated areas of Rocglen.
- Fire extinguishers will be maintained within site vehicles.
- Coal stockpiles will be are regularly inspected and, as required, watered.
- Regular consultation will be undertaken with the Forestry Corporation of NSW (NSW Forests) and NSW Rural Fire Service, including in relation to the bushfire hazard presented by the adjacent Vickery State Forest.

3.2.13 Traffic and Transport

The mitigation and management measures that will be implemented during the MOP term to minimise the potential for traffic-related issues are summarised below:

- Coal transportation will be undertaken via the approved haulage route between Rocglen and the Whitehaven CHPP.
- Coal transportation will be undertaken between the approved hours of 7:00 am and 9:15 pm Monday to Friday, and between 7:00 am and 5:15 pm on Saturdays.
- On school days, the two-way radio communication system will be maintained between the truck drivers and the local school bus driver to ensure that the trucks do not exceed 40 kilometres per hour when travelling in the vicinity of the school bus.
- All trucks transporting coal from the mine and back-loading reject from the Whitehaven CHPP will be well maintained to ensure optimal operation and will be required to be covered with fitted roll-over tarpaulins.
- Drivers will be instructed to operate in accordance with the *Transport Policy* and *Code of Conduct*, which identify aspects such as travelling speeds, general behaviour, avoidance of exhaust brakes, load coverage, complaints and disciplinary procedures.

- The on-going use of the road network will be covered under the arrangements of the existing road maintenance agreement with Gunnedah Shire Council to ensure the subject roads continue to be adequately maintained.

3.3 Specific Risks Relating to Rehabilitation

Whilst all risks to rehabilitation have been assessed as low, the following sections describe key risks to rehabilitation identified at Rocglen. The full risk assessment is attached to **Appendix B** which also outlines the key controls..

3.3.1 Topsoil Suitability and Availability

Topsoil management is outlined in **Section 2.3.3** and has not been repeated in this section. The main control relating to topsoil management for rehabilitation is that all topsoils intended for re-use in agricultural rehabilitation areas will be further assessed prior to stripping to determine their suitability for re-use and determine specific amelioration requirements.

3.3.2 Erosion and Sediment Control

Erosion and sediment control is outlined in **Section 3.2.2** and has not been repeated in this section.

Erosion and sedimentation will continue to be managed in accordance with the approved *Water Management Plan,* which includes an *Erosion and Sediment Control Plan*. The documents have been prepared in compliance with *Managing Urban Stormwater Volume 1: Soils and Construction* (Landcom 2004) and *Managing Urban Stormwater Volume 2E: Mines and Quarries* (DECC 2008).

3.3.3 Geotechnical

To ensure the ongoing stability of the slopes that are to be retained post closure, an appropriately qualified geotechnical engineer is consulted to provide input into the mine design. In addition to this, routine inspections are undertaken in conjunction with geotechnical monitoring.

4 POST MINING LAND USE

4.1 Regulatory Requirements

Regulatory requirements for post mining land use and rehabilitation, and where they relate to, as stipulated in Rocglen's PA 10_0015 (including the Statement of Commitments from the Project's EA), EPBC Approval 2010/5502 and mineral authorities at the time of MOP preparation, are listed in **Table 7.**

This MOP has been developed to meet the requirements of Conditions 3(34) to 3(36) of PA 10_0015.

Table 7 Regulatory Requirements for Rehabilitation

<table>
<tr><th>Source</th><th>Domain</th><th>Condition</th><th>Section Addressed</th></tr>
<tr><td colspan="4">PA 10_0015</td></tr>
<tr><td>Condition 34 Schedule 3</td><td>All Domains</td><td>Rehabilitation Objectives
The Proponent shall rehabilitate the site to the satisfaction of the Executive Director, Mineral Resources in DRE. This rehabilitation must be generally consistent with the proposed rehabilitation strategy described in the EA (and depicted conceptually in Figure 1 in Appendix 5), and comply with the objectives in Table 8.
Table 8: Rehabilitation Objectives
<table>
<tr><th>Feature</th><th>Objective</th></tr>
<tr><td>Mine site (as a whole)</td><td>Safe, stable and non-polluting</td></tr>
<tr><td>Final void</td><td>- Minimise the size and depth of the final void as far as is reasonable and feasible; and
- The final void is to be safe, stable and non-polluting</td></tr>
<tr><td>Surface infrastructure</td><td>To be decommissioned and removed, unless the Director-General agrees otherwise</td></tr>
<tr><td>Other land affected by the project</td><td>Restore ecosystem function, including maintaining or establishing self-sustaining eco-systems comprised of:
- local native plant species;
- at least 206 hectares of woodland (see Figure 1 in Appendix 5); and
- a landform consistent with the surrounding environment</td></tr>
<tr><td>Community</td><td>Minimise the adverse socio-economic effects associated with mine closure</td></tr>
</table></td><td>Section 5.2</td></tr>
</table>

Source	Domain	Condition	Section Addressed
Condition 35 Schedule 3	All Domains	**Progressive Rehabilitation** The Proponent shall carry out the rehabilitation of the site progressively, that is, as soon as reasonably practicable following disturbance.	Section 7.2
PA10_0015 Appendix 7 Statement of Commitments	All Domains	**Soil Stripping, Stockpiling and Re-Spreading** (h) A soil inventory will be maintained to ensure adequate material is available for planned rehabilitation activities.	Section 2.3.3
PA10_0015 Appendix 7 Statement of Commitments	Domain 6	**Soil Stripping, Stockpiling and Re-Spreading** (j) Whitehaven will adopt the general practice, where appropriate subsoil is available and targeting areas being rehabilitated to pasture, of including an intermediate layer of subsoil between the overburden material and the topdressing to improve the water holding capacity of the rehabilitated landform and reinstate a more natural soil profile. For areas being rehabilitated to bushland, Whitehaven may preferentially reduce the subsoil replacement depth and/or exclude subsoil replacement in selected areas to establish trial areas to monitor bushland development in different soil profiles.	Section 2.3.3
PA10_0015 Appendix 7 Statement of Commitments	Domain 6	**Soil Stripping, Stockpiling and Re-Spreading** (k) Where resources allow, topsoil and subsoil will each be spread to a nominal depth of between 100 to 150 mm, giving a combined depth of soil material on the rehabilitated landform of between 200 and 300 mm.	Section 2.3.3
PA10_0015 Appendix 7 Statement of Commitments	Disturbance Areas Domain 1, 2 and 3	**Progressive Rehabilitation** (a) Whitehaven will adopt a progressive approach to the rehabilitation of disturbed areas within the Project Site to ensure that, where practicable, completed mining and overburden emplacement areas are quickly shaped, top dressed and vegetated to provide a stable landform. Early reshaping and revegetation of the external batter slopes of the emplacement areas is particularly important and will be targeted as a priority.	Section 7.2
PA10_0015 Appendix 7 Statement of Commitments	Disturbance Areas Domain 1, 2 and 3	**Progressive Rehabilitation** (b) Disturbed areas will generally undergo rehabilitation within one year of overburden emplacement and reshaping.	Section 7.2
PA10_0015 Appendix 7 Statement of Commitments	Domain 4	**Drainage and Surface Water Structure Installation** (g) Surface water management structures will be progressively installed on the rehabilitated landform. The heights (effective depths) and cross-sectional areas of the individual banks will be determined on the basis of individual sub-catchment areas, but will typically be less than 0.7 metres and 3 square metres (m^2), respectively. Rock-lined drains will be used, where required, to convey water safely from the rehabilitated landform into the surface water management system that takes water from the site.	Section 3.2.2

Source	Domain	Condition	Section Addressed
PA10_0015 Appendix 7 Statement of Commitments	Disturbance Areas Domain 1, 2 and 3	**Revegetation** (h) The top dressed surfaces of those areas designated to be restored to rehabilitated pasture will be sown with a mixture of pasture species appropriate for the season. The seed mixture will include fast growing, short-lived species and perennial grasses and legumes.	Section 7.2
PA10_0015 Appendix 7 Statement of Commitments	Disturbance Areas	**Revegetation** (i) The top dressed surfaces of those areas designated to be restored as rehabilitated bushland will be initially stabilised with a non-persistent cover crop followed by planting of a selection of locally occurring tree and shrub species that will encourage the re-establishment of the pre-mining vegetation communities and, in the medium to longer term, create habitat and corridors for native fauna.	Section 7.2
PA10_0015 Appendix 7 Statement of Commitments	Domain 1, 2 and 3	**Revegetation** (j) All areas identified for bushland and pasture re-establishment will be fenced and have stock excluded until it can be demonstrated that the vegetation is stable and self-sustaining, and that grazing will not impact upon its establishment.	Section 7.2
PA10_0015 Appendix 7 Statement of Commitments	Domain 5	**Rehabilitation Monitoring and Maintenance** (k) Areas being rehabilitated will be regularly inspected and assessed against the long and short-term rehabilitation objectives. During regular inspections, aspects of rehabilitation to be monitored will include: - Evidence of any erosion or sedimentation from areas with establishing vegetation cover; - Success of initial grass cover establishment; - Success of tree and shrub plantings; - Adequacy of drainage controls; - Presence/absence of weeds; and - General stability of the rehabilitation site.	Section 8.1
PA10_0015 Appendix 7 Statement of Commitments	Domain 5	**Rehabilitation Monitoring and Maintenance** (l) Where the rehabilitation success appears limited, maintenance activities will be initiated. These may include re-seeding and where necessary, re-topdressing and/or the application of specialized treatments such as composted mulch to areas with poor vegetation establishment. Tree guards will be placed around planted tube stock if grazing by native animals is found to be excessive.	Section 8.1
PA10_0015 Appendix 7 Statement of Commitments	Domain 5	**Rehabilitation Monitoring and Maintenance** (m) If drainage controls are found to be inadequate for their intended purpose or compromised by grazing stock or wildlife, these will be repaired and/or temporary fences installed to exclude animals. Should areas of excessive erosion and sedimentation be identified, remedial works such as importation of additional fill, soil material and/or the redesigning of water management structures to address erosion will be undertaken.	Section 8.1

Source	Domain	Condition	Section Addressed
PA10_0015 Appendix 7 Statement of Commitments	Domain 5	**Rehabilitation Monitoring and Maintenance** (n) Monitoring will be conducted periodically by independent, suitably skilled and qualified persons at locations that are representative of the range of conditions on the rehabilitating areas. Annual reviews will be conducted of monitoring data to assess trends and monitoring program effectiveness.	Section 8.1
PA10_0015 Appendix 7 Statement of Commitments	All Domains	**Conceptual Post-Mining Land Use** (o) The disturbed area within the Project Site will be restored to either rehabilitated bushland or rehabilitated pasture, with approximately 5 hectares (1 percent) remaining as a stabilised highwall of the final void.	Section 4.2
PA10_0015 Appendix 7 Statement of Commitments	Eastern boundary	**Conceptual Post-Mining Land Use** (p) Along the eastern boundary of the Project Site, adjacent to the realigned Wean Road, a strip of rehabilitated bushland will be established to screen the view of the final void and generally improve the visual amenity from Wean Road, as well as provide vegetation connectivity north-south on the eastern side of the void.	Section 4.2
PA10_0015 Appendix 7 Statement of Commitments	All Domains	**Conceptual Post-Mining Land Use** (q) In addition to the large area to be rehabilitated to bushland, strategically placed tree lots will be established within rehabilitated pasture areas to break-up the landform and act as wildlife refuges and linkages.	Section 4.2
PA10_0015 Appendix 7 Statement of Commitments	All Domains	**Conceptual Post-Mining Land Use** (r) Tree trunks and branches less than 300 mm diameter and other smaller vegetative debris removed during clearing activities will be spread over those areas to be restored as rehabilitated bushland where practical.	Section 7.2
PA10_0015 Appendix 7 Statement of Commitments	Domain 3	**Final Void Management** (s) The final void will be designed and managed as a stable landform. Appropriate long-term land use options for the void will be considered and adequately assessed in consultation with relevant stakeholders as the mine approaches closure.	Section 4.2
PA10_0015 Appendix 7 Statement of Commitments	Domain 3	**Vegetation Clearing and Soil Stripping** (c) Cleared trees and branches will be retained for use in stabilising slopes identified for restoration of rehabilitated woodland. No burning of vegetation is permitted or occurs on-site.	Section 7.2
PA10_0015 Appendix 7 Statement of Commitments	Domain 3	**Vegetation Clearing and Soil Stripping** (v) As per the commitments listed in Section 8.6, Whitehaven will adopt a progressive approach to the rehabilitation of disturbed areas within the Project Site to ensure that, where practicable, completed mining and overburden emplacement areas are quickly shaped, top dressed and vegetated to provide a stable landform.	Section 7.2
PA10_0015 Appendix 7 Statement of Commitments	Domain 4	**Drainage Lines** (s) Sections of drainage lines that are or will be impacted upon by the mining operation will be rehabilitated post-mining generally in accordance with Section 5.3.3 of the Blue Book (Volume 1) and the Guidelines for Controlled Activities – In-Stream Works (DWE 2008, as cited in GSSE 2010) for watercourse rehabilitation and riparian zone rehabilitation.	Section 3.2.2

Source	Domain	Condition	Section Addressed
PA10_0015 Appendix 7 Statement of Commitments	Domain 5 and Offset Areas	**Flora and Fauna** (o) Regular monitoring of the vegetation within the Project Site and offset areas will be undertaken in order to enable effective management with regards to rehabilitation (planting), regeneration, watering, fencing and weed control.	Section 8.1
PA10_0015 Appendix 7 Statement of Commitments	Existing Disturbed Areas Domain 5	**Visual Amenity** (b) As per the commitments listed above in Section 8.6, Whitehaven will adopt a progressive approach to the rehabilitation of disturbed areas within the Project Site to ensure that, where practicable, completed mining and overburden emplacement areas are quickly shaped, topdressed and vegetated. Early reshaping and revegetation of the external batter slopes of the emplacement areas will be targeted as a priority.	Section 3.2.9
PA10_0015 Appendix 7 Statement of Commitments	Existing Disturbed Areas Domain 5	**Visual Amenity** (c) In addition to retaining areas of existing remnant vegetation, it is proposed to restore approximately 206 hectares (58 percent) of the disturbed area within the Project Site as rehabilitated bushland. This large area, which includes the western slopes of the Northern and Western Emplacement Areas, will blend in well with the retained remnant vegetation areas within the Project Site and within the adjacent Vickery State Forest and "Yarrawonga" property.	Section 4.2.4
PA10_0015 Appendix 7 Statement of Commitments	Existing Disturbed Areas Domain 5	**Visual Amenity** (d) Strategically placed bushland tree lots will be integrated into the post-mining landform to break-up the landform and provide visual texture. This will be complimented by the establishment of pasture grass areas that will provide short-term visual impact mitigation prior to the trees becoming established.	Section 3.2.9
EPBC Approval 2010/5502			
Condition 2	Offset Area	The person taking the action must submit to the Minister for approval an Offset Management Plan for the Whitehaven Regional Biodiversity Offset Site within 12 months of the date of the approval. The Offset Management Plan must contain details of measures to offset the impacts to the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland Ecological Community, Regent Honeyeater and Swift Parrot. The Offset Management Plan must be implemented. The offset management plan must include, at a minimum, the following information: b. details of management actions to protect and enhance the extent and condition of habitat values of the offset site, including, but not limited to rehabilitation, weed control, fire management, erosion and sediment control, management of livestock and any restrictions of access on no less than: i. 231.4 hectares of habitat for the Regent Honeyeater and Swift Parrot; and ii. 153 hectares White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland Ecological Community.	Section 8.3

Source	Domain	Condition	Section Addressed
ML1620 and ML 1662			
ML1620 and ML1662 Condition 3(a)	All Domains	Mining operations must not be carried out otherwise than in accordance with: A Mining Operations Plan (MOP) which has been approved by the Director General of the Department of Primary Industries.	Section 1.3
ML1620 and ML1662 Condition 3(b)	All Domains	The MOP must: i) identify areas that will be disturbed by mining operations;	Section 2.0
		ii) Detail the staging of specific mining operations;	Section 2.8
		iii) Identify how the mine will be managed to allow mine closure;	Section 7
		iv) Identify how mining operations will be carried out on site in order to prevent and or minimize harm to the environment;	Section 3.2
		v) Reflect the conditions of approval under: - The Environmental planning and Assessment Act 1979 - The Protection of the Environment Operations Act 1997 - And any other approvals relevant to the development including the conditions of this lease; and	Section 1.3
		vi) Have regard to any relevant guidelines adopted by the Director-General.	Section 1.3
ML1620 and ML1662 Condition 3(c)	All Domains	The titleholder may apply to the Director-General to amend an approved MOP at any time.	Section 11
ML1620 and ML1662 Condition 3(d)	All Domains	It is not a breach of this condition if: i) The operations constituting the breach were necessary to comply with a lawful order or direction given under the Mining Act 1992, the Environmental Planning and Assessment Act 1979, Protection of the Environment Operations Act 1997 or the Occupational Health and Safety Act 2000; and ii) the Director-General has been notified in writing of the terms of the order or the direction prior to the operations constituting the breach being carried out.	Section 1.3
ML1620 and ML1662 Condition 3(e)	All Domains	A MOP ceases to have affect 7 years after date of approval or other such period as identified by the Director-General. An approved amendment to the MOP under condition 5 does not constitute an approval for the purpose of this paragraph unless otherwise identified by the Director-General.	This document.
ML1620 and ML1662 Condition 7	Disturbance Areas	Disturbed land must be rehabilitated to a sustainable/agreed end land use to the satisfaction of the Director-General.	Section 7.0
ML1620 Condition 16, ML1662 Condition 11	All Domains	Operations must be carried out in a manner that ensures the safety of persons or stock in the vicinity of the operations. All drill holes, shafts and excavations must be appropriately protected to the satisfaction of the Director General, to ensure that access to them by persons and stock is restricted. Abandoned shafts and excavations opened up or used by the lease holder must be filled in or otherwise rendered safe to a standard acceptable to the Director-General.	Section 2.2

Source	Domain	Condition	Section Addressed
ML1620 Condition 17(b)	Exploration Areas	If the lease holder drills exploratory drill holes he must satisfy the Director-General that: (vii) once any drill hole ceases to be used the hole must be sealed in accordance with Departmental guidelines. Alternatively, the hole must be sealed as instructed by the Director-General. (vii) once any drill hole ceases to be used the land and its immediate vicinity is left in a clean, tidy and stable condition.	Section 2.2
ML1620 Condition 22	Access Tracks Domain 1	Access tracks must be kept to a minimum and be positioned so that they do not cause any unnecessary damage to the land. Temporary access tracks must be ripped, topsoiled and revegetated as soon as possible after they are no longer required for mining operations The design and construction of access tracks must be in accordance with specifications fixed by the Department of Environment and Climate Change.	Section 2.6
ML1662 Condition 14	Access Tracks Domain 1	(d) Temporary access tracks must be rehabilitated and revegetated to the satisfaction of the Director-General as soon as reasonably practicable after they are no longer required under this lease.	Section 2.6

4.2 Post Mining Land Use and Landscape Goals

4.2.1 Conceptual Post-Mining Landform

The proposed post-mining landform has been designed to achieve a stable topography with consideration to financial feasibility, environmental outcomes and potential future agricultural production. Primarily based on the annual sequencing of coal extraction and progressive rehabilitation, the post-mining landform has been developed and refined in order to ensure that a low maintenance, stable and safe landform remains that blends in with the surrounding topography and can support a mixture of rehabilitated bushland with areas of grazing consistent with the pre-mining conditions. Specific attention has been given to:

- Re-shaping and blending of emplacement areas with surrounding landforms, including the adjacent Vickery State Forest;
- Minimising the size of the final void, as far as practicable within mine planning and optimisation constraints; and
- Minimising possible geotechnical and safety issues through refining the location and configuration (including appropriate battering of the low walls and highwall) of the final void.

Plan 4 presents the conceptual final post-mining landform. The major features of the proposed final landform include the following:

- Coal extraction will leave an open pit void (final void) at mine closure covering an area of around 65 hectares in the eastern and southern extents of the open cut pit. It will have a maximum depth of around 65 metres below the natural surface, with elevations ranging between 220 and 285 metres AHD. The low walls, being the northern, western and part of the eastern slopes of the final void, will be shaped to achieve between 10 and a maximum of 18 degree batter angles (1H:6V to 1H:3V) depending on the location of the slope within the extent of the void. The highwall on the south-eastern margin of the final void will be battered to approximately 45 degrees (1H:1V) through blasting.

- The cost to infill or batter back the final void slopes further than proposed is not financially viable for the mine given the significant upfront costs in earthworks, haulage and rehandling large volumes of overburden, as costed against the low potential return on that parcel of land as a low intensity grazing area. The environmental outcomes that are potentially available for the final void include low erosion rates, low sedimentation and potential ecological benefits associated with a non-grazing landform.

- An elevated landform to the north, being the Northern Emplacement Area.

- An elevated ridgeline extending southwards adjacent to the Vickery State Forest along the western boundary of Rocglen, being the Western Emplacement Area.

- Runoff from the Northern and Western Emplacement Areas will be managed by contour banks and rock drop structures conveying water off the rehabilitated areas to the gentle surrounding slopes.

Final Void

- Leaving the void as a stable landform with established grasses/pastures on the low walls, with the possible additional use of long-term water storage in the deeper southern end of the void, is, at this point in time, the preferred option. There may be additional appropriate land use options at mine closure, such as backfilling with overburden and/or coal rejects from other nearby mining operations. Any such options will be assessed as appropriate in full consultation with the relevant government agencies and stakeholders at that time.

- The environmental outcomes that are potentially available for the final void if returned as planned to a stable area where grazing is limited, include low erosion rates, low sedimentation and potential ecological benefits associated with a non-grazing landform.

4.3 Rehabilitation Objectives

The overall long term mine rehabilitation objective is to provide a low maintenance, geotechnically stable and safe landform that blends in with the surrounding topography and provides a mixture of rehabilitated bushland with areas of grazing consistent with pre-mining conditions.

Rehabilitation objectives are outlined in Schedule 3 Condition 34 of the PA and included in **Table 8** below:

Table 8 Rehabilitation Objectives from the PA

Feature	Objectives
Mine Site (as a whole)	Safe, Stable and non-polluting.
Final Void	• Minimise the size and depth of the final void as far as is reasonable and feasible; and • The final void is to be safe, stable and non-polluting.
Surface infrastructure	To be decommissioned and removed, unless the Director-General agrees otherwise.
Other land affected by the project	Restore ecosystem function, including maintaining or establishing self-sustaining eco-systems comprised of: • Local native plant species; • At least 206 hectares of woodland (see Figure 1 in Appendix 5); and • A landform consistent with the surrounding environment.
Community	Minimise the adverse socio-economic effects associated with mine closure.

Short term rehabilitation objectives include:

- Minimise clearing/vegetation disturbance consistent with operational requirements;

- Schedule operations including overburden/interburden emplacement and shaping and revegetation to minimise visual exposure;

- Rehabilitate areas of disturbance no longer required for mining-related operations;

- Apply appropriate soil material (topsoil/subsoil) to the final landform based on material availability and post-mining land use;

- Stabilise all earthworks, drainage lines and disturbed areas in order to minimise erosion and sedimentation; and

- Control vermin, feral animals and noxious weeds.

Specific long-term objectives include:

- Re-establishing land to either pasture or bushland over the areas disturbed by the mine;
- Increasing the area of land allocated to bushland through the revegetation of those areas disturbed by the mine and the maintenance of remnant and degraded native vegetation and/or habitat corridors on the mine site;
- Provisions of habitat for fauna and corridors for fauna movement within the final landform;
- Developing and implementing a long-term and regionally integrated *Biodiversity Offset Management Plan;* and
- Monitoring rehabilitation success in terms of physical and biological parameters.

A full list of performance indicators and objectives, separated by rehabilitation phase is outlined in **Section 6** of this MOP.

5 REHABILITATION PLANNING AND MANAGEMENT

5.1 Domain Selection

Primary and secondary domains have been defined in accordance with the methodology prescribed in ESG3 (DRE 2013). As such the following applies:

- Primary Domains are defined as the set of discrete areas that have a particular operational or functional purpose. Land management units with similar operational function are likely to have similar geophysical features and constraints /opportunities for rehabilitation.
- Secondary Domains are land management units with similar post mining land use objectives, such as woodland communities and native grasslands.

Accordingly, domains have been defined considering the operational function and specific final land use objectives. Domains at the commencement of the MOP period are shown in **Plan 2,** and listed in **Table 9**.

Table 9 Domains adopted for this MOP term

Domain	Code	Description
Primary Domains		
Infrastructure	1	Infrastructure and facilities including administration areas, workshops, crushing and processing equipment, fuel farms and chemical storage areas, roadways, car parks and hardstands.
Overburden and Waste Dumps	2	Footprint of out-of-pit Northern Emplacement Area and Western Emplacement Area, along with the in-pit emplacement area. This domain includes active overburden emplacement areas, shaped areas and topsoiled areas that are yet to undergo seeding.
Void / Active Mining Areas	3	Footprint for the open cut mining pit.
Water Management Areas	4	Network of dams, diversions, channels and associated water management infrastructure (pipelines and pumps etc.).
Rehabilitation	5	Includes all lands that have undergone rehabilitation to date (including seeding).
Soil Stockpiles	6	Topsoil stockpiles at site are outlined in **Plan 2** and the **Plan 3** series.
Secondary Domains		
Final Void	A	The single void to remain at mine closure measuring around 100 hectares (based on MOP Plan 4) in the eastern and southern extents of the open cut pit. It will have a maximum depth of around 65 metres below the natural surface, with elevations ranging between 220 and 285 metres Australian Height Datum (AHD). The retained highwall of the final void will cover an area of approximately five hectares and will be battered to 45 degrees. The low walls of the void will be rehabilitated to 60 hectares of pasture and shaped to between 10 and 18 degrees. Leaving the void as a stable landform with established grasses/pastures on the low walls, with the possible additional use of long-term water storage in the deeper southern end of the void, is, at this point in time, the preferred option.
Water Management Area	B	Footprint of water management structures and dams retained in the final landform.
Pasture Rehabilitation Area	C	The central and eastern areas of the final landform, including areas directly surrounding the final void, will be restored as rehabilitated pasture. This domain will be shaped to less than 10 degrees.
Bushland Rehabilitation Area	D	The western areas of the final landform will be restored as rehabilitated bushland. This domain will be shaped to 14 degrees or less.

It is expected that each domain will require particular rehabilitation objectives and methodologies to achieve the desired final land use outcomes. Domain objectives and rehabilitation methods are discussed in the following sections.

5.2 Domain Rehabilitation Objectives

Whitehaven is committed to ensuring progressive rehabilitation of areas of disturbance (and sequencing activities to enable earliest revegetation consistent with operational requirements) within Rocglen. This is in order to minimise the areas of exposure and hence reduce the potential air quality impacts, erosion and sedimentation, and visibility of mining operations from surrounding residences and publically available vantage points.

Progressive rehabilitation will be undertaken on the site, involving the reshaping of the mining landforms, topdressing (including intermediate layering of subsoil where appropriate), installation of appropriate water management works and establishment of areas of native vegetation and pasture species as required to achieve the preferred post-mining land uses.

The key rehabilitation objectives for the Domains identified in **Section 5.1** are defined in **Table 10**.

Table 10 Domain Rehabilitation Objectives

Domain	Rehabilitation Objective	Timeframe to Achieve Objectives
Primary Domains		
Infrastructure	Mining infrastructure will be decommissioned and removed progressively when no longer required, any land contamination appropriately remediated, and the area rehabilitated.	At Closure
Overburden and Waste Dumps	Final landform will be safe, stable and adequately drained. Final landforms will be designed to integrate with the surrounding landscape.	Prior to surrendering lease
Void / Active Mining Areas	Void is safe, profiled for long term stability and non-polluting. The size and depth of the void is minimised as far as is reasonable. Surface water inflows to the final void directed away from the highwall face (where ever possible) through the construction of interceptor channel drains around the perimeter of the highwall. In addition, spoon drains will be utilised on the upslope side of all benches. Drainage over the low wall minimised through constructing surface water diversions. The catchment area of the final void will be minimised by the installation of diversion drains.	Prior to surrendering lease
Water Management Areas	The final landform drainage will integrate with the surrounding catchments and will achieve long term geomorphic stability and minimise erosion. Sediment dams identified for retention in the final landform will be decontaminated and preserved as clean water dams.	Prior to surrendering lease

Domain	Rehabilitation Objective	Timeframe to Achieve Objectives
Rehabilitation	As per Secondary Domains C and D below.	Prior to surrendering lease Staged objectives for rehabilitation phases
Soil Stockpiles	Soils to be used in rehabilitation at Rocglen. Soil used in rehabilitation is generally free of weeds. Soil to be tested for quality prior to rehabilitation campaigns.	Prior to surrendering lease
Secondary Domains		
Final Void	Final void is safe, profiled for long term stability and non-polluting. The size and depth of the final void is minimised as far as is reasonable. The void will have a total area of 65 hectares. The low walls of the final void will comprise 60 hectares of Class VII land capability and Class 5 agricultural suitability. The highwall of the final void will comprise five hectares of Class VIII land capability and Class 5 agricultural suitability. These classes are generally considered unsuitable for agriculture.	Prior to surrendering lease
Water Management Area	The final landform drainage will integrate with the surrounding catchments and will achieve long term geomorphic stability and minimise erosion. Sediment dams identified for retention in the final landform have been decontaminated and preserved as clean water dams. Safe, stable and non-polluting	Prior to surrendering lease
Pasture Rehabilitation Area	This domain will include rehabilitated pasture that is safe, stable and non-polluting, and will tie in with the existing surrounding grassland areas of the locality. The post-mining land capability within this domain will predominantly comprise Classes III and VI. The post-mining agricultural suitability in this domain will predominately comprise Class 4 and 5 land, with some smaller areas of Class 3 land. Soil at closure to be in accordance within the soil criteria within **Table 15**. Reinstate soil profiles (soil characteristics and soil depths) for future agricultural production.	Prior to surrendering lease Staged objectives for rehabilitation phases
Bushland Rehabilitation Area	Restore ecosystem function, including maintaining or establishing self-sustaining eco-systems comprised of local native plant species. Establish approximately 206 hectares of open woodland/forest that is safe, stable and non-polluting, to link in with the existing remnant bushland to the west of the site (Vickery State Forest) and to the east of the site, creating a viable connection with the surrounding	Prior to surrendering lease Staged objectives for rehabilitation phases

Domain	Rehabilitation Objective	Timeframe to Achieve Objectives
	environment and a wildlife corridor. The post-mining land capability within this domain will comprise Classes IV and VI, with smaller areas of Class III and V land. The post-mining agricultural suitability will predominately comprise Class 4 land, with some smaller areas of Class 3 land.	

5.3 Rehabilitation Phases

The rehabilitation process can be described as a sequence of conceptual rehabilitation phases to achieve a final land use that is self-sustaining. These phases of rehabilitation are described in the MOP Guidelines are outlined in **Table 11.**

Table 11 Rehabilitation Phases

Phase	Description
Decommissioning	The process of removing plant and equipment from active services and rendering the area safe.
Landform Establishment	The process of shaping unformed rock of other sub-stratum material into a desired land surface profile. This includes earthworks activities such as cut and fill, rock raking, water storage and drainage construction.
Growth Medium Development	The process of establishing and enhancing the physical structure, chemical properties and biological properties of a soil stratum suitable for plant growth. This includes placing and spreading soil and applying ameliorants.
Ecosystem and Land Use Establishment	The process of seeding, planting and transplanting plant species. Incorporates management actions such as weed and feral pest control to achieve species establishment and growth to juvenile communities, and habitat augmentation.
Ecosystem and Land Use Sustainability	The process of applying management techniques to encourage an ecosystem to grow and develop towards a desired and sustainable post mining land use outcome. Incorporates features including species reproduction, nutrient recycling and community structure.
Land Relinquishment	The completion criteria for rehabilitation are met and the land is determined to be suitable to be relinquished from the mining tenement.

Section 7.3 provides a general overview of the rehabilitation methodology for each rehabilitation phase and provides a summary of the phases expected to be completed for each domain at the end of the MOP period.

Table 12 Summary of Rehabilitation Phases Proposed for Completion at end of the MOP Term

Domain / Rehabilitation Phase	D1 - Infrastructure Areas	D2 - Overburden Emplacement Area	D3 - Void / Active Mining	D4 - Water Management Area	D5 - Rehabilitation	D6 - Soil Stockpiles
Active	✓	✓	✓	✓	✓	✓
Phase 1 – Decommissioning	×	×	×	×	✓	×
Phase 2 – Landform Establishment	×	×	×	×	✓	×
Phase 3 – Growth Medium Development	×	×	×	×	✓	×
Phase 4 – Ecosystem and Land Use Establishment	×	×	×	×	✓	×
Phase 5 – Ecosystem and Land Use Sustainability	×	×	×	×	✓	×
Phase 6 – Land Relinquishment	×	×	×	×	×	×

✓ = Areas of this domain are subject to this rehabilitation phase during MOP term.
× = Domain not expected to enter this rehabilitation phase during the MOP term.

Note, sections of D2 (Overburden Emplacement Area) and D3 (Void / Active Mining) will be transferred to the primary domain of D5 Rehabilitation during the MOP period. Rehabilitation of areas is outlined further in **Table 20** of this MOP.

6 PERFORMANCE INDICATORS AND COMPLETION/RELINQUISHMENT CRITERIA

Key performance outcomes for rehabilitation include:

- Clearing/vegetation disturbance and rehabilitation progress consistent with the MOP;
- Successful establishment of vegetation on the final landform consistent with the MOP;
- Progressive achievement of landform and land use objectives;
- Achievement of the objectives with respect to flora and fauna, air quality, soil resources, land capability and erosion and sediment control;
- Verification of achievements through monitoring;
- A legally binding arrangement to secure the long-term security of the biodiversity offset areas; and
- Performance reporting in the AEMR/Annual Review.

The success criteria are performance objectives or standards against which rehabilitation success in achieving a sustainable system for the proposed post-mine land use is demonstrated. Satisfaction and maintenance of the success criteria (as indicated by monitoring results) will demonstrate that the rehabilitated landscape is ready to be relinquished from the mine's financial assurance and handed back to stakeholders in a productive and sustainable condition.

The success criteria comprise indicators for flora, fauna, soil, land use and safety on a landform-type basis that reflects the nominated post-mine land use of a mosaic of rehabilitated bushland, rehabilitated grazing and open grasslands.

These completion criteria, which may be subject to refinement as the operation progresses, including through consultation with the relevant stakeholders, will be utilised to demonstrate achievement of rehabilitation objectives. The achievement (or otherwise) of the completion criteria will be reported within the AEMR/Annual Review.

Secondary Domain B, being Water Management Area, refers to the surface water management structures (for example, dams) that will be retained in the final landform following mine closure. On this basis, none of the five rehabilitation phases apply to this domain. Completion criteria for the site are outlined in **Table 13-18**.

Table 13 Decommissioning Phase

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	Link to TARP	Progress at start of MOP
All Domains						
Public safety	Site Security	Appropriate security measures (e.g. adequate fencing) has been implemented (where required) prior to commencing decommissioning and demolition works	This MOP/ Whitehaven HSE Policy.	No	No	Ongoing
Domain 1 – Infrastructure Area						
All surface infrastructure decommissioned and removed, unless the Secretary agrees otherwise	Demolition of infrastructure	All demolition work has been carried out in accordance *with AS2601-2001: The Demolition of Structures* or its latest version.	AS2604-2001	No	No	Not commenced
	Site services	Services isolated and disconnected. Underground infrastructure to be made safe and left buried. Overhead infrastructure to be removed.	PA 10_0015 Condition 34	No	No	Not commenced
	Offices and workshops	Offices and workshops, including foundations are removed.	PA 10_0015 Condition 34	No	No	Not commenced
	Fuel farms and chemical storage areas	Tanks, drums, compounds, footings and bunds removed. Phase 1 and 2 Assessments.	PA 10_0015 Condition 34	No	No	Not commenced
	Roads	Bitumen and gravel roads removed.	PA 10_0015 Condition 34	No	No	Not commenced
	Water pumps and pipe lines	Pumps and pipelines removed.	PA 10_0015 Condition 34	No	No	Not commenced
	Tracks	Remove road material from tracks to natural soil surface profile.	PA 10_0015 Condition 34 ML1620 Condition 22 ML1662 Condition 14	No	No	Not commenced

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	Link to TARP	Progress at start of MOP
Boreholes/drill holes removed or made safe.	Boreholes	Boreholes (except those retained for monitoring or agricultural purposes) have been shutdown, core casings removed and holes plugged or capped to regulatory standards (EDG01 Borehole Sealing Requirements on Land: Coal Exploration for holes drilled post April 2012).	ML1620 Condition 16, ML1662 Condition 11	No	No	Not commenced
	Drill holes	All drill holes, pits, open cuts and other openings to be securely capped, filled or otherwise made safe.	ML1620 Condition 16, ML1662 Condition 11	No	No	Rehabilitated as required
No rubbish to remain at surface, or at risk of being exposed through erosion	Rubbish	No rubbish remaining at surface, or at risk of being exposed through erosion.	This document	No	No	Not commenced
Domain 2 – Overburden Emplacement						
All open cut mining infrastructure removed.	Temporary buildings	Any temporary buildings and foundations are removed.	PA 10_0015 Condition 34	No	No	Not commenced
	Fuel and chemical tanks/drums	Fuel and chemical tanks, bunds, footings and bunds removed.	PA 10_0015 Condition 34	No	No	Not commenced
Domain 3 – Void/Active Mining						
All open cut mining infrastructure removed	Fuel and chemical tanks/drums	Fuel and chemical tanks, bunds, footings and bunds removed.	PA 10_0015 Condition 34	No	No	Not commenced
Domain 4 – Water Management Area						
All infrastructure removed	Dams and water management infrastructure	Dams and water management infrastructure decommissioned apart from those required for post mining land use purposes.	This document	No	No	Not commenced

Table 14 Landform Establishment Phase

Domain Objective	Performance Indicator	Completion Criteria	Justification / Source	Complete (Yes/No)	Link to TARP	Progress at start of MOP
All Domains						
Water quality of runoff from all domains non -polluting and appropriate for end land use	Water quality parameters	Ensure receiving waters affected by surface water runoff are within the limits of the EPL.	New Criteria	No	No	Not commenced
Domain 1 – Infrastructure Area						
Landform is safe, stable and non-polluting	Drill hole sites	Once drill hole ceases to be used, the land and its immediate vicinity is left in a clean, tidy and stable condition.	ML1620 Condition 17 (b)	No	No	Rehabilitated as required
	Access tracks	Temporary access tracks are to be ripped and shaped for vegetation.	ML1620 Condition 22	No	No	Not commenced
	Slopes	Slopes are regraded to a stable grade (gradients of $<2^0$)	This document	No	1	Not commenced
	Erosion control	Erosion mitigation measures have been applied. Average soil loss per annum per domain unit is <40 tonnes/ha/year (sheet erosion)	This document	No	No	Not commenced
	Drainage condition	Use of contour banks and diversion drains to direct water into stable areas or sediment control basins. No active erosion.	This document	No	No	Not commenced
Domain 2 – Overburden Emplacement Areas						
Landform is safe, stable and non-polluting	Slopes	All slopes generally 10^0, and in all cases $<18^0$. Where the slopes are steeper, additional water management structures will be utilised (as required).	This document	No	1	Not commenced
	Drainage condition	Erosion control structures are installed at intervals commensurate with landform slope.	This document	No	3	Not commenced
		Average soil loss per annum is <40 tonnes/ha/yr (sheet erosion).	This document	No	No	Not commenced
		Dimensions and frequency of occurrence of erosion rills and gullies are not compromising landform stability.	This document	No	2	Not commenced

Domain Objective	Performance Indicator	Completion Criteria	Justification / Source	Complete (Yes/No)	Link to TARP	Progress at start of MOP
	Dump heights	The Northern Emplacement Areas has a maximum height of 340 metres AHD.	2011 EA, pg 54	No	No	Not commenced
		The final batter slopes for the Northern and Western Emplacement Areas are generally 10 degrees but do not exceed 14 degrees.	This document	No	1	Not commenced
Domain 3 – Void/Active Mining Area						
Landform is safe, stable and non-polluting	Landform stability	Qualified geotechnical engineer determines that the landform has achieved long term stability.	This document	No	No	Not commenced
		Excavations to be rendered safe	This document	No	No	Not commenced
		The final void has elevations ranging between 220 and 285 Australian Height Datum (AHD).	2011 EA, pg 54	No	No	Not commenced
		The low walls of the final void are shaped to achieve between 10 and 18 degree batter angles (1V:6H to 1V:3H).	2011 EA, pg 54	No	1	Not commenced
		The highwall on the south-eastern margin of the final void is battered to approximately 45 degrees (1V:1H).	2011 EA, pg 54	No	No	Not commenced
Domain 4 – Water Management Area						
Landform is safe, stable and non-polluting	Drainage condition	All landforms will be free draining except where specific structures (i.e. dams) have been constructed for the storage of water as required for sediment and erosion control or some post mining land use.	This document	No	3	Not commenced
		Runoff from the Northern and Western Emplacement Areas is managed by contour banks and rock drop structures.	This document	No	No	Not commenced
		Runoff from the Northern Emplacement Area is directed to Dams A, B, C and E and discharged from the site into Driggle Draggle Creek.	This document	No	No	Not commenced

Domain Objective	Performance Indicator	Completion Criteria	Justification / Source	Complete (Yes/No)	Link to TARP	Progress at start of MOP
		Drainage lines within the Project Site are reinstated to their natural hydraulic functions.	Blue Book (LandCom 2004 and DECC 2008) Guidelines for Controlled Activities – In-Stream Works (DWE 2008).	No	3	Not commenced
		The final landform incorporates contour/graded banks on the steeper slopes, at spacings between 50 and 80 metres.	This document	No	No	Not commenced
		The heights and cross-sectional areas of contour banks is less than 0.7 metres and 3 m^2, respectively.	2011 EA, SOC p.153	No	No	Not commenced
		Rock-lined diversion drains are in place to convey water from the rehabilitated landform.	2011 EA, SOC p.153	No	No	Not commenced

Table 15 Growth Medium Development Phase

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	Link to TARP	Progress at MOP start
Domains 1, 2, 3, 5 and 6						
Soil able to support nominated final land use	All disturbance areas topsoiled for revegetation	Areas topsoiled with a minimum depth of 100mm	ML1620 Condition 22 2010 EA, SOC p.151	No	6	Not commenced
		Pasture rehabilitation areas to include subsoil at a minimum depth of 100mm.	2011 EA, SOC p.151	No	6	Not commenced
	Soil to be ameliorated to sustain vegetation	Soil salinity content is <0.6 dS/m.	This document	No	5	Not commenced
		Soil pH is between 5.5 and 8.5.	This document	No	5	Not commenced
		Soil Exchange Sodium Percentage (ESP) is <15%.	This document	No	5	Not commenced
Domain A – Final Void						
Soil able to support nominated final land use	All disturbance areas (excluding the highwall) topsoiled for revegetation	Areas of low walls topsoiled with a minimum depth of 100mm	ML1620 Condition 22 2010 EA, SOC p.151	No	6	Not commenced
		Pasture rehabilitation areas (low walls) to include subsoil at a minimum depth of 100mm.	2011 EA, SOC p.151	No	6	Not commenced
	Soil to be ameliorated to sustain vegetation (excluding the highwall and the pit)	Soil salinity content is <0.6 dS/m.	This document	No	5	Not commenced
		Soil pH is between 5.5 and 8.5.	This document	No	5	Not commenced

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	Link to TARP	Progress at MOP start
	** Leaving the void as a stable landform with established grasses/pastures on the low walls, with the possible additional use of long-term water storage in the deeper southern end of the void, is, at this point in time, the preferred option (p 37 Rehabilitation Management Plan).*	Soil Exchange Sodium Percentage (ESP) is <15%.	This document	No	5	Not commenced

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	Link to TARP	Progress at MOP start
Domain C - Pasture Rehabilitation Areas and Domain D – Bushland Rehabilitation Areas						
Soil able to support nominated final land use	All disturbance areas topsoiled for pasture revegetation	Areas topsoiled with a minimum depth of 100mm	ML1620 Condition 22 2011 EA, SOC p.151	No	6	Not commenced
		Pasture rehabilitation areas to include subsoil at a minimum depth of 100mm.	2011 EA, SOC p.151	No	6	Not commenced
	Soil to be ameliorated to sustain pasture species	Soil salinity content is <0.6 dS/m.	This document	No	5	Not commenced
		Soil pH is between 5.5 and 8.5.	This document	No	5	Not commenced
		Soil Exchange Sodium Percentage (ESP) is <15%.	This document	No	5	Not commenced

Table 16 Ecosystem and Land Use Establishment Phase

Domain Objective	Performance Indicator	Completion Criteria	Justification / Source	Complete (Yes/No)	Link to TARP	Progress at start of MOP
Domain 4 – Water Management Area						
Landform safe, stable and non-polluting	Effective drainage control in final landform	Drainage controls are not compromised by grazing stock or wildlife.	This document	No	No	Not commenced
	Effective erosion and sediment control in final landscape	Observed adequacy of drainage controls in rehabilitation areas.	This document	No	No	Not commenced
Domain C - Pasture Rehabilitation Areas						
Vegetation established to sustain final land use	Vegetation structure	Rehabilitated pasture areas have been sown with a mixture of pasture species including fast growing, short-lived species and perennial grasses and legumes.	2011 EA, SOC p.153	No	8	Not commenced
		Rehabilitation areas are fenced and have stock excluded (until stable and grazing will not impact upon its establishment).	2011 EA, SOC p.153	No	No	Not commenced
		Tree lots have been planted within rehabilitated pasture areas to break-up the landform and act as wildlife refuges and linkages.	2011 EA, SOC p.154	No	No	Not commenced
		Minimum of 70% vegetative ground cover is present.	This document	No	7	Not commenced
		No bare surfaces >20 m^2 in area or >10 m in length down slope.	This document	No	2	Not commenced
		Rehabilitation areas comprise a mixture of grasses representative of regionally occurring vegetation where possible. Grasses sown will be selected from those listed in **Table 22.**	This document	No	8	Not commenced
		Noxious weeds will be controlled in accordance with the Noxious Weeds Act 1993.	This document	No	10	Not commenced
		Pests are managed to minimise impact on the development of vegetation (as guided by LLS).	This document	No	11	Not commenced

Domain Objective	Performance Indicator	Completion Criteria	Justification / Source	Complete (Yes/No)	Link to TARP	Progress at start of MOP
		Vegetation health comparable to reference site.	This document	No	No	Not commenced
Visual impact of rehabilitated mining areas minimised	Landform compatible with adjacent landscape	Visual impact in accordance with visual assessment in EA.	2011 EA, p. 139	No	No	Not commenced
Domain D - Bushland Rehabilitation Areas						
Vegetation established to sustain final land use	Vegetation structure developed	Rehabilitated bushland areas have been initially stabilised with a non-persistent cover crop followed by planting of a selection of locally occurring tree and shrub species.	2011 EA, SOC p.153	No	8	Not commenced
		Rehabilitation areas are fenced and have stock excluded.	2011 EA, SOC p.153	No	No	Not commenced
		Minimum of 70% vegetative cover is present (or 50% if rocks, logs or other features of cover are present).	This document	No	No	Not commenced
		No bare surfaces >20 m^2 in area or >10 m in length down slope.	This document	No	7	Not commenced
		Comprise a mixture of native trees, shrubs and grasses representative of regionally occurring vegetation where possible.	This document	No	2	Not commenced
		Vegetation communities developed to attract and support the re-colonisation by native flora and fauna species found in the area.	This document	No	8	Not commenced
		Noxious weeds will be controlled in accordance with the Noxious Weeds Act 1993.	This document	No	10	Not commenced
		Pests are managed to minimise impact on the development of vegetation (as guided by LLS and comparable to reference sites).	This document	No	11	Not commenced
		Tree health comparable to reference sites.	This document	No	No	Not commenced
Visual impact of rehabilitated mining areas minimised	Landform compatible with adjacent landscape	Visual impact in accordance with visual assessment in EA.	This document	No	No	Not commenced

Domain Objective	Performance Indicator	Completion Criteria	Justification / Source	Complete (Yes/No)	Link to TARP	Progress at start of MOP
		A strip of rehabilitated bushland exists along the eastern boundary of the Project Site, adjacent to the realigned Wean Road as a vegetation screen.	2011 EA, SOC p.163	No	No	Not commenced
Rehabilitation size compliant with consent requirements	206 hectares rehabilitated as woodland	At least 206 hectares of the site are rehabilitated as woodland.	PA 10_0015 Condition 34	No	No	Not commenced

Table 17 Ecosystem and Land Use Sustainability Phase

Domain Objective	Performance Indicator	Completion Criteria	Justification / Source	Complete (Yes/No)	Link to TARP	Progress at MOP start
Domain 4 – Water Management Area						
Landform safe, stable and non-polluting	Effective drainage control in final landform	Drainage controls are not compromised by grazing stock or wildlife.	This document	No	3	Not commenced
	Effective erosion and sediment control in final landscape	Observed adequacy of drainage controls in rehabilitation areas.	This document	No	3	Not commenced
Domain C - Pasture Rehabilitation Areas						
Nutrient accumulation and recycling processes are occurring in rehabilitation areas	Adequate macro and micro-nutrients present	Nutrient accumulation and recycling processes are occurring as evidenced by the presence of a litter layer, mycorrhizae and/or other microsymbionts.	This document	No	No	Not commenced
		Adequate macro and micro-nutrients are present, as assessed by specialist consultant.	This document	No	No	Not commenced
Vegetation established to sustain final land use	Vegetation structure developed	The site can be managed for its designated land use without any greater management inputs than other land in the area being for a similar purpose.	This document	No	No	Not commenced
		Tree lots have been established within rehabilitated pasture areas to break-up the landform and act as wildlife refuges and linkages.	2011 EA, SOC p.154	No	No	Not commenced
		Minimum of 70% vegetative ground cover is present.	This document	No	7	Not commenced
		No bare surfaces >20 m^2 in area or >10 m in length down slope.	This document	No	7	Not commenced
		Rehabilitation areas comprise a mixture of grasses representative of regionally occurring vegetation where possible.	This document	No	8	Not commenced
		Established species survive and/or regenerate after disturbance.	This document	No	8	Not commenced
		Noxious weeds will be controlled in accordance with the Noxious Weeds Act 1993.	This document	No	10	Not commenced
		Pests are managed to minimise impact on the development of vegetation (as guided by LLS and comparable to reference sites).	This document	No	11	Not commenced

Domain Objective	Performance Indicator	Completion Criteria	Justification / Source	Complete (Yes/No)	Link to TARP	Progress at MOP start
		Species are capable of setting viable seed, flowering or otherwise reproducing.	This document	No	No	Not commenced
		Tree health comparable to reference sites.	This document	No	No	Not commenced
Visual impact of rehabilitated mining areas minimised	Landform compatible with adjacent landscape	Visual impact in accordance with visual assessment in EA.	This document	No	No	Not commenced

Domain Objective	Performance Indicator	Completion Criteria	Justification / Source	Complete (Yes/No)	Link to TARP	Progress at MOP start
Domain D - Bushland Rehabilitation Areas						
Nutrient accumulation and recycling processes are occurring in rehabilitation areas	Adequate macro and micro-nutrients present	Nutrient accumulation and recycling processes are occurring as evidenced by the presence of a litter layer, mycorrhizae and/or other microsymbionts.	This document	No	No	Not commenced
		Adequate macro and micro-nutrients are present, as assessed by specialist consultant.	This document	No	No	Not commenced
Vegetation established to sustain final land use	Vegetation structure developed	Area accomplishes and remains as a healthy stand of shrubs, trees and grass species, comparable to reference sites.	This document	No	No	Not commenced
		The site can be managed for its designated land use without any greater management inputs than reference sites in the area being for a similar purpose.	This document	No	No	Not commenced
		Minimum of 70% vegetative cover is present (or 50% if rocks, logs or other features of cover are present). Canopy and ground cover trending towards land use in reference sites.	This document	No	7	Not commenced
		No bare surfaces >20 m^2 in area or >10 m in length down slope.	This document	No	7	Not commenced
		Rehabilitation areas comprise a mixture of species listed in **Table 22 and Table 23**.	This document	No	8	Not commenced
		Vegetation communities have been developed to attract and support the re-colonisation by native flora and fauna species found in the area.	This document	No	8	Not commenced
		Established species survive and/or regenerate after disturbance.	This document	No	8	Not commenced
		Noxious weeds will be controlled in accordance with the Noxious Weeds Act 1993.	This document	No	10	Not commenced
		Pests are managed to minimise impact on the development of vegetation (as guided by LLS and comparable to reference sites).	This document	No	11	Not commenced
		Species are capable of setting viable seed, flowering or otherwise reproducing.	This document	No	No	Not commenced
		Evidence of second generation of shrub and understorey species.	This document	No	No	Not commenced

Domain Objective	Performance Indicator	Completion Criteria	Justification / Source	Complete (Yes/No)	Link to TARP	Progress at MOP start
		Vegetation develops and maintains a litter layer evidenced by a consistent mass and depth of litter over subsequent seasons, comparable to reference sites.	This document	No	No	Not commenced
		Tree health comparable to reference sites.	This document	No	No	Not commenced
Rehabilitated areas create fauna habitat	Fauna species present	Representation of a range of species characteristics from each faunal assemblage group (e.g. reptiles, birds, mammals), present in the ecosystem type, based on pre-mine fauna lists and sighted within the three-year period preceding mine closure and comparable to reference sites.	This document	No	No	Not commenced
		The number of vertebrate species does not show a decrease over a number of successive seasons prior to mine closure, comparable to reference sites.	This document	No	No	Not commenced
		Presence of representatives of a broad range of functional indicator groups involved in different ecological processes, comparable to reference sites.	This document	No	No	Not commenced
		Typical food, shelter and water sources required by the majority of vertebrate and invertebrate inhabitants of that ecosystem type are present, including: a variety of food plants; evidence of active use of habitat provided during rehabilitation such as nest boxes, and logs and signs of natural generation of shelter sources including leaf litter.	This document	No	No	Not commenced
Visual impact of rehabilitated mining areas minimised	Landform compatible with adjacent landscape	Visual impact in accordance with visual assessment in EA.	This document	No	No	Not commenced
		A strip of rehabilitated bushland exists along the eastern boundary of the Project Site, adjacent to the realigned Wean Road as a vegetation screen.	2011 EA, SOC p.163	No	No	Not commenced

Table 18 Relinquishment

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	Link to TARP	Progress at end of MOP
All Domains						
Site will be restored to a landform capable of sustaining the post-mining land uses.	Completion Criteria	All relevant completion criteria for the land proposed for relinquishment (Rehabilitation Phases) are acknowledged to be met by the DRE (or contemporary equivalent).	This document	No	No	Not commenced
	Access Tracks	Access tracks not required in the final landform are decommissioned and rehabilitated.	This document	No	No	Not commenced
	Monitoring Points	Any ancillary disturbance or equipment associated with surface water and rehabilitation monitoring points is removed and/or rehabilitated.	This document	No	No	Not commenced

7 REHABILITATION IMPLEMENTATION

7.1 Status at MOP Commencement

Table 19 describes the status of each domain at the commencement of this MOP period. This information is also presented graphically in **Plan 2.** The asset register (**Section 2.2)** provides a summary of the total area and key features of each domain in the MOP period.

Table 19 Rehabilitation Status at MOP Commencement

Domain	Status at MOP Commencement
Primary Domains	
Domain 1 - Infrastructure	This domain is currently active and subject to ongoing operations.
Domain 2 - Overburden and Waste Dumps	This domain is currently active and subject to ongoing operations.
Domain 3 - Void / Active Mining Areas	This domain is currently active and subject to ongoing operations.
Domain 4 - Water Management Areas	This domain is currently active and subject to ongoing operations.
Domain 5 - Rehabilitation	This domain is currently active. Rehabilitation has been undertaken to date on approximately 119.7 ha at Rocglen. In summary, the rehabilitation undertaken in these areas comprises the following: • Reshaping of overburden; • Subsoil replacement and topsoil dressing; • Installation of contours for surface water management; • Sowing of a cover crop including Japanese Millet, Rye Grass, Oats and Arrow Leaf Clover; • A trial of incorporating humus compost in the seed mix to improve fertility and micro-organism establishment; • A trial involving chicken manure compost to enhance moisture retention and improve crop establishment; and • Planting of tubestock comprising a mix of endemic native understory and overstorey species.
Domain 6 - Soil Stockpiles	This domain is currently active and subject to ongoing operations.
Secondary Domains	
Domain A – Final Void	This domain is currently active (active mining area) and subject to ongoing operations.
Domain B – Water Management Area	This domain is currently active and subject to ongoing operations.
Domain C – Pasture Rehabilitation Area	Approximately 22 ha of pasture rehabilitation has been established at the commencement of the MOP term.
Domain D – Bushland Rehabilitation Area	Approximately 97.7 ha of bushland rehabilitation has

Domain	Status at MOP Commencement
	been established at the commencement of the MOP term.

7.2 Proposed Rehabilitation Activities during the MOP Term

Table 20 summarises the forecast total disturbance and rehabilitation areas at Rocglen for each year of the MOP term.

Table 20 Disturbance and Rehabilitation Progression during the MOP Term

Period	Disturbance (ha)*	Rehabilitation (ha)**	Cumulative Rehabilitation (ha)#	Comments
Start of MOP	~~213.6~~ 246.4	119.7	119.7	See **Plan 2**
(November 2015 – October 2016)	~~213.6~~ 247.5	0	~~119.7~~ 119.7	See **Plan 3A.** No additional rehabilitation is proposed in Year 1 of the MOP period. An additional 1.8 ha of disturbance will be undertaken during this MOP period.
(November 2016 – October 2017)	~~192.4~~ 227.7	~~21.2~~ 19.8	~~140.9~~ 139.5	See **Plan 3B** During Year 2 19.8 ha of rehabilitation will be undertaken. Rehabilitation in will consist of a section of the northern section of the active pit and the western section of the northern overburden emplacement area.
(November 2017 – October 2018)	~~192.4~~ 228.4	0	~~140.9~~ 139.5	See **Plan 3C.** No additional rehabilitation is proposed in Year 3 of the MOP period. Additional disturbance will be undertaken in Active Mine areas during this period.
(November 2018 – October 2019)	~~189.2~~ 228.6	~~5.7~~ 0	~~146.6~~ 139.5	See **Plan 3D.** ~~A small area of the western overburden emplacement area will commence rehabilitation during Year 4 of the MOP period.~~ During the MOP period there will be 0.2 ha of additional disturbance.
(November 2019 – October 2020)	~~191.7~~ 228.6	0	~~146.6~~ 139.5	See **Plan 3E.** No additional rehabilitation is proposed in Year 5 of the MOP period.
End of MOP	~~191.7~~ 228.6	~~146.6~~ 139.5	~~146.6~~ 139.5	See **Plan 3E**

**Covers disturbance area for that year of the MOP. This covers any land within the Active and Decommissioning phases in that year of the MOP. The total disturbance area has decreased over the MOP period due to rehabilitation.*

***Covers rehabilitation area for that year of the MOP (any new rehabilitation).*

#Covers cumulative rehabilitation over the period of the MOP.

Table 21 summarises the proposed rehabilitation activities in the MOP term for each domain. Rehabilitation methodologies for the proposed activities are described in **Section 7.3**.

Table 21 Proposed Rehabilitation Activities during the MOP Term

Domain	Proposed Rehabilitation Activities
Primary Domains	
Domain 1 - Infrastructure	This domain will remain active in the MOP term, with no rehabilitation activities proposed.
Domain 2 - Overburden and Waste Dumps	This domain will remain active in the MOP term. Areas of overburden which will be rehabilitated include the western section of the northern overburden emplacement area. ~~and a small section of the western overburden emplacement area~~.
Domain 3 - Void / Active Mining Areas	This domain will remain active in the MOP term.
Domain 4 - Water Management Areas	This domain will remain active in the MOP term.
Domain 5 - Rehabilitation	This domain will remain active in the MOP term. Rehabilitation will increase during the MOP term with approximately ~~26.9~~ 19.8 ha of rehabilitation proposed, mostly consisting of woodland rehabilitation (~~22.1~~ 14.8 ha), with some grassland rehabilitation (~~4.8~~ 5.0 ha).
Domain 6 - Soil Stockpiles	Soil will be used in rehabilitation during the MOP period.
Secondary Domains	
Domain A – Final Void	This domain refers to the final void to be retained in the final landform. The locality of this final void is shown on **Plan 4**.
Domain B – Water Management Area	This domain refers to the surface water management structures (dams) that will be retained in the final landform following mine closure. The locality of these structures that will be retained in the final landform have been shown on **Plan 4**.
Domain C – Pasture Rehabilitation Area	22 ha of pasture rehabilitation is in place at the commencement of the MOP term. A cumulative total of ~~26.8~~ 27.0 ha will be completed at the end of the MOP.
Domain D – Bushland Rehabilitation Area	97.7 ha of bushland rehabilitation is in place at the commencement of the MOP term. A cumulative total of ~~117.3~~ 112.5 ha will be completed at the end of the MOP.

7.2.1 Decommissioning Phase

The Decommissioning Phase encompasses all works required to prepare land for rehabilitation including removal of built infrastructure, foundation and hardstand materials, services, equipment and materials including wastes and contamination.

Decommissioning is planned to be undertaken at the end of the MOP term, which will also be the end of mine life. Following recent consultation with the DRE and Whitehaven, it has been determined that a MOP will be submitted to the DRE in mid – 2016 covering rehabilitation and closure.

Key decommissioning activities will include, unless otherwise agreed with relevant stakeholders:

- Disconnection and removal of all services, except the overhead power line to the north of the site;

- Dismantling and removal of buildings including site offices, crib room and first aid room and weighbridge;
- Removal of concrete piers and foundation pads, concrete paths and car parks;
- Decommissioning the fuel farm;
- Decommissioning of the workshop structure and wash down sump;
- Partial dismantling of the workshop to a basic structure, removal of the oil separation tank, and removal from site of bulk stores including hydrocarbon and chemical products;
- Decommissioning the ROM pad including removing the coal loading bin and associated equipment.
- Decommissioning of the septic tank.

7.2.2 Landform Establishment

Landform establishment is the process of shaping the final landform to a safe, stable and free draining landform that is appropriate for the desired final land use and consistent with the surrounding landscape. The final landform for Rocglen is shown on **Plan 4**. Final landforms will have acceptable slopes and unimpeded drainage lines.

Domain 2 – Overburden Emplacement Areas

During the MOP term rehabilitation will be undertaken on parts of the out-of-pit Northern Emplacement Area and Western Emplacement Area, along with parts of the in-pit emplacement area, as shown on **Plans 3A** to **3E**. Placement and shaping of overburden to the nominated area at slopes with gradients generally around 10 degrees, with some slopes up to 14 degrees. This will be undertaken in a manner which, wherever practicable, ensures that any friable or weathered materials are placed below the subsoil and topsoil layers in order to provide a cover of more competent material and avoid the exposure of large rocks on the final surface. Any coarse coal rejects placed in the mine void will be covered with at least three metres of inert overburden material.

The chemical and physical characteristics of the overburden material are outlined above in **Section 3.3.1**.

In accordance with Whitehaven's adopted general practice, an intermediate layer of subsoil will be placed between the overburden material and the topdressing to improve the water holding capacity of the rehabilitated landform and reinstate a more natural soil profile. For areas being rehabilitated to bushland, Whitehaven may preferentially reduce the subsoil replacement depth and/or exclude subsoil replacement in selected areas to establish trial areas to monitor bushland development in different soil profiles.

Where resources allow, topsoil and subsoil will each be spread to a nominal depth of between 100 to 150 millimetres, giving a combined depth of soil material on the rehabilitated landform of between 200 and 300 millimetres. In all cases, at least 100 millimetres of topsoil will be respread. The subsoil layer will be spread on an even but roughened surface that has been ripped along the line of the contour to break any compacted and/or smooth surfaces. Ripping will also assist keying of subsoil into the overburden, which will, in turn, assist the prevention of land slip and can help vegetation penetrate deep into the soil profile, encourage ingress of water and minimise erosion.

Based on the stripping depths recommended by GSSE (2012) and the estimated area of land to be disturbed over the life of the Project, sufficient material will be available to enable effective intermediate layering and topdressing for site rehabilitation.

Selected tree trunks and branches and other vegetative debris removed during clearing will be spread over those areas to be restored as bushland where practical.

Domain 4 – Water Management

Surface water management structures will be progressively installed on the rehabilitated landform. The water management structures will be designed in accordance with the requirements of the 'Blue Book'.

Rock-lined drains will be constructed where required (ie. as already shown in the EA or where expert advice suggests other alternatives are not appropriate) to convey water safely from the rehabilitated landform in to the surface water management system at natural surface that conveys water from the mine site. Consideration will also be given to trialling other erosion control devices or systems as rehabilitation progresses across the site.

Domain 6 – Soil Stockpiles

Topsoil stockpiling will be undertaken during the MOP term as outlined in the **Plan 3** Series.

7.2.3 Growth Media Development

In the context of this MOP, growth media development encompasses activities to reinstate soils with the initial physical, chemical and biological characteristics required to establish the desired vegetation community.

Domain B - Water Management Area

This domain is active. Where practicable, water management structures that will remain in the final landform such as contour banks and drains will be constructed with longitudinal gradients that permit the transfer of water at non-erosive velocities (for example, 1V:200H).

The planting of trees and other vegetation around the various water management structures can enhance the filtration ability of these structures and surrounding areas and minimise the potential for erosion, as well as encouraging their use by native fauna. Plantings will be excluded from contour drains.

Domains C and D – Pasture Rehabilitation and Bushland Rehabilitation

Section 2.3.3 of this MOP outlines the management of soil resources relating to rehabilitation.

Where resources allow, topsoil and subsoil will each be spread to a nominal depth of between 100 to 150 millimetres, giving a combined depth of soil material on the rehabilitated landform of between 200 and 300 millimetres. In all cases, at least 100 millimetres of topsoil will be respread. The subsoil layer will be spread on an even but roughened surface that has been ripped along the line of the contour to break any compacted and/or smooth surfaces. Ripping will also assist the keying of subsoil into the overburden, which will, in turn, assist in the prevention of land slip and can help vegetation penetrate deep into the soil profile, encourage ingress of water and minimise erosion.

7.2.4 Ecosystem and Land Use Establishment

In the context of this MOP, ecosystem and land use establishment includes activities to establish the desired floristic composition (species diversity and density) and habitat features.

Domain C – Pasture Rehabilitation Area

Cover Crop Establishment

Following soil preparation all rehabilitation areas are stabilised with a cover crop (ie. Millet in Summer or Oats in Winter).

Pasture Establishment

Seed mixes appropriate to the season include fast growing, short lived species to optimise rapid stabilisation and increase soil organic content, and perennial grasses and legumes to fix nitrogen and establish native grasses groundcover for open woodland. Typical species mixes are presented in **Table 22**.

Soil tests will be undertaken as an aid to match suitable species using appropriate advice from a local agronomist.

Table 22 Recommended Pasture Species Seed Mix

Pasture Species	Rate (kg/ha)	Fertiliser
Warm Season Grasses		
Bombatsi Panic	1 – 2	40-60 kg/ha
Green/Gatton Panic [1]	2 – 4	Di-Ammonium Phosphate (DAP)
Purple Pigeon Grass	1 – 2	
Hatch Creeping Blue Grass	1-2	
Premier Digit	5-7	
Sabi Grass	5-7	
Annual Legumes		
Arrow Leaf Clover	4 - 5	
Casbah Bisserrula	1-2	
Rose Clover	1-2	
Cool Season Legumes[1]		
Barrel (Sephi) medic	2 – 4	
Snail (sava) medic [2]	3 – 5	
Woolly Pod Vetch	4 – 6	
Serradella (Elgara)	1 – 2	
Lucerne	0.5-1	
Cool Season Grasses		
Phalaris (Sirolan or Holdfast)	1 - 2	
Wallaby Grass	0.3 - 1	

1 – inoculated and appropriate rhizobia

2– specific soil conservation application

Domain D – Bushland Rehabilitation Areas

The top-dressed surfaces of those areas designated to be restored as rehabilitated bushland will be initially stabilised with a non-persistent cover crop followed by planting of a selection of locally occurring species. **Table 23** presents a list of suitable species for the re-establishment of bushland within the site.

These species will encourage the re-establishment of the pre-mining vegetation communities and, in the medium to longer term, create habitat and corridors for native fauna. Tubestock will generally be propagated from locally-collected seed though Whitehaven's seed collection program and will be used in strategic landscape planting around the site for visual mitigation. Large areas may be planted by direct seeding methods if site conditions allow, and will require the purchase of bulk seed mixes. Where possible, these mixes will be complimented with the addition of seed collected in the immediate area.

All areas identified for bushland and pasture re-establishment will be fenced and have stock excluded until it can be demonstrated that the vegetation is stable and self-sustaining, and that grazing will not impact upon its establishment.

Table 23 Recommended Tree and Shrub Species

Common Name	Scientific Name	Common Name	Scientific Name
Trees		**Shrubs**	
Narrow-leaf ironbark	*Eucalyptus crebra*	Western Golden Wattle	*Acacia decora*
Pilliga Grey Box	*Eucalyptus pilligaensis*	Amulla	*Myoporum debile*
White Box	*Eucalyptus albens*	Sandalwood	*Santalum lanceolatum*
Blakely's Red Gum	*Eucalyptus blakelyi*	Eastern Cottonbush	*Maireana microphylla*
Yellow Box	*Eucalyptus melliodora*	Native Jasmine	*Jasminum lineare*
Rosewood	*Alectryon oleifolius*	Gargaloo	*Parsonsia eucalyptophylla*
Bull Oak	*Allocasuarina luehmannii*	Yellow Berry Bush	*Maytenus cunninghamii*
Bimble Box	*Eucalyptus populnea*	Wild Lemon	*Canthium oleifolium*
Brigalow *Acacia*	*Harpophylla*	Wild Orange	*Capparis mitchellii*
Wilga	*Geijera parviflora*	Hopbush	*Dodonaea* spp.
Belah	*Casuarina cristata*	Emubush	*Eremophila longifolia*
Wild Orange	*Capparis mitchellii*	Native Olive	*Notelaea macrocarpa*
White Cypress Pine	*Callitris glaucophylla*	Butterbush	*Pittosporum angustifolium*
-	-	Cough Bush	*Cassinia laevis*

7.2.5 Ecosystem and Land Use Sustainability Phase

For the purposes of this MOP the Ecosystem and Land Use Sustainability phase represents those activities required to develop sustainable ecosystems that have characteristics comparable to similar undisturbed vegetation associations in the area.

All Domains

Activities associated with the ecosystem and land use sustainability phase of rehabilitation are generally ongoing maintenance and land management activities and rehabilitation monitoring. Maintenance at rehabilitated areas will include, but not be limited to:

- Ongoing environmental management to minimise risks to rehabilitation;

- Comparing specific ecosystem characteristics such as soil profile development, floristic composition and structure and faunal diversity and abundance with the characteristics of appropriate analogue sites; and
- Undertaking adaptive management and remedial works where characteristics of the rehabilitation are not trending toward desired outcomes.

Rehabilitation monitoring will be undertaken throughout the ecosystem and land use sustainability phase until it can be demonstrated that rehabilitation areas have met all conditions for relinquishment. Rehabilitation monitoring for the MOP term is discussed in **Section 8.1**.

7.3 Summary of Rehabilitation Areas during this MOP term

Table 24 summarises the rehabilitation status for each domain at the start of the MOP and anticipated status at the end of the MOP period.

Table 24 Summary of Rehabilitation Proposed during the MOP Term

Primary Domain	Secondary Domain	Code	Rehabilitation Phase	Total Area at MOP start (ha)	Area at end of MOP (ha)
Infrastructure Area (1)	Final Void (A)	1A	Active	9.7	3.3
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	0	0
			Ecosystem and Land Use Sustainability	0	0
			Total	**9.7**	**3.3**
Infrastructure Area (1)	Water Management Area (B)	1B	Active	7.9	2.0
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	0	0
			Ecosystem and Land Use Sustainability	0	0
			Total	**7.9**	**2.0**
Infrastructure Area (1)	Pasture Rehabilitation Area (C)	1C	Active	~~18.4~~ 18.9	~~14.4~~ 18.0
			Decommissioning	0	0
			Landform Establishment	0	0

Primary Domain	Secondary Domain	Code	Rehabilitation Phase	Total Area at MOP start (ha)	Area at end of MOP (ha)
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	0	0
			Ecosystem and Land Use Sustainability	0	0
			Total	~~**18.4**~~ **18.9**	~~**14.4**~~ **18.0**
Infrastructure Area (1)	Bushland Rehabilitation Area (D)	1D	Active	~~18.8~~ 35.4	~~18.0~~ 28.3
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	0	0
			Ecosystem and Land Use Sustainability	0	0
			Total	~~**18.8**~~ **35.4**	~~**18.0**~~ **28.3**
Infrastructure Area Total				~~**37.2**~~ **71.9**	~~**32.4**~~ **51.6**
Overburden Emplacement Area (2)	Pasture Rehabilitation Area (C)	2C	Active	~~4.9~~ 8.7	~~1.3~~ 2.9
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	0	0
			Ecosystem and Land Use Sustainability	0	0
			Total	~~**4.9**~~ **8.7**	~~**1.3**~~ **2.9**
Overburden Emplacement Area (2)	Bushland Rehabilitation Area (D)	2D	Active	~~38.2~~ 35.8	~~30.9~~ 29.8
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0

Primary Domain	Secondary Domain	Code	Rehabilitation Phase	Total Area at MOP start (ha)	Area at end of MOP (ha)
			Ecosystem and Land Use Establishment	0	0
			Ecosystem and Land Use Sustainability	0	0
			Total	~~**38.2**~~ **35.8**	~~**30.9**~~ **29.8**
Overburden Emplacement Area Total				~~**43.1**~~ **44.5**	~~**32.2**~~ **32.7**
Void / Active Mining (3)	Final Void (A)	3A	Active	0	7.6
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	0	0
			Ecosystem and Land Use Sustainability	0	0
			Total	**0**	**7.6**
Void / Active Mining (3)	Water Management Area (B)	3B	Active	0	7.9
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	0	0
			Ecosystem and Land Use Sustainability	0	0
			Total	**0**	**7.9**
Void / Active Mining (3)	Pasture Rehabilitation Area (C)	3C	Active	~~78.1~~ 83.1	~~83.7~~ 78.0
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	0	0
			Ecosystem and Land Use Sustainability	0	0
			Total	~~**78.1**~~ **83.1**	~~**83.7**~~ **78.0**

Primary Domain	Secondary Domain	Code	Rehabilitation Phase	Total Area at MOP start (ha)	Area at end of MOP (ha)
Void / Active Mining (3)	Bushland Rehabilitation Area (D)	3D	Active	~~32.6~~ 22.2	~~22.9~~ 15.5
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	0	0
			Ecosystem and Land Use Sustainability	0	0
			Total	**~~32.6~~ 22.2**	**~~22.9~~ 15.5**
Void / Active Mining Total				**~~110.7~~ 105.3**	**~~106.6~~ 109.0**
Water Management Area (4)	Final Void (A)	4A	Active	0.2	0
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	0	0
			Ecosystem and Land Use Sustainability	0	0
			Total	**0.2**	**0**
Water Management Area (4)	Water Management Area (B)	4B	Active	~~12.6~~ 5.6	~~11.0~~ 4.1
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	0	0
			Ecosystem and Land Use Sustainability	0	0
			Total	**~~12.6~~ 5.6**	**~~11.0~~ 4.1**
Water Management Area (4)	Pasture Rehabilitation Area (C)	4C	Active	2.7	5.9
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and	0	0

Primary Domain	Secondary Domain	Code	Rehabilitation Phase	Total Area at MOP start (ha)	Area at end of MOP (ha)
			Land Use Establishment		
			Ecosystem and Land Use Sustainability	0	0
			Total	**2.7**	**5.9**
Water Management Area (4)	Bushland Rehabilitation Area (D)	4D	Active	2.0	2.0
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	0	0
			Ecosystem and Land Use Sustainability	0	0
			Total	**2.0**	**2.0**
Water Management Area Total				**~~12.6~~ 10.5**	**~~11.0~~ 12.0**
Rehabilitation (5)	Pasture Rehabilitation Area (C)	5C	Active	0	0
			Decommissioning	0	0
			Landform Establishment	~~22.0~~ 21.7	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	~~0~~ 0.2	~~26.8~~ 26.9
			Ecosystem and Land Use Sustainability	0	~~0~~ 0.2
			Total	**21.9**	**~~26.8~~ 27.1**
Rehabilitation (5)	Bushland Rehabilitation Area (D)	5D	Active	0	0
			Decommissioning	0	0
			Landform Establishment	2.2	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	95.6	~~21.5~~ 17.2
			Ecosystem and Land Use Sustainability	0	~~95.8~~ 95.2
			Total	**97.8**	**~~117.3~~ 112.4**
Rehabilitation Total				**~~119.7~~ 119.7**	**~~144.1~~**

Primary Domain	Secondary Domain	Code	Rehabilitation Phase	Total Area at MOP start (ha)	Area at end of MOP (ha)
					139.5
Soil Stockpiles (6)	Pasture Rehabilitation Area (C)	6C	Active	~~1.0~~ 4.9	~~0.8~~ 5.4
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	0	0
			Ecosystem and Land Use Sustainability	0	0
			Total	~~**1.0**~~ **4.9**	~~**0.8**~~ **5.4**
Soil Stockpiles (6)	Bushland Rehabilitation Area (D)	6D	Active	~~9.0~~ 10.4	~~8.7~~ 17.9
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	0	0
			Ecosystem and Land Use Sustainability	0	0
			Total	~~**9.0**~~ **10.4**	~~**8.7**~~ **17.9**
Soil Stockpile Total				~~**10.0**~~ **15.3**	~~**9.5**~~ **23.3**
Overall Domain Total				~~**333.3**~~ **367.2**	~~**335.8**~~ **368.1**

7.4 Relinquishment Phase Achieved During MOP Period

No areas within the MOP boundary are anticipated to be relinquished during the current MOP period.

8 REHABILITATION MONITORING, RESEARCH AND REPORTING

8.1 Rehabilitation Monitoring

8.1.1 Rehabilitation Inspections

Prior to 2014/15, rehabilitation/revegetation monitoring by Whitehaven personnel has been confined to inspections of water management structures, soil stockpiles and seeded/planted areas for evidence of instability, erosion, or poor vegetation establishment.

8.1.2 Rehabilitation Monitoring Methodology

Rehabilitation monitoring was undertaken by Eco Logical in Spring 2014 and Autumn 2015. Details of rehabilitation monitoring results will be outlined in future AEMR/Annual Reviews. Areas being rehabilitated will be regularly inspected and assessed against the long and short-term rehabilitation objectives.

Rehabilitation monitoring will continue annually throughout the MOP period and be reported in the AEMR/Annual Review. Aspects of rehabilitation to be monitored will include:

- Evidence of any erosion or sedimentation from areas with establishing vegetation cover;
- Success of initial grass cover establishment;
- Success of tree and shrub plantings;
- Adequacy of drainage controls;
- Presence/absence of weeds; and
- General stability of the rehabilitation site.

Where the rehabilitation success appears limited, maintenance activities will be initiated. These may include re-seeding and where necessary, re-topdressing and/or the application of specialised treatments such as composted mulch to areas with poor vegetation establishment. Tree guards will be placed around planted tube stock if grazing by native animals is found to be excessive.

If drainage controls deteriorate they will be repaired and/or temporarily fenced to exclude animals. Should areas of excessive erosion and sedimentation be identified, remedial works such as importation of additional soil material and/or the redesigning of water management structures to address erosion will be undertaken.

A MOP will be prepared during the reporting period (planned for mid - 2016) in consultation with DRE to address rehabilitation and closure, with this document providing details of post-mining rehabilitation monitoring and maintenance.

The key monitoring parameters to be included in the program include:

- Landform and drainage design details;
- Substrate (spoil) characterisation;
- Site preparation techniques (for example, topsoil source and depth, soil ameliorants used etc.);
- Revegetation methodologies (for example, rate and type of fertiliser, cover crop and rate, time of sowing /planting);
- Weather conditions;
- Photographic records; and
- Initial follow-up care and maintenance works.

8.2 Research and Rehabilitation and Use of Analogue Sites

8.2.1 Use of Analogue Sites

The rehabilitation monitoring program outlined in **Section 8.1** will involve the use of analogue sites to allow a comparison of the development and success of the rehabilitation against a control. These analogue sites were established by Geoff Cunningham Natural Resource Consultants prior to the Rocglen Coal Mine Extension Project and indicate the condition of surrounding undisturbed areas.

These sites are located within vegetation communities that replicate areas that have been cleared as part of mining operations. They will be used to provide the basis for future rehabilitation efforts over the area of the mine site to be returned to bushland. Analogue, or reference, sites have been incorporated into the completion criteria in **Section 7**, where appropriate.

8.2.2 Research and Rehabilitation Trials

As outlined above in **Section 7.2**, Whitehaven typically places an intermediate layer of subsoil between the overburden material and the topdressing to improve the water holding capacity of the rehabilitated landform and reinstate a more natural soil profile. For areas being rehabilitated to bushland, Whitehaven may preferentially reduce the subsoil replacement depth and/or exclude subsoil replacement in selected areas to establish trial areas to monitor bushland development in different soil profiles. At this point in time, Whitehaven does not have any specific plans in this regard and any such activities will be undertaken in consultation with the relevant government agencies and reported in the AEMR/Annual Review.

Other rehabilitation trials are already underway to combat low organic matter and low soil microbe activity identified in topsoil on the northern area of the Western Emplacement. These trials will be monitored during the MOP term and include:

- Poultry manure compost trial - this trial was established within an area measuring 20 metres by 20 metres during November 2010 to investigate the potential benefits of spreading poultry manure compost over an area that had been shaped and topdressed (topsoil) to aid in cover crop establishment. At MOP commencement this trial had showed limited success, however it will continue to be monitored during the MOP term.
- Humus compost trial – with advice from a local agronomist, a mix of winter pasture seed was treated with a plant probiotic to stimulate microbial activity. The treated seed was then mixed with humus compost made from various plant materials at different stages of decomposition. The seed/compost mix was applied in early May 2011. At MOP commencement this trial had showed limited success, however it will continue to be managed during the MOP term.

- Direct seeding trial - this trial was established in 2012 on the southern slope of the Western Emplacement Area (refer **Plan 2**) to determine the suitability of direct seeding on site as a method of revegetation. Seed was cast by hand onto a 35 metre by 10 metre plot and lightly raked to cover the seeds. Results to date indicate that direct seeding is an effective option for the establishment of understory trees and shrubs on rehabilitation areas designated to bushland.

The results of these on-going trials will be reported in the AEMR/Annual Review.

8.3 Biodiversity Offset Management

To address and offset the impacts of the Rocglen Coal Mine, EcoLogical Australia prepared a *Biodiversity Offset Strategy* as part of the Rocglen Coal Mine Extension Project EA. EcoLogical prepared a *Regional Whitehaven Biodiversity Management Plan* in August 2013.

Section 3 of the *Regional Whitehaven Biodiversity Management Plan* outlines management strategies for the offset area. **Plan 4** outlines the location of the regional Whitehaven Offsets.

9 INTERVENTION AND ADAPTIVE MANAGEMENT

Where rehabilitation monitoring indicates that rehabilitation outcomes are not trending toward the nominated completion criteria Whitehaven will instigate early intervention and adaptive management to minimise the potential for rehabilitation failure. Identification of threats to rehabilitation and the subsequent intervention is discussed in the sections below

9.1 Threats to Rehabilitation

Unpredictable events such as bushfires, droughts and floods may present risks to rehabilitation both during the life of mine and post closure. These events generally have significant consequences for rehabilitation quality and are likely to require adaptive management in order to mitigate risks and achieve relinquishment of affected rehabilitation areas within a satisfactory timeframe.

Although these events may have a high degree of unpredictability, monitoring the status of contributing factors enables an assessment of the likelihood of a major impact to rehabilitation occurring. For example, measuring fuel loads in and adjacent to woodland rehabilitation areas informs a periodic assessment of the likelihood of a bushfire event.

Other major risks to rehabilitation may not present as sudden events, but as an increasing impact over an extended period of time. For example, evolution of regulator or community expectations regarding post mining land uses may present a risk to achieving relinquishment, or increasing feral pest numbers may increase pressure on native fauna and vegetation communities.

Key risks to rehabilitation were identified in the Risk Assessment (see **Section 3.1**), with a summary provided in **Table 25** and a full copy of the risk assessment included as **Appendix B**. The risk assessment was based on the MOP Guidelines and **Appendix B** outlines the current controls.

Table 25 Key Risks to Rehabilitation

Element	Issue
Erosion and Sediment Control	Failure to enhance progressive rehab Failure of existing rehab areas LTA knowledge of water management system and/or design
Acid Mine Drainage	LTA knowledge of material that may result in AMD.
Spontaneous Combustion	Poor management of materials with propensity for spon com.
Geotechnical	Geotechnical failure Flooding of the final void
Soil Type(s) and Suitability	Inadequate topsoil available No additional stripping opportunities due to full disturbance footprint
Flora	Not considering requirements in rehab planning (correct species) Failure to manage weeds
Fauna	Failure to manage pest species (kangaroos, goats, etc)
Bushfire	Bushfire entering the mine site but originating offsite
Contaminated	Long term use of the site

Element	Issue
Land	Spills, leaks etc.
Other Risks	
Air Quality	Dust created from intense earthworks during rehabilitation
Blasting	Blasting to achieve final landform
Noise	Intensive earthworks during rehabilitation
Visual Amenity	Lighting plant visible during bulk earthworks. Exposed areas visible from public roads or nearby residents
Aboriginal Cultural Heritage	Unintended interaction with Aboriginal site due to lack of awareness
Agricultural Resources	Mining disturbance Possible soil contamination Erosion and sedimentation Inability to recreate required Ag land capability on the post mining landform

9.2 Trigger Action Response Plan

The following Trigger Action Response Plan (TARP) for rehabilitation has been developed to identify required management actions in the event of impacts to rehabilitation, or where rehabilitation outcomes are not achieved in an acceptable timeframe. Where necessary, rehabilitation procedures will be amended accordingly with the aim of continually improving rehabilitation standards. Rocglen will notify DRE and other relevant stakeholders of any incident resulting in major impacts to rehabilitation.

The TARP is provided in **Table 26**. It will be reviewed and revised (as required) as conditions at Rocglen change or new risks to rehabilitation are identified.

Table 26 Trigger Action Response Plan

Aspect/ Category	Key Element	Element Number	Trigger Response	Condition Green	Condition Amber	Condition Red
Landform stability	Slope gradient	1	Trigger	At least 70% rehabilitation areas to have slopes within the limits stipulated in this document.	<70% of the rehabilitation area has slopes within the limits stipulated in this document.	<55% of the rehabilitation area has slopes within the limits stipulated in this document.
			Response	No response required. Continue monitoring program.	Undertake regrading and revegetation of the area.	Undertake a review of the landform design, including survey if required. Undertake regrading and revegetation of the area.
	Erosion control	2	Trigger	No gully or tunnel erosion. No rilling present.	Minor gully or tunnel erosion present and/or minor rilling, which is compromising landform stability.	Significant gully or tunnel erosion present and/or significant rilling.
			Response	No response required. Continue monitoring program.	An inspection of the site will be undertaken by a suitably trained person. Investigate opportunities to install water management infrastructure to address erosion. Remediate as appropriate.	Engage a consultant to assist with the management of erosion and sedimentation at the site and provide recommendations to appropriately remediate the erosion. Remediate as soon as practicable.
	Drainage Condition	3	Trigger	Drainage condition is in accordance with the design criteria established within this document.	Landforms exhibiting minor drainage issues but does not threaten or cause material harm to the environment.	Landforms exhibiting significant drainage issues, threatening or causing material harm to the environment.
			Response	No response required. Continue monitoring program.	An inspection of the site will be undertaken by a suitably trained person. Investigate opportunities to address issues. Remediate as appropriate.	Reporting as per PIRMP and all statutory reporting requirements. Engage a consultant to assist with the management of erosion and sedimentation at the site and provide recommendations to appropriately remediate the area. Remediate as soon as practicable.
Water Quality	Monitoring parameters	4	Trigger	Surface water quality of runoff from rehabilitation areas is within EPL criteria and site specific criteria established within the Water Management Plan.	Water quality exceeds trigger values for further investigation but does not threaten or cause material harm to the environment.	Water quality exceeds criteria, threatening or causing material harm to the environment.
			Response	No response required. Continue monitoring program.	Review and investigation of water quality monitoring and management where appropriate. Implement relevant remedial measures where required. See *Water Management Plan*.	Reporting as per PIRMP and all statutory reporting requirements. Implement relevant responses and undertake immediate review to determine source of issues and implement remediation measures identified as soon as practicable.

Aspect/ Category	Key Element	Element Number	Trigger Response	Condition Green	Condition Amber	Condition Red
Soil/spoil Quality	Monitoring parameters	5	Trigger	Properties of soil/spoil are within the ranges of established criteria within this document.	Properties of soil/spoil are outside the ranges specified within this document, but are able to sustain selected vegetation species.	Properties of soil/spoil are outside the ranges specified within this document, but are not able to sustain selected vegetation species.
			Response	No response required. Continue monitoring program.	Investigate application of additional soil, and/or use of appropriate soil ameliorants or management options to address soil/spoil quality.	Engage a consultant to assist with recommendations to appropriately remediate soil/spoil quality and depth. Remediate as soon as practicable.
Topsoil Depth	Depth	6	Trigger	At least 100mm of topsoil has been used in rehabilitation.	Less than 100mm of topsoil has been used in rehabilitation	Sufficient suitable topsoil cannot be identified for reinstatement at the minimum specified depth for the proposed final land use
			Response	Undertake rehabilitation. Regularly monitor rehabilitation.	Use ameliorants to enhance organic growing material. Initiate discussions with DRE.	Undertake a review of the topsoil balance to confirm sufficient material to meet minimum depth requirements. Investigate suitable topsoil resource substitutes if required.
Vegetation	Surface cover	7	Trigger	Six months following revegetation works, a minimum of 70% vegetative cover is present within rehabilitation areas (or 50% if rocks, logs or other features of cover are present).	Minimum of 60% vegetative cover is present within rehabilitation areas.	Minimum of 50% vegetative cover is present within rehabilitation areas.
			Response	No response required. Continue monitoring program.	Review procedures where required to increase vegetation cover.	An inspection of the site will be undertaken by a suitably trained person. Investigate use of appropriate management options to remediate. Remediate as appropriate.
	Species composition	8	Trigger	Six months following revegetation, species composition comprises native species mix consistent with surrounding vegetation.	Six months following revegetation, species composition comprises <75% native species.	Six months following revegetation, species composition comprises <50% native species.
			Response	No response required. Continue monitoring program.	Engage weed management contractor to remove introduced species from the site.	Engage weed management contractor to remove introduced species from the site as soon as practicable. Investigate management measures to assist native plant establishment including use of ameliorants and implement as appropriate.

Aspect/ Category	Key Element	Element Number	Trigger Response	Condition Green	Condition Amber	Condition Red
	Resilience to Disturbance	9	Trigger	Established species survive and/or regenerate after disturbance.	Minor occurrences of established species not surviving and/or regenerating after disturbance.	Significant numbers of established species not surviving and/or regenerating after disturbance.
			Response	No response required. Continue monitoring program.	Review procedures where required to increase resilience to disturbance.	An inspection of the site will be undertaken by a suitably trained person. Investigate use of appropriate management options to remediate. Undertake management measures and revegetation as soon as practicable.
		10	Trigger	Following disturbance and/or after rain, the number of weeds species and surface area cover ≤ in reference sites.	Following disturbance and/or after rain, the number of weeds species and surface area cover >25% greater than in reference sites.	Following disturbance and/or after rain, the number of weeds species and surface area cover >50% greater than in surrounding similar vegetation.
			Response	No response required. Continue monitoring program.	Engage weed management contractor to remove introduced species from the site.	Engage weed management contractor to remove introduced species from the site as soon as practicable. Investigate management measures to assist native plant establishment including use of ameliorants and implement as appropriate.
Feral Animals	Presence or absence of feral animals	11	Trigger	Pests are managed to minimise impact on the development of vegetation (as guided by LLS).	Pest animal species presence and density increased in annual monitoring events	Significant numbers of pest animals causing widespread damage to rehabilitation
			Response	Continue pest management program	Consult with LLS to recommend and implement appropriate pest animal control campaign.	Consult with LLS to recommend and implement appropriate pest animal control campaign. Engage a suitably qualified specialist to prepare a site management plan and implement recommendations such as augmenting pest animal exclusion fencing and re-vegetation.

10 REPORTING

Results of rehabilitation monitoring will be reported in the AEMR/Annual Review. The AEMR/Annual Review will also discuss rehabilitation performance against key performance measures/indicators, compliance with regulatory requirements and commitments, and identified trends and instances where potential rehabilitation failure has been identified triggering intervention in accordance with a Rehabilitation TARP (see **Section 9.2**).

AEMR/Annual Reviews will be submitted to relevant government agencies and made publically available on the Whitehaven website.

11 REVIEW AND IMPLEMENTATION OF THE MOP

11.1 Review of the MOP

Periodic reviews will be conducted to assess the effectiveness of this MOP. This MOP may also be revised due to:

- Deficiencies being identified;
- Results from the monitoring and review program;
- Recommendations resulting from the monitoring and review program;
- Changing environmental requirements;
- Improvements in knowledge or technology becoming available;
- Change in legislation;
- Where a risk assessment identifies the requirement to alter the MOP; and
- Change in the activities or operations at Rocglen.

11.2 Implementation

Whitehaven personnel are responsible for monitoring, review and implementation of this MOP, as listed in **Table 27**.

Table 27 Responsibilities for MOP Implementation

Position	Responsibility
Mine Manager	• Ensuring all contractors, sub-contractors and service-personnel are appropriately qualified and/or licenced to undertake the required work and have a good environmental performance record; • Ensuring all operations are undertaken in accordance with relevant environmental legislation; • Providing the final sign-off and/or authorising distribution of, all environmental reports / management plans etc.; • Workforce induction/training; and • Communication with statutory authorities and the community.
Group Manager - Environment	• Assist and advise management with the requirements of the relevant environmental laws and regulations, consents, licences, approvals and environmental management systems and plans; • Implement, monitor and review programs and procedures associated with this plan; • Consult with regulatory authorities as required; and • Report the progress of rehabilitation and biodiversity monitoring in the AEMR/Annual Review.
Environmental personnel	• Provide support to the Group Manager – Environment for MOP implementation as required. • Undertake site based actions to implement this plan in cooperation with the Operations Manager

12 REFERENCES

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Whitehaven Coal Mining (2013a) *Blast Management Plan*

Whitehaven Coal Mining (2013b) *Environmental Management Strategy*

Whitehaven Coal Mining (2013c) *Heritage Management Plan*

Whitehaven Coal Mining (2013d) *Noise Management Plan*

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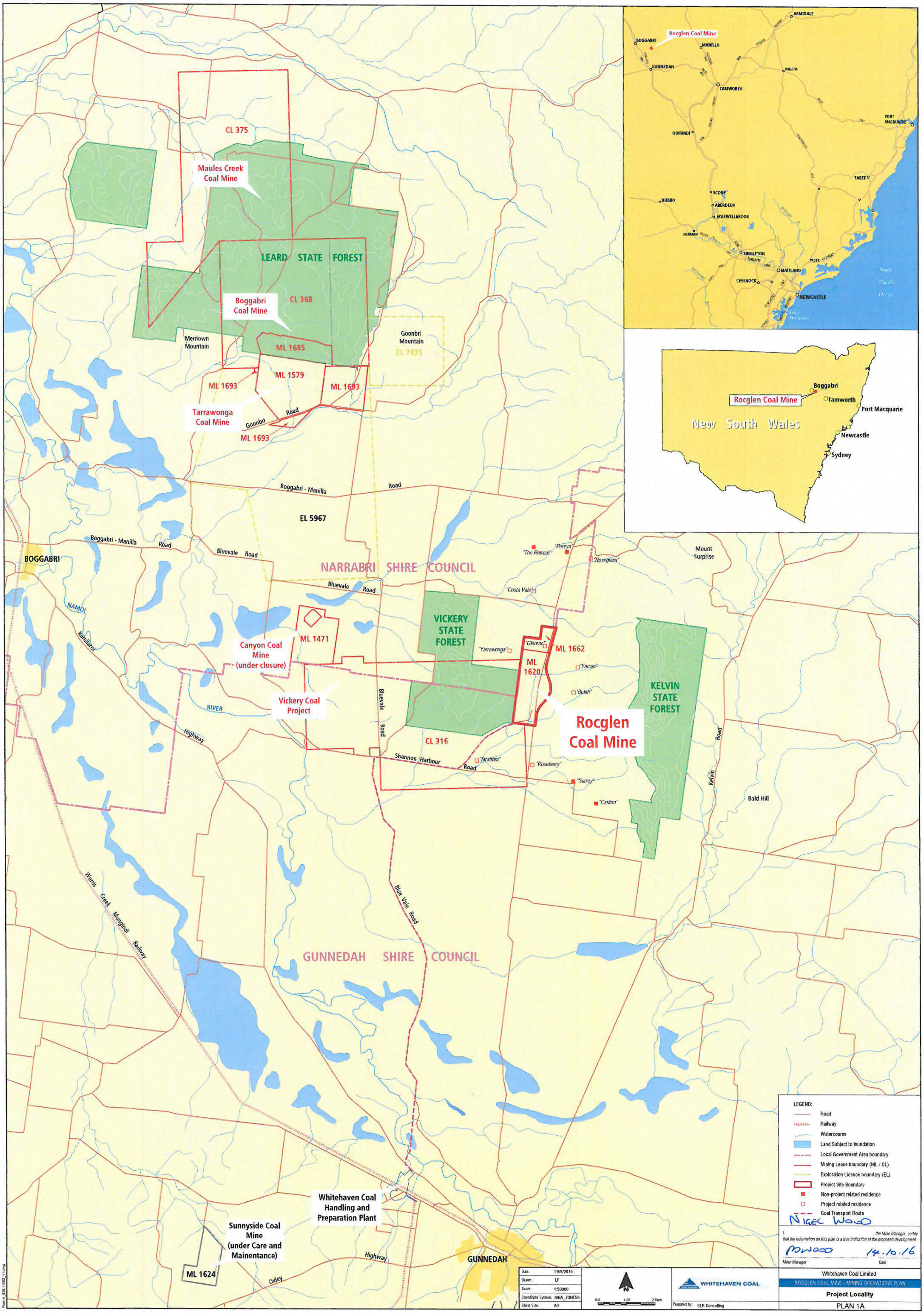
Whitehaven Coal Mining in conjunction with R.W. Corkery & Co. (2008) *Mining Operations Plan*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Maules Creek Coal Mine
LEARD STATE FOREST
Boggabri Coal Mine
CL 368
Merriown Mountain
ML 1685
Goonbri Mountain
EL 7435
ML 1579
ML 1693
ML 1693
Tarrawonga Coal Mine
Goonbri Road
ML 1693
Boggabri - Manilla Road
EL 5967
Boggabri - Manilla Road
BOGGABRI
Bluevale Road
NARRABRI SHIRE COUNCIL
Bluevale Road
NAMOI
Kamilaroi
Canyon Coal Mine (under closure)
ML 1471
VICKERY STATE FOREST
"Yarrawonga"
"Glenroc"
ML 1662
ML 1620
"Yarran"
"Belah"
Vickery Coal Project
RIVER
Bluevale Road
Highway
CL 316
Shannon Harbour Road
"Stratford"
"Roseberry"
"Surrey"
"Carlton"
Rocglen Coal Mine
KELVIN STATE FOREST
Kelvin Road
Bald Hill
"The Retreat"
"Penryn"
"Roseglass"
"Costa Vale"
Mount Surprise
Werris Creek Mungindi Railway
Blue Vale Road
GUNNEDAH SHIRE COUNCIL
Whitehaven Coal Handling and Preparation Plant
Sunnyside Coal Mine (under Care and Mainentance)
ML 1624
Highway
Oxley
GUNNEDAH
Rocglen Coal Mine
BOGGABRI
MANILLA
GUNNEDAH
TAMWORTH
WALCHA
ARMIDALE
PORT MACQUARIE
QUIRINDI
TAREE
SCONE
DUBBO
ABERDEEN
MUSWELLBROOK
DENMAN
SINGLETON
MAITLAND
CESSNOCK
NEWCASTLE
Boggabri
Rocglen Coal Mine
Tamworth
Port Macquarie
New South Wales
Newcastle
Sydney
LEGEND:
Road
Railway
Watercourse
Land Subject to Inundation
Local Government Area boundary
Mining Lease boundary (ML / CL)
Exploration Licence boundary (EL)
Project Site Boundary
Non-project related residence
Project related residence
Coal Transport Route
I, Nigel Wood, the Mine Manager, certify that the information on this plan is a true indication of the proposed development.
Mine Manager
Date 14.10.16
Date: 29/9/2015
Drawn: LF
Scale: 1:50000
Coordinate System: MGA_ZONE56
Sheet Size: A0
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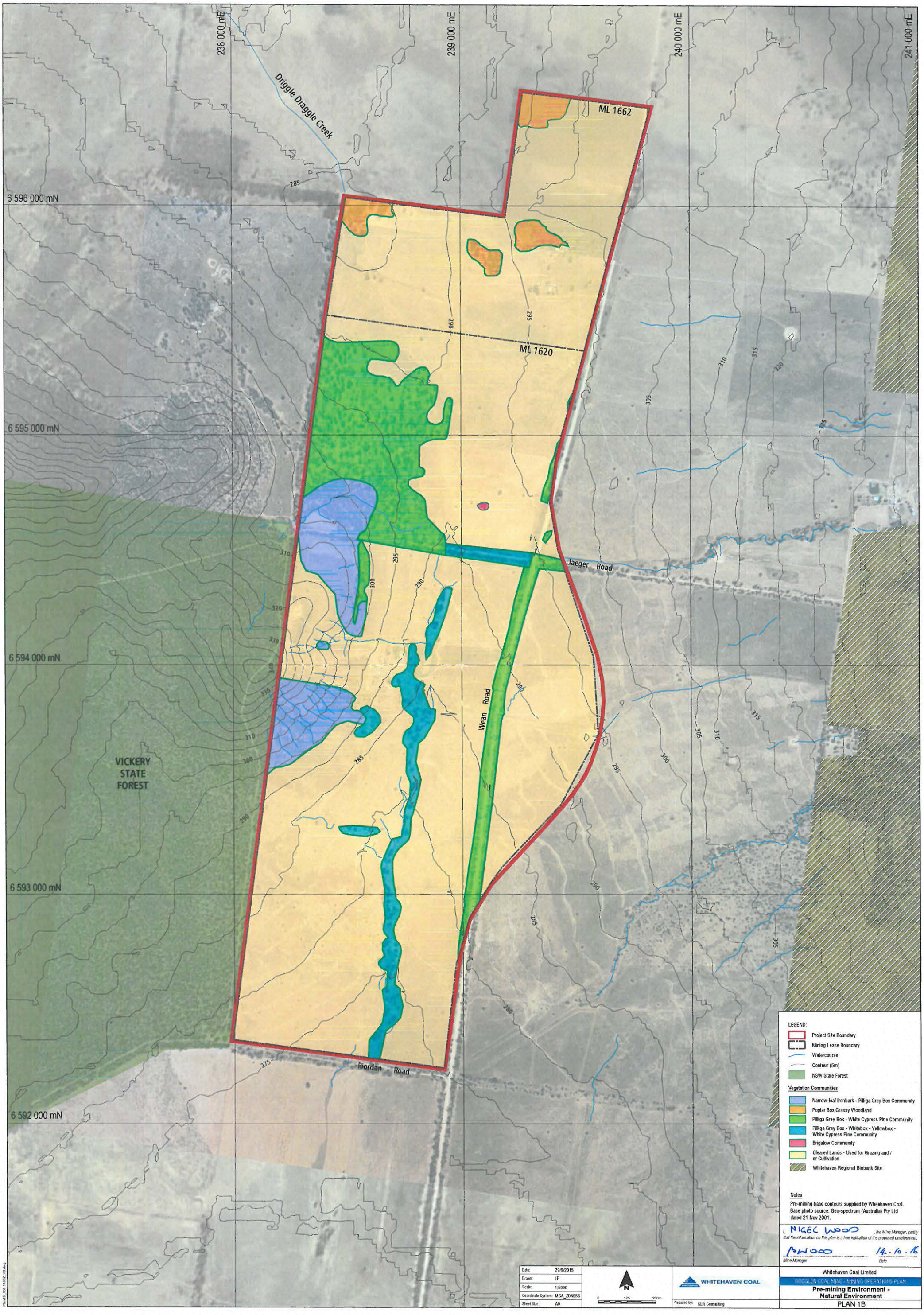
N
WHITEHAVEN COAL
Prepared by: SLR Consulting
Whitehaven Coal Limited
ROCGLEN COAL MINE - MINING OPERATIONS PLAN
Project Locality
PLAN 1A
Plan1A_630.11052_V4.dwg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6 594 000 mN
6 593 000 mN
6 592 000 mN
Driggle Draggle Creek
ML 1662
ML 1620
Jaeger Road
Wean Road
Riordan Road
VICKERY
STATE
FOREST
LEGEND:
Project Site Boundary
Mining Lease Boundary
Watercourse
Contour (5m)
NSW State Forest
Vegetation Communities
Narrow-leaf Ironbark - Pilliga Grey Box Community
Poplar Box Grassy Woodland
Pilliga Grey Box - White Cypress Pine Community
Pilliga Grey Box - Whitebox - Yellowbox - White Cypress Pine Community
Brigalow Community
Cleared Lands - Used for Grazing and / or Cultivation
Whitehaven Regional Biobank Site
Notes
Pre-mining base contours supplied by Whitehaven Coal.
Base photo source: Geo-spectrum (Australia) Pty Ltd dated 21 Nov 2001.
I, NIGEL WOOD, the Mine Manager, certify that the information on this plan is a true indication of the proposed development.
Mine Manager
14.10.16
Date
Date: 29/9/2015
Drawn: LF
Scale: 1:5000
Coordinate System: MGA_ZONE56
Sheet Size: A0
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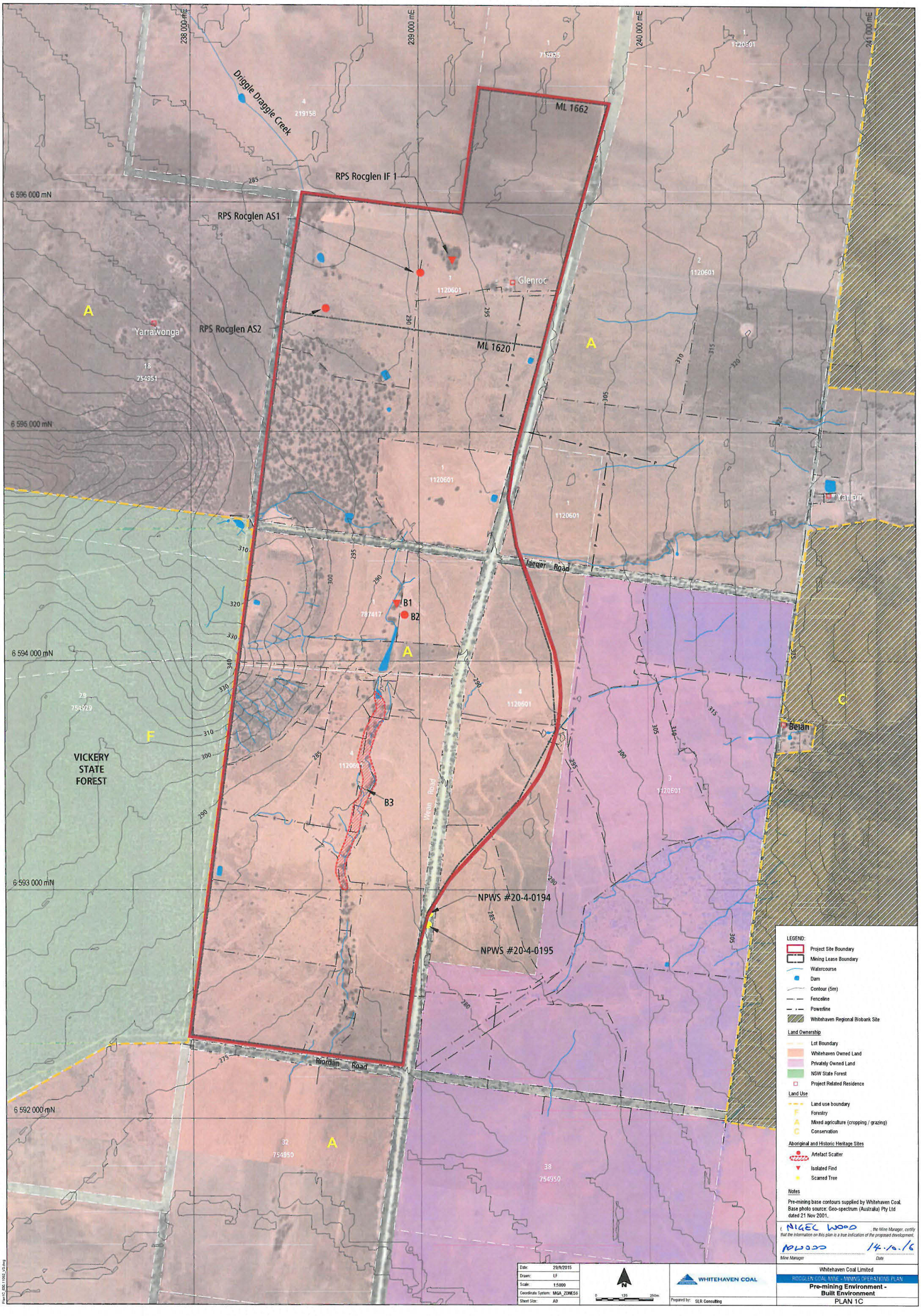
0 125 250m
WHITEHAVEN COAL
Prepared by: SLR Consulting
Whitehaven Coal Limited
ROGGLEN COAL MINE - MINING OPERATIONS PLAN
Pre-mining Environment - Natural Environment
PLAN 1B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6 593 000 mN
6 592 000 mN
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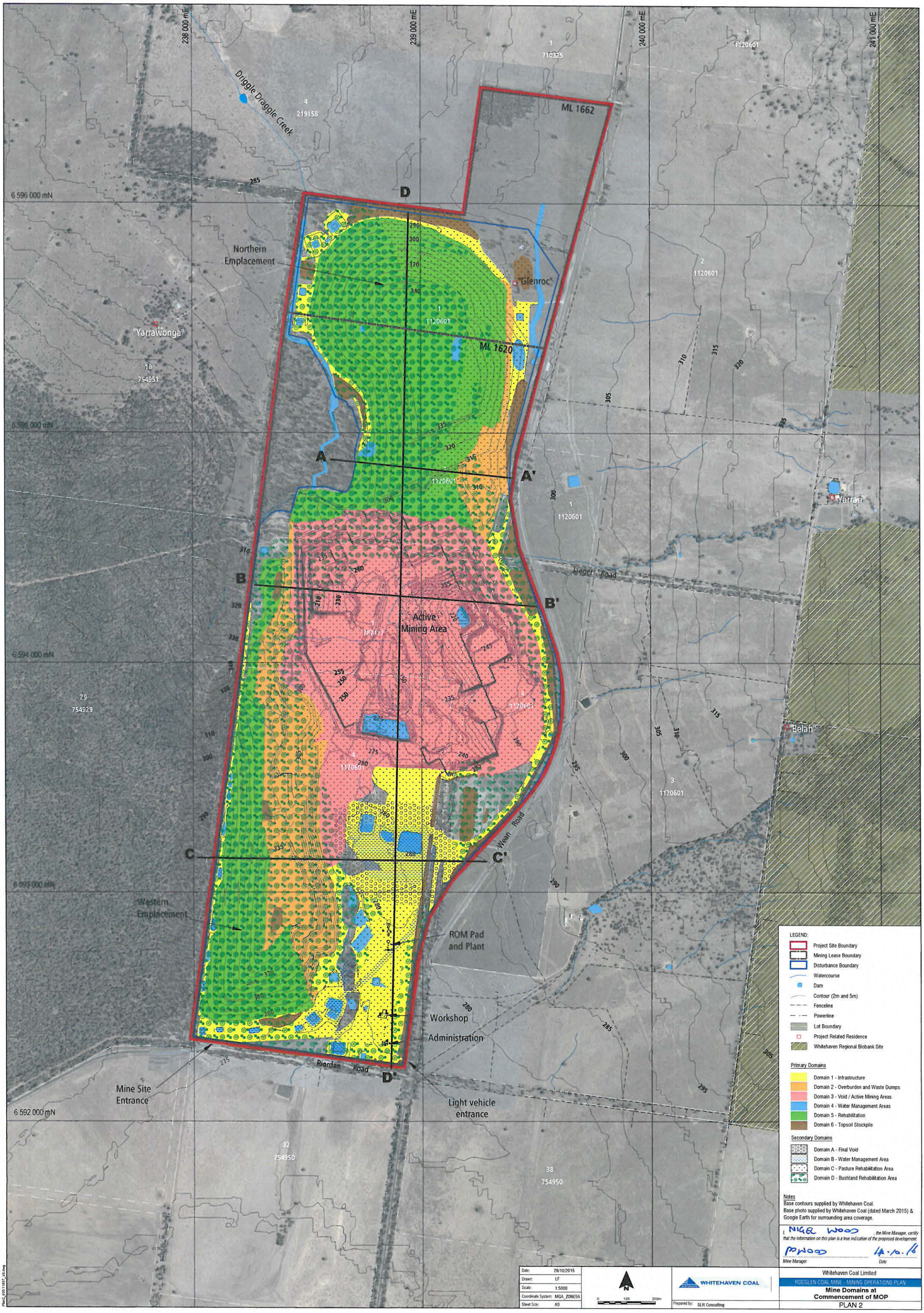
219158
1
710325
1
1120601
ML 1662
RPS Rocglen IF 1
RPS Rocglen AS1
RPS Rocglen AS2
Glenroc
"Yarrawonga"
18
754951
ML 1620
2
1120601
A
Yarrari
Jaeger Road
B1
B2
B3
787417
4
1120601
3
1120601
"Belah"
C
F
29
754929
VICKERY STATE FOREST
Wean Road
NPWS #20-4-0194
NPWS #20-4-0195
Riordan Road
32
754950
38
754950
285
290
295
300
305
310
315
320
330
340
280
275
LEGEND:
Project Site Boundary
Mining Lease Boundary
Watercourse
Dam
Contour (5m)
Fenceline
Powerline
Whitehaven Regional Biobank Site
Land Ownership
Lot Boundary
Whitehaven Owned Land
Privately Owned Land
NSW State Forest
Project Related Residence
Land Use
Land use boundary
Forestry
Mixed agriculture (cropping / grazing)
Conservation
Aboriginal and Historic Heritage Sites
Artefact Scatter
Isolated Find
Scarred Tree
Notes
Pre-mining base contours supplied by Whitehaven Coal.
Base photo source: Geo-spectrum (Australia) Pty Ltd dated 21 Nov 2001.
I, NIGEL WOOD, the Mine Manager, certify that the information on this plan is a true indication of the proposed development.
NWOOD 14.10.16
Mine Manager
Date
Date: 29/9/2015
Drawn: LF
Scale: 1:5000
Coordinate System: MGA_ZONE56
Sheet Size: A0
0 125 250m
WHITEHAVEN COAL
Prepared by: SLR Consulting
Whitehaven Coal Limited
ROCGLEN COAL MINE - MINING OPERATIONS PLAN
Pre-mining Environment - Built Environment
PLAN 1C
Plan1C_630.11062_V3.dwg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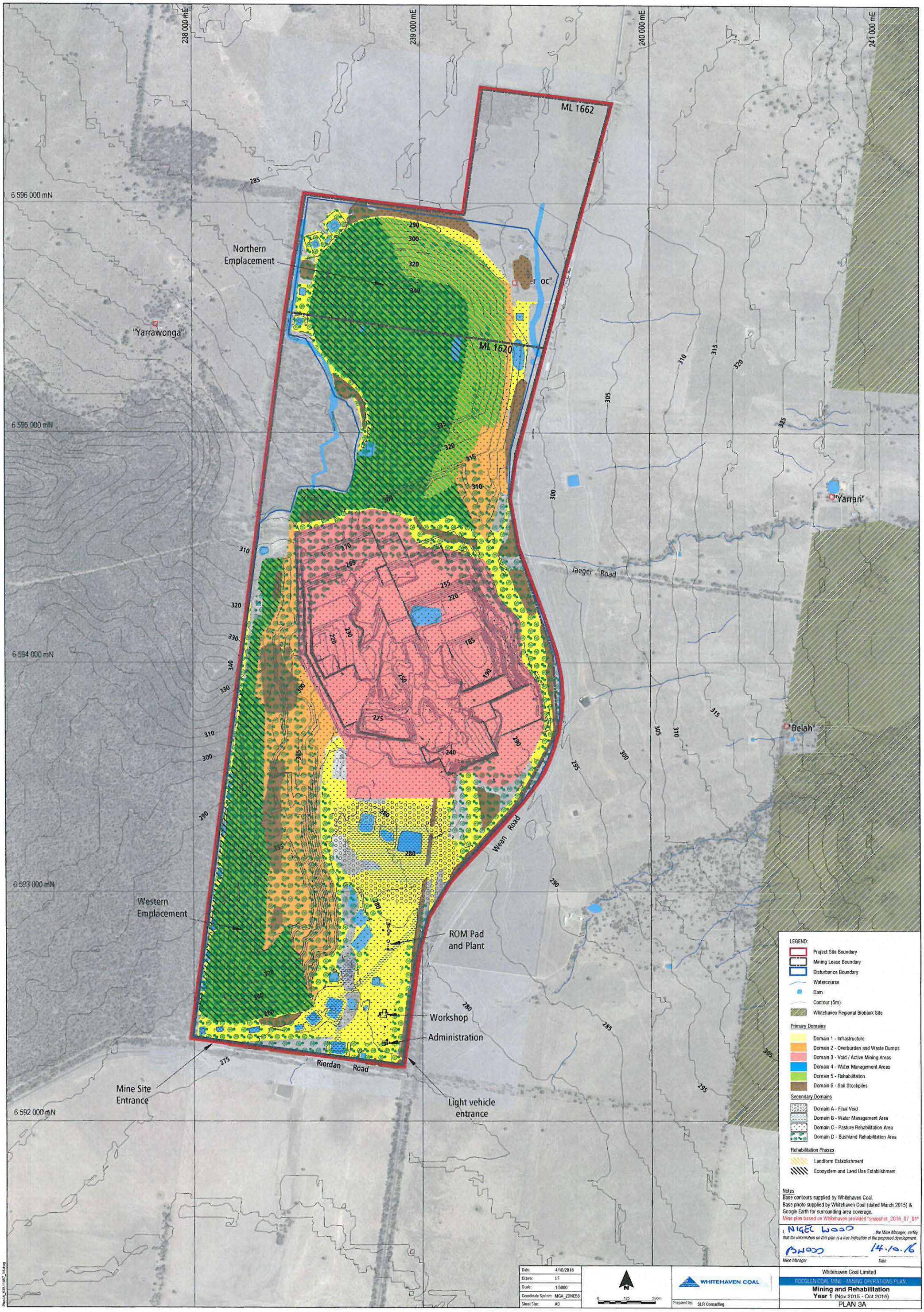
241 000 mE
6 596 000 mN
6 594 000 mN
6 593 000 mN
6 592 000 mN
Driggle Draggle Creek
ML 1662
ML 1620
D
A
A'
B
B'
C
C'
D'
Northern Emplacement
Western Emplacement
Active Mining Area
ROM Pad and Plant
Workshop
Administration
Mine Site Entrance
Light vehicle entrance
"Glenroc"
"Yarrawonga"
Yarrari
Belah
Jaeger Road
Wean Road
Riordan Road
LEGEND:
Project Site Boundary
Mining Lease Boundary
Disturbance Boundary
Watercourse
Dam
Contour (2m and 5m)
Fenceline
Powerline
Lot Boundary
Project Related Residence
Whitehaven Regional Biobank Site
Primary Domains
Domain 1 - Infrastructure
Domain 2 - Overburden and Waste Dumps
Domain 3 - Void / Active Mining Areas
Domain 4 - Water Management Areas
Domain 5 - Rehabilitation
Domain 6 - Topsoil Stockpile
Secondary Domains
Domain A - Final Void
Domain B - Water Management Area
Domain C - Pasture Rehabilitation Area
Domain D - Bushland Rehabilitation Area
Notes
Base contours supplied by Whitehaven Coal.
Base photo supplied by Whitehaven Coal (dated March 2015) & Google Earth for surrounding area coverage.
I NIGEL WOOD, the Mine Manager, certify that the information on this plan is a true indication of the proposed development.
Mine Manager
Date
14.10.16
Date: 29/10/2015
Drawn: LF
Scale: 1:5000
Coordinate System: MGA_ZONE56
Sheet Size: A0
0 125 250m
Prepared by: SLR Consulting
WHITEHAVEN COAL
Whitehaven Coal Limited
ROCGLEN COAL MINE - MINING OPERATIONS PLAN
Mine Domains at Commencement of MOP
PLAN 2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6 593 000 mN
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ML 1662
ML 1620
Northern Emplacement
Western Emplacement
"Yarrawonga"
"Yarrari"
"Belah"
Jaeger Road
Wean Road
Riordan Road
ROM Pad and Plant
Workshop
Administration
Mine Site Entrance
Light vehicle entrance
LEGEND:
Project Site Boundary
Mining Lease Boundary
Disturbance Boundary
Watercourse
Dam
Contour (5m)
Whitehaven Regional Biobank Site
Primary Domains
Domain 1 - Infrastructure
Domain 2 - Overburden and Waste Dumps
Domain 3 - Void / Active Mining Areas
Domain 4 - Water Management Areas
Domain 5 - Rehabilitation
Domain 6 - Soil Stockpiles
Secondary Domains
Domain A - Final Void
Domain B - Water Management Area
Domain C - Pasture Rehabilitation Area
Domain D - Bushland Rehabilitation Area
Rehabilitation Phases
Landform Establishment
Ecosystem and Land Use Establishment
Notes
Base contours supplied by Whitehaven Coal.
Base photo supplied by Whitehaven Coal (dated March 2015) & Google Earth for surrounding area coverage.
Mine plan based on Whitehaven provided "snapshot_2016_07_01"
I, NIGEL WOOD, the Mine Manager, certify that the information on this plan is a true indication of the proposed development.
NWOOD
14.10.16
Mine Manager
Date
Date: 4/10/2016
Drawn: LF
Scale: 1:5000
Coordinate System: MGA_ZONE56
Sheet Size: A0
N
0 125 250m
WHITEHAVEN COAL
Prepared by: SLR Consulting
Whitehaven Coal Limited
ROCGLEN COAL MINE - MINING OPERATIONS PLAN
Mining and Rehabilitation
Year 1 (Nov 2015 - Oct 2016)
PLAN 3A

238 000 mE
239 000 mE
240 000 mE
241 000 mE
6 596 000 mN
6 595 000 mN
6 594 000 mN
6 593 000 mN
6 592 000 mN
ML 1662
ML 1620
Northern Emplacement
"Yarrawonga"
"Glenroc"
"Yarrari"
"Belah"
Active Mining Area
Western Emplacement
ROM Pad and Plant
Workshop
Administration
Mine Site Entrance
Light vehicle entrance
Jaeger Road
Wean Road
Riordan Road

LEGEND:

- Project Site Boundary
- Mining Lease Boundary
- Disturbance Boundary
- Watercourse
- Dam
- Contour (5m)
- Whitehaven Regional Biobank Site

Primary Domains

- Domain 1 - Infrastructure
- Domain 2 - Overburden and Waste Dumps
- Domain 3 - Void / Active Mining Areas
- Domain 4 - Water Management Areas
- Domain 5 - Rehabilitation
- Domain 6 - Soil Stockpiles

Secondary Domains

- Domain A - Final Void
- Domain B - Water Management Area
- Domain C - Pasture Rehabilitation Area
- Domain D - Bushland Rehabilitation Area

Rehabilitation Phases

- Landform Establishment
- Ecosystem and Land Use Establishment

Notes
Base contours supplied by Whitehaven Coal.
Base photo supplied by Whitehaven Coal (dated March 2015) & Google Earth for surrounding area coverage.
Mine plan based on Whitehaven provided "snapshot_2017_07_01"

I, NIGEL WOOD, the Mine Manager, certify that the information on this plan is a true indication of the proposed development.

NWood — Mine Manager — 14.10.16 — Date

Date:	4/10/2016
Drawn:	LF
Scale:	1:5000
Coordinate System:	MGA_ZONE56
Sheet Size:	A0

N
0 125 250m

WHITEHAVEN COAL

Prepared by: SLR Consulting

Whitehaven Coal Limited
ROCGLEN COAL MINE - MINING OPERATIONS PLAN
Mining and Rehabilitation
Year 2 (Nov 2016 - Oct 2017)
PLAN 3B

Plan3B_609.11857_V6.dwg

238 000 mE
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240 000 mE
241 000 mE
6 596 000 mN
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6 594 000 mN
6 593 000 mN
6 592 000 mN
ML 1662
ML 1620
Northern Emplacement
"Glenroc"
"Yarrawonga"
"Yarrari"
"Belah"
Jaeger Road
Active Mining Area
Wean Road
Western Emplacement
ROM Pad and Plant
Workshop
Administration
Riordan Road
Mine Site Entrance
Light vehicle entrance

LEGEND:
- Project Site Boundary
- Mining Lease Boundary
- Disturbance Boundary
- Watercourse
- Dam
- Contour (5m)
- Whitehaven Regional Biobank Site

Primary Domains
- Domain 1 - Infrastructure
- Domain 2 - Overburden and Waste Dumps
- Domain 3 - Void / Active Mining Areas
- Domain 4 - Water Management Areas
- Domain 5 - Rehabilitation
- Domain 6 - Soil Stockpiles

Secondary Domains
- Domain A - Final Void
- Domain B - Water Management Area
- Domain C - Pasture Rehabilitation Area
- Domain D - Bushland Rehabilitation Area

Rehabilitation Phases
- Ecosystem and Land Use Establishment

Notes
Base contours supplied by Whitehaven Coal.
Base photo supplied by Whitehaven Coal (dated March 2015) & Google Earth for surrounding area coverage.
Mine plan based on Whitehaven provided "snapshot_2018_07_01"

I, NIGEL WOOD, the Mine Manager, certify that the information on this plan is a true indication of the proposed development.

Mine Manager — Date 14.10.16

Date:	4/10/2016
Drawn:	LF
Scale:	1:5000
Coordinate System:	MGA_ZONE56
Sheet Size:	A0

0 125 250m

Prepared by: SLR Consulting

Whitehaven Coal Limited

ROSEGLEN COAL MINE - MINING OPERATIONS PLAN

Mining and Rehabilitation
Year 3 (Nov 2017 - Oct 2018)

PLAN 3C

Plan3C_930_11857_v8.dwg

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6 594 000 mN
6 593 000 mN
6 592 000 mN
ML 1662
ML 1620
Northern Emplacement
"Yarrawonga"
Active Mining Area
Western Emplacement
ROM Pad and Plant
Workshop
Administration
Mine Site Entrance
Light vehicle entrance
Jaeger Road
Wean Road
Riordan Road
"Yarrari"
"Belah"

LEGEND:

- Project Site Boundary
- Mining Lease Boundary
- Disturbance Boundary
- Watercourse
- Dam
- Contour (5m)
- Whitehaven Regional Biobank Site

Primary Domains

- Domain 1 - Infrastructure
- Domain 2 - Overburden and Waste Dumps
- Domain 3 - Void / Active Mining Areas
- Domain 4 - Water Management Areas
- Domain 5 - Rehabilitation
- Domain 6 - Soil Stockpiles

Secondary Domains

- Domain A - Final Void
- Domain B - Water Management Area
- Domain C - Pasture Rehabilitation Area
- Domain D - Bushland Rehabilitation Area

Rehabilitation Phases

- Landform Establishment
- Ecosystem and Land Use Establishment

Notes
Base contours supplied by Whitehaven Coal.
Base photo supplied by Whitehaven Coal (dated March 2015) & Google Earth for surrounding area coverage.
Mine plan based on Whitehaven provided "snapshot_2019_07_01"

I NIGEL WOOD, the Mine Manager, certify that the information on this plan is a true indication of the proposed development.

N WOOD 14.10.16
Mine Manager Date

Date:	4/10/2016
Drawn:	LF
Scale:	1:5000
Coordinate System:	MGA_ZONE56
Sheet Size:	A0

N
0 125 250m

WHITEHAVEN COAL

Prepared by: SLR Consulting

Whitehaven Coal Limited
ROCGLEN COAL MINE - MINING OPERATIONS PLAN
Mining and Rehabilitation
Year 4 (Nov 2018 - Oct 2019)
PLAN 3D

Plan3D_630_11657_V8.dwg

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241 000 mE
6 596 000 mN
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6 593 000 mN
6 592 000 mN
ML 1662
ML 1620
Northern Emplacement
"Glenroc"
"Yarrawonga"
"Yarrari"
"Belah"
Jaeger Road
Active Mining Area
Wean Road
Western Emplacement
ROM Pad and Plant
Workshop
Administration
Riordan Road
Mine Site Entrance
Light vehicle entrance

LEGEND:

- Project Site Boundary
- Mining Lease Boundary
- Disturbance Boundary
- Watercourse
- Dam
- Contour (5m)
- Whitehaven Regional Biobank Site

Primary Domains

- Domain 1 - Infrastructure
- Domain 2 - Overburden and Waste Dumps
- Domain 3 - Void / Active Mining Areas
- Domain 4 - Water Management Areas
- Domain 5 - Rehabilitation
- Domain 6 - Soil Stockpiles

Secondary Domains

- Domain A - Final Void
- Domain B - Water Management Area
- Domain C - Pasture Rehabilitation Area
- Domain D - Bushland Rehabilitation Area

Rehabilitation Phases

- Ecosystem and Land Use Establishment
- Ecosystem and Land Use Sustainability

Notes
Base contours supplied by Whitehaven Coal.
Base photo supplied by Whitehaven Coal (dated March 2015) & Google Earth for surrounding area coverage.
Mine plan based on Whitehaven provided "snapshot_2020_10_01"

I, , the Mine Manager, certify that the information on this plan is a true indication of the proposed development.

Mine Manager ..... Date .....

Date:	31/10/2016
Drawn:	LF
Scale:	1:5000
Coordinate System:	MGA_ZONE56
Sheet Size:	A0

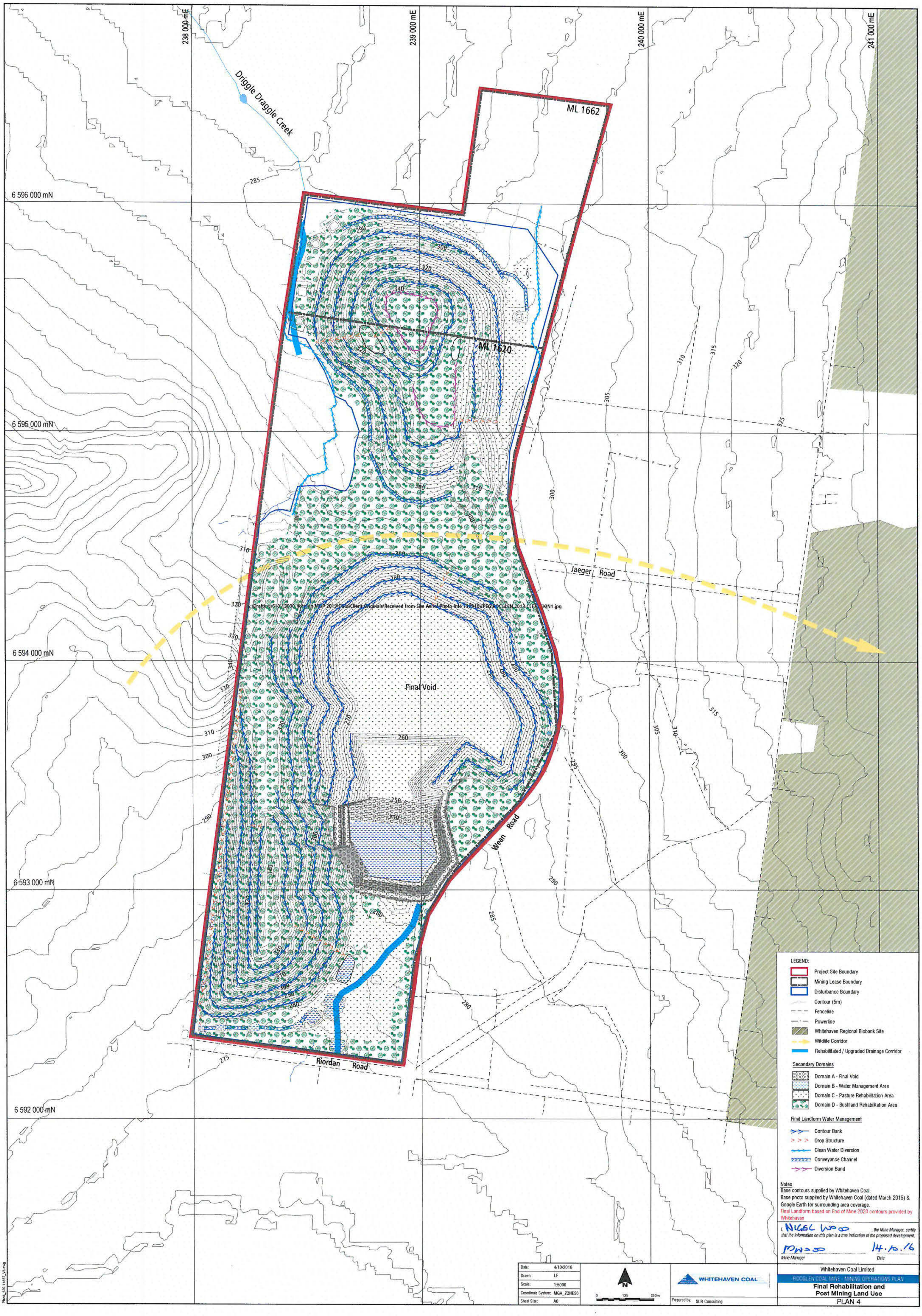
N
0 125 250m

WHITEHAVEN COAL

Prepared by: SLR Consulting

Whitehaven Coal Limited
ROCGLEN COAL MINE - MINING OPERATIONS PLAN
Mining and Rehabilitation
Year 5 (End of MOP) - Nov 2019 - Oct 2020
PLAN 3E

Plan3E_630.11807_V7.dwg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6 593 000 mN
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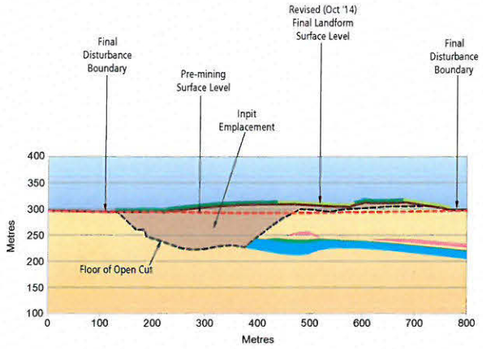
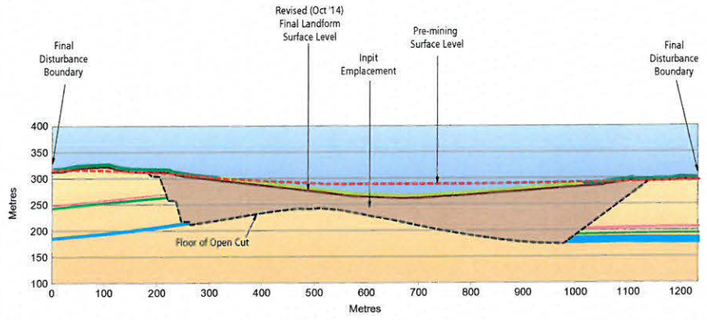
Driggle Draggle Creek
ML 1662
ML 1620
Jaeger Road
Wean Road
Riordan Road
Final Void
LEGEND:
Project Site Boundary
Mining Lease Boundary
Disturbance Boundary
Contour (5m)
Fenceline
Powerline
Whitehaven Regional Biobank Site
Wildlife Corridor
Rehabilitated / Upgraded Drainage Corridor
Secondary Domains
Domain A - Final Void
Domain B - Water Management Area
Domain C - Pasture Rehabilitation Area
Domain D - Bushland Rehabilitation Area
Final Landform Water Management
Contour Bank
Drop Structure
Clean Water Diversion
Conveyance Channel
Diversion Bund
Notes
Base contours supplied by Whitehaven Coal.
Base photo supplied by Whitehaven Coal (dated March 2015) & Google Earth for surrounding area coverage.
Final Landform based on End of Mine 2020 contours provided by Whitehaven
I, NIGEL WOOD , the Mine Manager, certify that the information on this plan is a true indication of the proposed development.
Mine Manager
Date 14.10.16
Date: 4/10/2016
Drawn: LF
Scale: 1:5000
Coordinate System: MGA_ZONE56
Sheet Size: A0
N
0 125 250m
WHITEHAVEN COAL
Prepared by: SLR Consulting
Whitehaven Coal Limited
ROCGLEN COAL MINE - MINING OPERATIONS PLAN
Final Rehabilitation and Post Mining Land Use
PLAN 4
Plan4_630.11857_V6.dwg



SECTION A - A'



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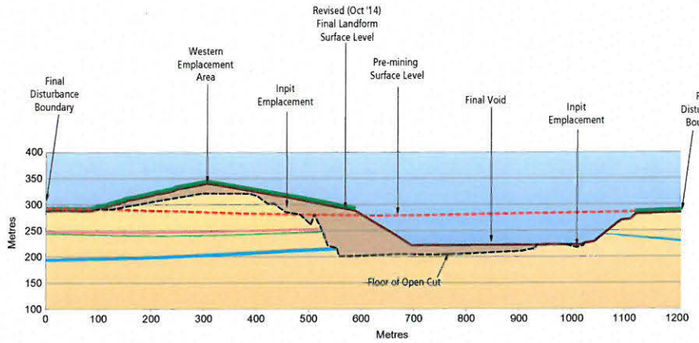

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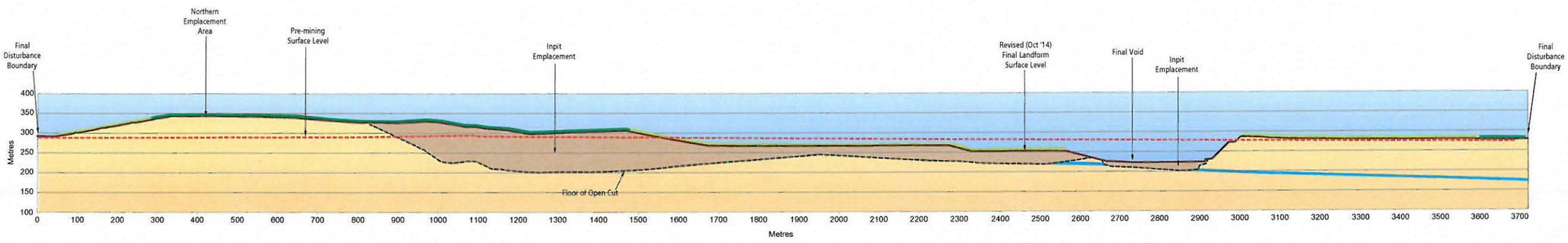

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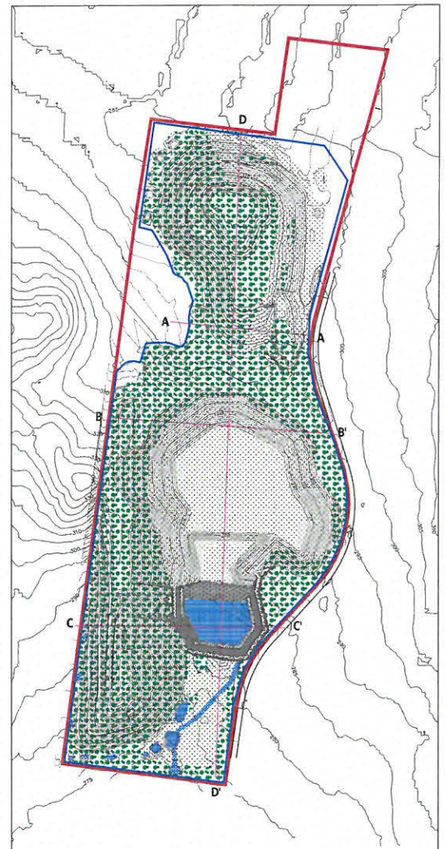

PLAN - Post-Mining Landform and Land Use
(showing Section locations)

LEGEND: (Relating to Plan)
- Project Site Boundary
- Final Disturbance Boundary
- Final Landform Contour (5m)
- Surface Water Storage
- Rehabilitated Pasture
- Rehabilitated Bushland

LEGEND: (Relating to Sections)
- Upper Glenroc Seam
- Lower Glenroc Seam
- Belmont Seam
- Rehabilitated Pasture
- Rehabilitated Bushland

I, NIGEL WOOD, the Mine Manager, certify that the information on this plan is a true indication of the proposed development.

Mine Manager — Date: 14.10.16

Date:	4/10/2016
Drawn:	LF
Scale:	
Coordinate System:	MGA_ZONE56
Sheet Size:	A0

N

0 300 600m
0 100 200m

WHITEHAVEN COAL

Prepared by: SLR Consulting

Whitehaven Coal Limited

ROCGLEN COAL MINE - MINING OPERATIONS PLAN

Rehabilitation and Post Mining Land Use Cross Sections

PLAN 5

Plot: 600.11952.V4.dwg

Rocglen Coal Mine, Risks to Rehabilitation, 2015

Key Element	Issue	Caused By	Consequence	Current Controls *(are in place)*	Risk Control Effectiveness	Consequence Category	Expected Risk Consequence	Risk Likelihood	Current Risk Rating	Proposed Additional Controls/Actions	Task Owner	Approval Required	Due Date	% Complete
Erosion and Sediment Control	Erosion and sediment on disturbed areas Uncontrolled discharge offsite of sediment laden water.	Failure to enhance progressive rehab Failure of existing rehab areas LTA knowledge of water management system and/or design	Impact on rehabilitated areas through erosion / riling Pollution through sediment laden water leaving the site	Erosion and Sediment Control Plan (part of Water Management Plan)	Satisfactory	Financial	4	D	L					
Acid Mine Drainage	Failure to achieve the rehabilitation outcome prescribed in the MOP	LTA knowledge of material that may result in AMD.	Inability to reach closure and relinquishment of the lease. Failure of the rehabilitated areas Poor water quality in on site water storages Requirement to treat water in the long term. Impact on environment.	Water Management Plan Water quality monitoring program	Satisfactory	Financial	5	D	L					
Spontaneous Combustion	Spon com impedes rehabilitation	Poor management of materials with propensity for spon com.	Inability to complete rehab. Impact on established rehab. Cost of managing spon com outbreak.	No history of spon comm No evidence of carb material on the site Spon Com Management procedures	Satisfactory	Financial	5	E	L					
Geotechnical	Failure of highwall or slumping of dumps around final void	Geotechnical failure Flooding of the final void	Inability to reach closure and relinquishment of the lease. Additional costs for rework. Safety concerns.	Original Mine and Landform design Geotechnical Inspections Monitoring	Satisfactory	Financial	4	C	L					
Soil Type(s) and Suitability	Inadequate volume of topsoil to achieve the rehabilitation outcome prescribed in the MOP	Inadequate topsoil available No additional stripping opportunities due to full disturbance footprint	Inability to reach closure and relinquishment of the lease. Cost of sourcing ameliorants and alternates Less than adequate rehabilitation outcomes	Topsoil mass balance estimate (stockpile quantities generally known and material ahead of operations is estimated) Conservative estimate of in situ topsoil reserves.	Satisfactory	Financial	4	D	L					
Flora	Failure to achieve the rehabilitation outcome prescribed in the MOP	Not considering requirements in rehab planning (correct species) Failure to manage weeds	Inability to reach closure and relinquish lease		Satisfactory	Legal and Compliance	5	D	L					
Fauna	Failure to achieve the rehabilitation outcome prescribed in the MOP	Failure to manage pest species (kangaroos, goats, etc)	Rehabilitation establishment not successful Need to re-work rehabilitated areas Inability to reach closure and relinquish lease		Satisfactory	Community/Reputation	5	D	L					
Bushfire	Damage to rehab	Bushfire entering the mine site but originating offsite	Loss of established rehabilitation Additional costs for rework of rehab Exposed areas (erosion, sediment, dust)	Water truck Rural Fire Service	Satisfactory	Financial	5	D	L					
Contaminated Land	Contaminated land occurring on the site at closure	Long term use of the site Spills, leaks etc.	Impact on environment Constraint for future land use Additional cost for clean up	Pollution Incident Response Management Plan (PIRMP) Emergency Management System	Satisfactory	Environment	5	D	L					
Other Risks														
Air Quality	Increased air borne dust resulting in complaints	Dust created from intense earthworks during rehabilitation	Complaints Prosecution and fines	Adjacent land owned by Whitehaven Water Carts Complaints Management System	Satisfactory	Community/Reputation	5	E	L					
Blasting	Blast impacts	Blasting to achieve final landform	Complaints Prosecution and fines	Blast Management Plan Noise Management Plan Current operational procedures	Satisfactory	Community/Reputation	5	D	L					
Noise	Increased noise resulting in complaints	Intensive earthworks during rehabilitation	Complaints Prosecution and fines	Noise Management Plan Current operational procedures	Satisfactory	Community/Reputation	5	D	L					
Visual Amenity	Rehab and closure works visible to private landowners	Lighting plant visible during bulk earthworks. Exposed areas visible from public roads or nearby residents	Complaints	Current operational procedures Complaints procedure Progressive rehabilitation	Satisfactory	Community/Reputation	5	E	L					
Aboriginal Cultural Heritage	Disturbance of known Aboriginal site	Unintended interaction with Aboriginal site due to lack of awareness	Prosecution Loss of culturally significant site	Already disturbed site with the location of the sites known Pre-clearance procedures Heritage Management Plan	Satisfactory	Legal and Compliance	3	D	L					
European Heritage	No European heritage issues.													
Agricultural Resources	Loss of agricultural resources	Mining disturbance Possible soil contamination Erosion and sedimentation Inability to recreate required Ag land capability on the post mining landform	Reduced amount of land available suitable for agricultural production	Minimisation of disturbance where possible Management of soil resources Inclusion of agricultural lands in final landform.	Satisfactory	Community/Reputation	5	E	L					
Groundwater	No additional issues identified (see above Geochem, ESC and AMD)													
Surface Water	No additional issues identified (see above Geochem, ESC and AMD)													