REHABILITATION MANAGEMENT PLAN

Edition	Rev.	Comments	Author	Authorised By	Date
1	0	2011 Rocglen Extension Project Review	GSSE	Danny Young	February 2012
	1	Updates to Figures 7 & 8 and revised Section 3.1	GSSE	D McGregor	April 2013

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1.0 INTRODUCTION

1.1 Background

Rocglen Coal Mine (Rocglen) is an open cut mining development owned and operated by Whitehaven Coal Limited (Whitehaven) in the Gunnedah coalfield of New South Wales (NSW). It is located approximately 25 kilometres north of Gunnedah and 23 kilometres south-east of Boggabri in northwest NSW (see **Figure 1**). The Rocglen Project Site covers approximately 460 hectares and incorporates the following land parcels:

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

All of the freehold land within the Project Site, being Lot 1 in DP 787417 and Lots 1 and 4 in DP 1120601, is owned by Whitehaven. The Vickery State Forest adjoining the site to the west is owned by the Crown.

Rocglen was originally approved by the Minister on the 15 April 2008 under Project Approval (PA) 06_0198. It was classified as a Major Project in accordance with the State Environmental Planning Policy (Major Projects) 2005 and, subsequently, was determined under Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act). The Mining Lease ML 1620 was issued for the Rocglen operation in June 2008 and coal production commenced in late 2008.

Following further drilling and resource definition, as well as additional reviews of the mine plan, the Minister granted Project Approval PA 10_0015 on the 27 September 2011 for the Rocglen Extension project, which permits Whitehaven to expand operations at Rocglen in order to maximise coal recovery and allow for improved mine progression. The Rocglen Extension Project will be fully integrated with the previously approved mining operation (PA 06_0198), enabling Whitehaven to operate the Rocglen Coal Mine under a single Project Approval (PA 10_0015).

GSS Environmental (GSSE) has been engaged by Whitehaven to prepare a Rehabilitation Management Plan for Rocglen in accordance with Condition 36 of Schedule 3 of Project Approval PA 10_0015. It is intended to provide a framework for mine closure, including progressive rehabilitation strategies and decommissioning works. **Section 1.3** outlines the scope and objectives of this Rehabilitation Management Plan, respectively.

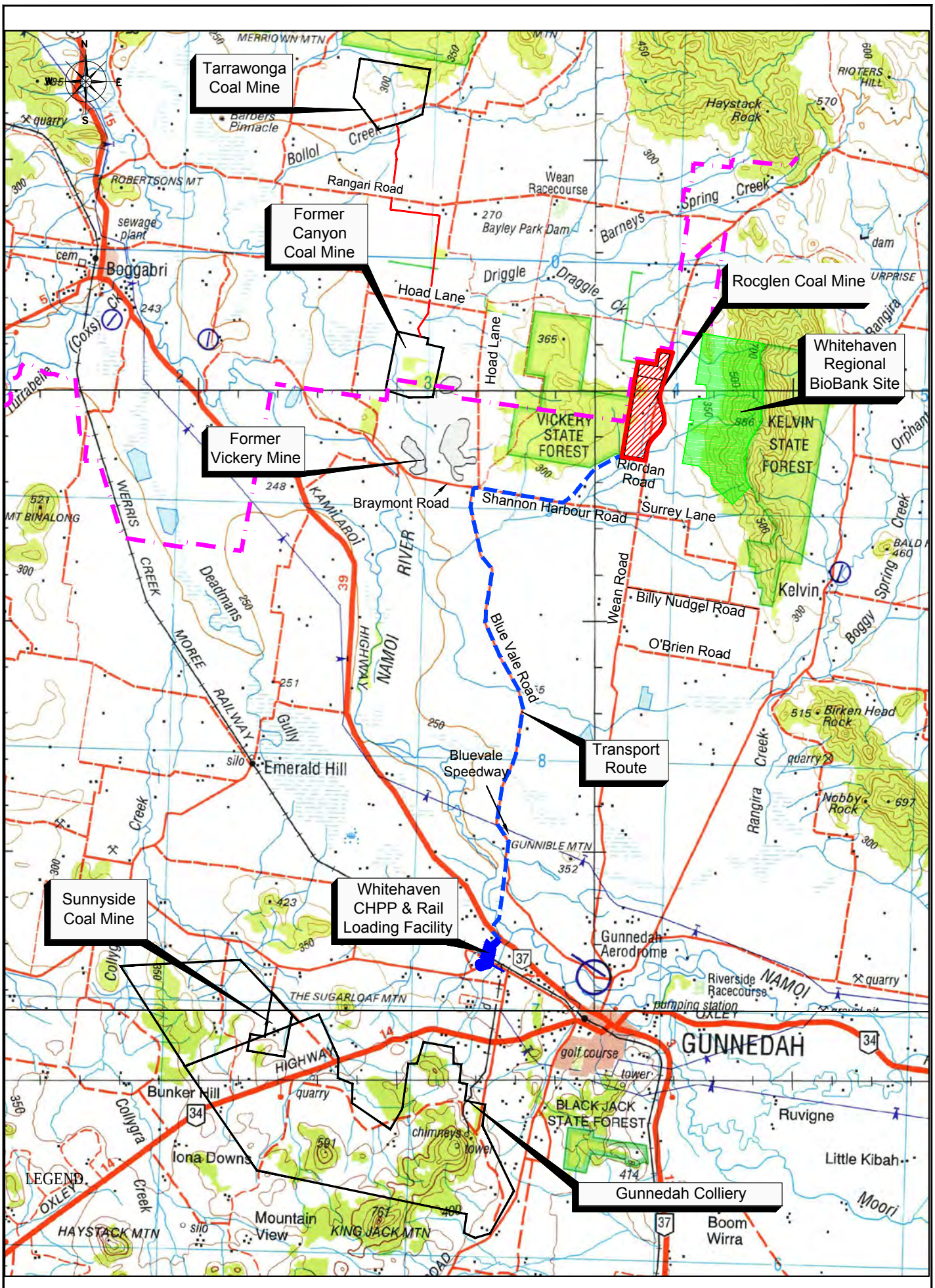
1.2 Approved Operations

In summary, the key activities approved at Rocglen under Project Approval PA 10_0015 are:

- **Coal Mining by Open Cut 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 (Upper Glenroc, Lower Glenroc and Belmont Seams) at a production rate of 1.5 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal.

- **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.

- **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 open cut pit for crushing, screening and loading into trucks for transport off-site.



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Rocglen Coal Mine
Location Plan
FIGURE 1

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- **Transportation** – road transportation of crushed and screened coal approximately 30 kilometres to the Whitehaven Coal Handling and Processing Plant (CHPP) for selective washing, stockpiling and dispatch by both rail and road. A proportion of the coarse reject material from the CHPP is approved to be backloaded to Rocglen for placement in the mined-out areas of the open cut.

- **Rehabilitation** – progressive rehabilitation of disturbed areas to ensure that, where practicable, completed mining and overburden emplacement areas are promptly shaped, topdressed and vegetated to provide a stable landform. Of the total anticipated disturbed area of approximately 358 hectares, it is proposed to restore approximately 206 hectares as rehabilitated bushland (58 percent), 147 hectares as rehabilitated pasture (41 percent), with the remaining five hectares comprising the retained highwall of the final void (one percent).

- **Biodiversity Offset Strategy** – offsetting of the disturbance to remnant native vegetation through the long-term conservation of over 525 hectares of vegetation within the Whitehaven Regional BioBank Site.

Under the provision of Project Approval PA 10_0015, Rocglen has approval to extract up to 1.5 Mtpa of ROM coal until the end of December 2022. **Figure 2** illustrates the approved layout of the mine site.

1.3 Rehabilitation Management Plan

1.3.1 Objectives

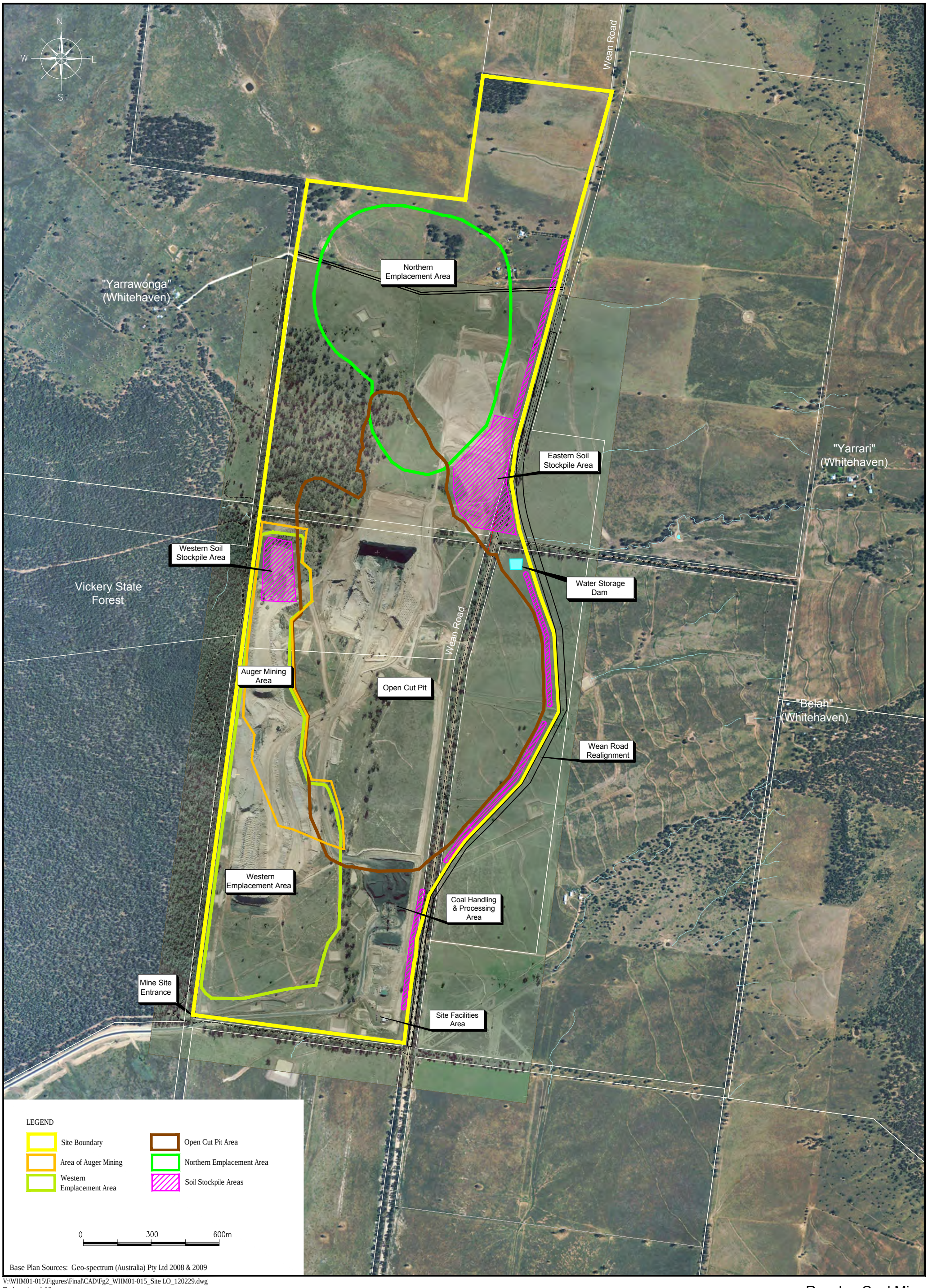
The most effective rehabilitation and decommissioning strategies are those that are integrated with the long term operational plans of the mine and are subject to regular review to accommodate regulatory, technological, social and economic change.

The principal objectives of mine closure planning, incorporated into this *Rehabilitation Management Plan*, include:

- Providing an overall framework for mine closure, including rehabilitation and decommissioning strategies. In this regard, a mine closure plan should be considered a template on which future activities should be based;
- Ensuring that adequate financial provision is made available to cover the cost of decommissioning, final rehabilitation and any other post closure costs related to the closure of the mine site;
- Establishing clear and agreed criteria with relevant stakeholders that can be used to provide the standard to which the final mine rehabilitation and post-mining land use can be assessed against;
- Minimising or eliminating adverse environmental and/or social impacts once the mine ceases operation;
- Ensuring closure is completed in accordance with good industry practice and meets the statutory requirements that may be applicable; and
- Ensuring the closed mine does not pose an unacceptable risk to public health and safety.

1.3.2 Scope

This *Rehabilitation Management Plan* has been prepared to identify and detail the progressive rehabilitation strategies to be implemented at Rocglen, along with the conceptual final rehabilitated landform and post-mining land use. It has been prepared to address and/or fulfil Conditions 34 to 36 of Schedule 3 of Project Approval PA 10_0015, as listed in **Table 1**.



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Rocglen Coal Mine
Site Layout
FIGURE 2

Table 1 – Relevant Conditions of Project Approval PA 10_0015

Condition
34 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

Feature	***Objective***
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*

35 Progressive Rehabilitation
The Proponent shall carry out the rehabilitation of the site progressively, that is, as soon as reasonably practicable following disturbance.
36 Rehabilitation Management Plan
The Proponent shall prepare and implement a Rehabilitation Management Plan to the satisfaction of the Executive Director, Mineral Resources in DRE. This plan must:
(a) be prepared in consultation with the Department, NOW, OEH, Council and the CCC;
(b) be submitted to the Executive Director, Mineral Resources in DRE by the end of February 2012;
(c) be prepared in accordance with any relevant DRE guideline;
(d) describe the measures that would be implemented to ensure compliance with the relevant conditions of this approval;
(e) address all aspects of rehabilitation including mine closure, final landform, and final land use; and
(f) build to the maximum extent practicable on the other management plans required under this approval.

Additionally, this *Rehabilitation Management Plan* has been prepared in accordance with the requirements of Condition 2 of Schedule 5 of Project Approval PA 10_0015 (management plan requirements), as applicable and/or warranted. Several of these requirements, including a contingency plan to manage unpredicted impacts and a pr otocol for managing incidents and complaints, which are detailed in Rocglen's *Environmental Management Strategy,* have not been addressed in this document to avoid unnecessary replication.

The Plan has been prepared with reference to relevant legislation and guidelines and is consistent with the commitments made in the *Environmental Assessment* (EA) (GSSE 2011) that accompanied the application seeking Project Approval PA 10_0015 for the Rocglen Extension Project. This EA includes the *Rehabilitation and Decommissioning Strategy* (GSSE 2011) prepared for Rocglen, along with the Statement of Commitments.

2.0 REHABILITATION MANAGEMENT STRATEGY

Whitehaven is committed to ensuring progressive rehabilitation of areas of disturbance (and sequencing activities to enable earliest revegetation consistent with operational requirements) within the Rocglen Project Site in order to minimise the areas of exposure and hence reduce the potential air quality impacts, erosion and sedimentation, and the visibility of mining operations from surrounding residences and publically available vantage points. Rehabilitation of disturbed areas will involve the re-profiling of the landform, top dressing (including subsoils) application consistent with the desired post-mining land capability and land use, installation of appropriate water management works and establishment of areas of native vegetation and pasture species.

Rehabilitated bushland areas along the western fringe of the Project Site will be linked to existing bushland, creating a connection with the surrounding environment. A corridor from the rehabilitated bushland will extend east just south of the Northern Emplacement Area, connecting the rehabilitated bushland on the site with remnant vegetation to the east and creating a wildlife corridor. Strategically placed bushland tree lots will also be established within grassland areas to act as wildlife refuges.

Central and eastern areas of the final landform will be established with rehabilitated pasture, including the areas directly surrounding the final void. This rehabilitated pasture will tie in with the existing surrounding grassland areas of the locality.

Along the eastern boundary of the Project Site, adjacent to Wean Road, a 20 metre strip of rehabilitated bushland will be established to increase the visual amenity of the site and reduce the visual impacts of the final void, as well as provide vegetation connectivity north-south on the eastern side of the final void.

The *Biodiversity Offset Strategy* aims to compensate for the impacts of the Rocglen operation on a 'like for like' basis with the equivalent of over 525 hectares of vegetation within the Whitehaven Regional BioBank Site. The Strategy provides an offset to impact ratio of 4.75:1. The BioBank Site will be actively managed via a BioBanking Management Plan with in-perpetuity management funding, and will have the highest level of conservation status outside of National Parks (via a BioBanking Agreement registered on the land title in-perpetuity). The improvements in conservation values at the Whitehaven Regional BioBank Site (through cessation of grazing and implementation of conservation practices) will lead to an 'improve and maintain' conservation outcome.

In the long term, upon mine completion, the primary rehabilitation objective will be to provide a low maintenance, stable and safe landform that blends in with the surrounding topography and provides a mixture of rehabilitated bushland and grazing comparable to pre-mining conditions.

2.1 Short and Long-Term Rehabilitation Objectives

All areas significantly disturbed by mining activities will be rehabilitated to a stable landform with a self-sustaining vegetation cover. This would be achieved by the early establishment of a ground cover and appropriately positioned tree and shrub plantings. 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.

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 and grazing areas that are generally consistent to pre-mining conditions. Specific long-term objectives include:

- Re-establish land to either pasture or bushland over the areas disturbed by the mine;
- Increase the area of land allocated to bushland/woodland through the revegetation of those areas disturbed by the mine and the long-term conservation of remnant and degraded native vegetation and/or habitat corridors on the mine site;
- Provide habitat for fauna and corridors for fauna movement within the final landform;
- Develop and implement a long-term and regionally integrated Biodiversity Offset Strategy; and
- Monitor rehabilitation success in terms of physical and biological parameters.

2.2 Preliminary Rehabilitation Success Criteria

Rehabilitation planning criteria for the mine site presented in this section have been taken from *Strategic Framework for Mine Closure* (ANZMEC 2000) to ensure the most appropriate and efficient rehabilitation techniques are applied. Whitehaven will seek advice from representatives of the relevant government agencies and specialist consultants regarding any additional actions that may need to be adopted.

The following is a list of the ANZMEC Rehabilitation Criteria:

- Rehabilitation and rehabilitation outcomes consistent with the Environmental Assessment which formed the basis of approval.
- Based on mine closure criteria and rehabilitation outcomes developed through stakeholder consultation.
- Integrates rehabilitated native vegetation with undisturbed native vegetation to provide larger areas and wildlife corridors.
- Suitable for an agreed subsequent land use as far as possible compatible with the surrounding land fabric and land use requirements.
- Addresses limitations on the use of rehabilitated land.
- Sustainable in terms of that land use.
- Stable and permanent landforms, with soils, hydrology, and ecosystems with maintenance needs no greater than those of surrounding land (may include waste emplacements, voids, pits and water-bodies providing that they are part of the accepted final outcome).
- Securely and safely contain waste substances that have the potential to affect land use or result in pollution.
- Not present a hazard to persons, stock or native fauna.
- Addresses threatened species issues.
- Addresses heritage issues.
- Clean and tidy, and free of rubbish, metal and derelict equipment/structures, except for heritage and other agreed features.
- Free from unacceptable air and water pollution, and other environmental effect outside the disturbed area.

The 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, soil resources and land capability, erosion and sediment control, and air quality;
- 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 Annual Environmental Management Report (AEMR) / Annual Report.

The preliminary success criteria (or closure criteria as they are often referred to) for the rehabilitation areas are identified in **Table 2**. For each element, standards that define rehabilitation success at mine closure are provided.

Table 2 – Preliminary Rehabilitation Success Criteria

Rehabilitation Element	Indicator	Criteria
1. Inpit Overburden		
Landform stability	Slope gradient	No less than 75% of the area has overall slopes ≤3H:1V. Where the slopes are steeper, additional water management structures will be utilised (as required).
	Erosion control	Erosion control structures are installed at intervals commensurate with landform slope.
		Average soil loss per annum is <40 tonnes/ha/yr (sheet erosion).
		Dimensions and frequency of occurrence of erosion rills and gullies are generally no greater than that in reference sites that exhibit similar landform characteristics.
	Surface Water Drainage	Use of contour banks and diversion drains to direct water into stable areas or sediment control basins.
		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.
Water quality	Water Quality	Ensure receiving waters affected by surface water runoff have contaminant limits within an acceptable range.
Topsoil	Salinity (electrical conductivity)	Soil salinity content is <0.6 dS/m.
	pH	Soil pH is between 5.5 and 8.5.
	Sodium content	Soil Exchange Sodium Percentage (ESP) is <15%.
	Nutrient cycling	Nutrient accumulation and recycling processes are occurring as evidenced by the presence of a litter layer, mycorrhizae and/or other microsymbionts. Adequate macro and micro-nutrients are present.
Vegetation	Land use	Area accomplishes and remains as a healthy stand of shrubs, trees and grass species.
		The site can be managed for its designated landuse without any greater management inputs than other land in the area being for a similar purpose.
	Surface cover	Minimum of 70% vegetative cover is present (or 50% if rocks, logs or other features of cover are present). No bare surfaces >20 m^2 in area or >10 m in length down slope.
	Species composition	Subject to proposed land use, comprise a mixture of native trees, shrubs and grasses representative of regionally occurring vegetation where possible.
		Vegetation communities should be developed to attract and support the re-colonisation by native flora and fauna species found in the area.
	Resilience to disturbance	Established species survive and/or regenerate after disturbance. Weeds do not dominate native species after disturbance or after rain. Pests do not occur in substantial numbers or visibly affect the development of native plant species.

Rehabilitation Element	Indicator	Criteria
	Sustainability	Species are capable of setting viable seed, flowering or otherwise reproducing. Evidence of second generation of shrub and understorey species. Vegetation develops and maintains a litter layer evidenced by a consistent mass and depth of litter over subsequent seasons. More than 75% of shrubs and/or trees are healthy when ranked healthy, sick or dead.
Fauna	Vertebrate species	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. The number of vertebrate species does not show a decrease over a number of successive seasons prior to mine closure.
	Invertebrate species	Presence of representatives of a broad range of functional indicator groups involved in different ecological processes.
	Habitat structure	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.
Visual	Visual Amenity	Long term visual impact should be minimised by creating acceptable landforms, preferably compatible with adjacent landscape
Safety	Physical	Excavations to be rendered safe
		All drill holes, pits, open cuts and other openings to be securely capped, filled or otherwise made safe
		Public and livestock access is to be restricted as appropriate to site conditions
		No rubbish should remain at the surface, or at risk of being exposed through erosion
2. Final Void (including Ramps)		
Landform stability	Stability	Inspection undertaken by a qualified geotechnical engineer and there is no subsidence or slipping of the pit walls present that is a threat to the long term stability of the final void.
Safety	Risk Assessment	Risk assessment has been undertaken in accordance with relevant guidelines and Australian Standards and risks reduced to levels agreed with the stakeholders.
	Physical	Excavations to be rendered safe
		All drill holes, pits, open cuts and other opening to be securely capped, filled or otherwise made safe
		Public and livestock access is to be restricted as appropriate to site conditions
		No rubbish should remain at the surface, or at risk of being exposed through erosion.
4. Mine Plant/Industrial Areas		
Landform stability	Slope gradient	Areas have gradients of <2°.
	Erosion control	Erosion mitigation measures have been applied. Average soil loss per annum per domain unit is <40 tonnes/ha/yr (sheet erosion).
	Surface Water Drainage	Use of contour banks and diversion drains to direct water into stable areas or sediment control basins.
Water quality	Water Quality	Ensure receiving waters affected by surface water runoff have contaminant limits within an acceptable range.
Topsoil	Salinity (electrical conductivity)	Soil salinity content is <0.6 dS/m.
	pH	Soil pH is between 5.5 and 8.5.
	Sodium content	Soil Exchange Sodium Percentage (ESP) is <15%.
	Nutrient cycling	Nutrient accumulation and recycling processes are occurring as evidenced by the presence of a litter layer, mycorrhizae and/or other microsymbionts. Adequate macro and micro-nutrients are present.
	Land use	Buildings, water storage, roads (except those used by the public) and other infrastructure have been removed unless stakeholders have entered into formal written agreements for their retention.
	Land use	Areas are readily accessible and conducive to safe management activities. Predicted economics and /or benefits have been defined and agreed by the stakeholders.

Rehabilitation Element	Indicator	Criteria
	Boreholes	Boreholes (except those retained for monitoring purposes) have been shutdown, bore casings removed and holes plugged or capped to regulatory standards
	Land use	Area accomplishes and remains as a healthy stand of shrubs, trees and grass species.
Infrastructure		The site can be managed for its designated landuse without any greater management inputs than other land in the area being for a similar purpose.
	Surface cover	Minimum of 70% vegetative cover is present (or 50% if rocks, logs or other features of cover are present). No bare surfaces >20 m^2 in area or >10 m in length down slope.
	Species composition	Subject to proposed land use, comprise a mixture of native trees, shrubs and grasses representative of regionally occurring vegetation where possible.
Vegetation	Land use	Area accomplishes and remains as a healthy stand of shrubs, trees and grass species.
		The site can be managed for its designated landuse without any greater management inputs than other land in the area being for a similar purpose.
	Surface cover	Minimum of 70% vegetative cover is present (or 50% if rocks, logs or other features of cover are present). No bare surfaces >20 m^2 in area or >10 m in length down slope.
	Species composition	Subject to proposed land use, comprise a mixture of native trees, shrubs and grasses representative of regionally occurring vegetation where possible.
		Vegetation communities should be developed to attract and support the re-colonisation by native flora and fauna species found in the area.
	Resilience to disturbance	Established species survive and/or regenerate after disturbance. Weeds do not dominate native species after disturbance or after rain. Pests do not occur in substantial numbers or visibly affect the development of native plant species.
	Sustainability	Species are capable of setting viable seed, flowering or otherwise reproducing. Evidence of second generation of shrub and understorey species. Vegetation develops and maintains a litter layer evidenced by a consistent mass and depth of litter over subsequent seasons. More than 75% of shrubs and/or trees are healthy when ranked healthy, sick or dead.
		All surfaces should be regraded to the agreed landform on the ESIA and revegetated to a self-sustaining condition similar to vegetation in comparable local areas to a standard consistent with data obtained from pre-mining baseline environmental studies.
Fauna	Vertebrate species	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. The number of vertebrate species does not show a decrease over a number of successive seasons prior to mine closure.
	Invertebrate species	Presence of representatives of a broad range of functional indicator groups involved in different ecological processes.
	Habitat structure	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.
Visual	Visual Amenity	Long term visual impact should be minimised by creating acceptable landforms, preferably compatible with adjacent landscape
Safety	Physical	Excavations and subsidence to be rendered safe
		All drill holes, pits, open cuts and other opening to be securely capped, filled or otherwise made safe
		Access to members of the public and livestock is to be restricted as appropriate to site conditions
		No rubbish should remain at the surface, or at risk of being exposed through erosion

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.

Based on the generic indicators in **Table 2**, each criterion will be further developed to be specific, measurable, achievable, realistic and outcome based, and to reflect the principle of sustainable development. This will be based on results of further research and on-going monitoring of the progressive rehabilitation areas. The success criteria will be reviewed every three to five years with stakeholder participation to ensure the nominated success criteria remain realistic and achievable.

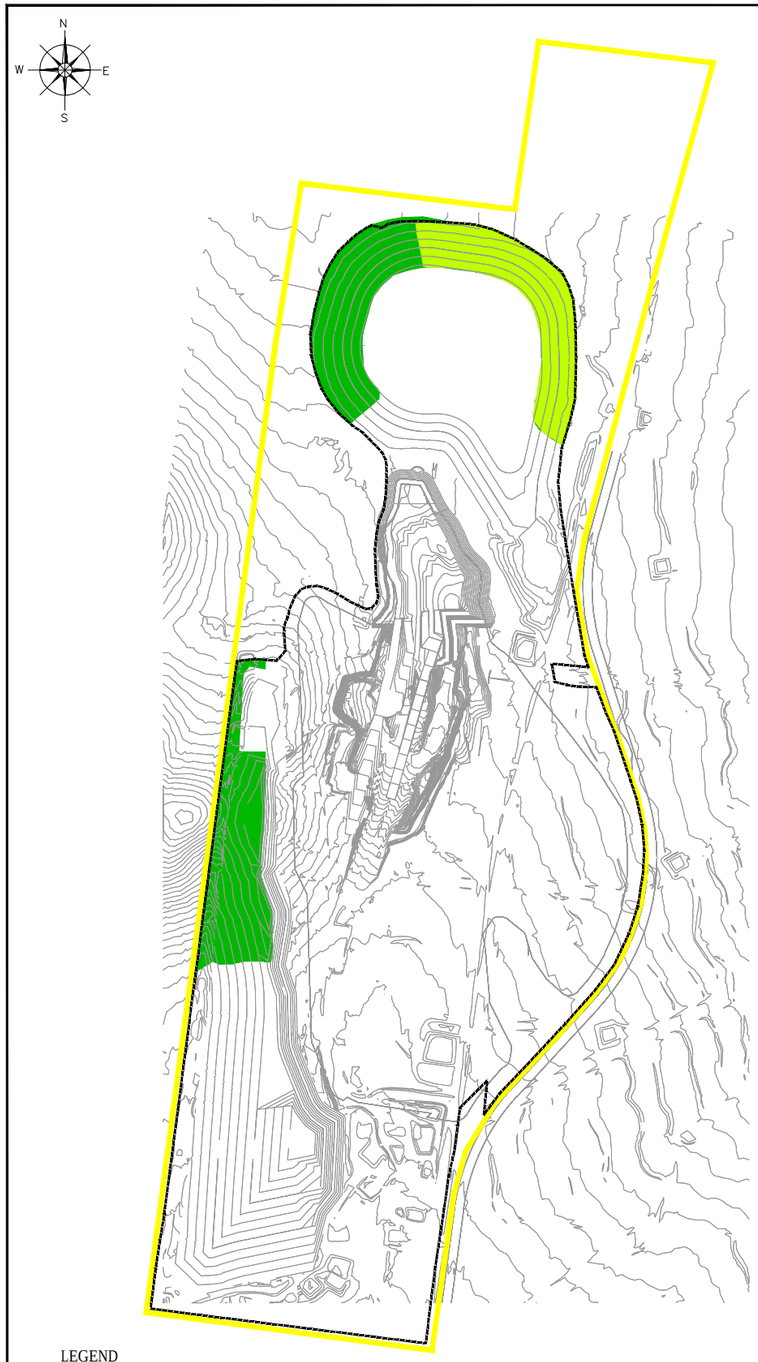
2.3 Progressive Rehabilitation

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 promptly shaped, topdressed 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.

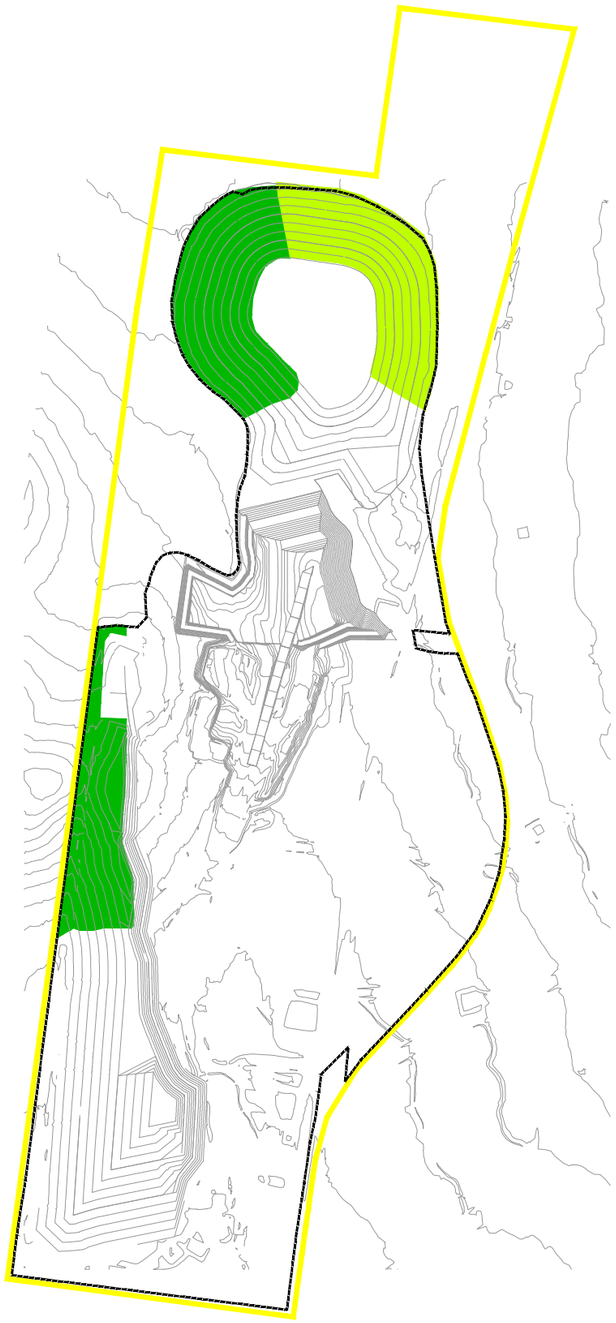
Disturbed areas will generally be rehabilitated within one year of overburden placement and reshaping. **Table 3** summarises the areas of land to be rehabilitated within each year, with **Figures 3** to **6** illustrating the annual rehabilitation schedule.

Table 3 – Indicative Progressive Annual Rehabilitation Schedule

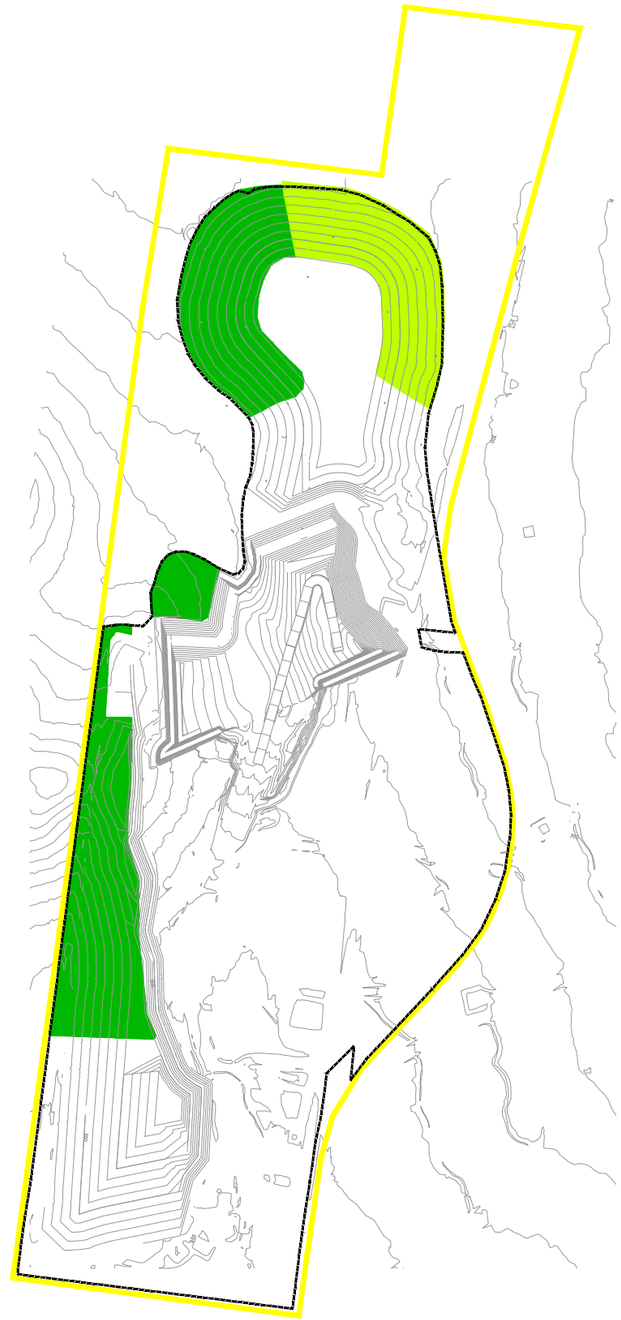
Year of Expanded Operation	Rehabilitated Area (ha)	Description
Year 1	38	Rehabilitation of approximately 27 ha on the lower slopes of the Northern Emplacement Area to the east, west and north, and approximately 11 ha on the northern section of the Western Emplacement Area. Topsoil utilised for this rehabilitation will be obtained from stripped and stockpiled sources.
Year 2	14	Rehabilitation of approximately 14 ha on the central slopes of the Northern Emplacement Area to the east, west and north, utilising topsoil from stripped and stockpiled sources.
Year 3	14	Rehabilitation of approximately 4 ha within the mine pit and approximately 10 ha at the southern end of the Western Emplacement Area. Topsoil utilised for this rehabilitation will be obtained from stripped and stockpiled sources.
Year 4	14	Rehabilitation of approximately 14 ha on the lower slopes of the Northern Emplacement Area to the south, using stripped and stockpiled topsoil.
Year 5	29	Rehabilitation of approximately 17 ha on the upper slopes of the Northern Emplacement Area and approximately 12 ha on the southern end of the Western Emplacement Area. Topsoil utilised for this rehabilitation will be obtained from stripped and stockpiled sources.
Year 6	13	Rehabilitation of approximately 13 ha within the northern area of the mine pit, utilising stripped and stockpiled topsoil.
Year 7	29	Rehabilitation of approximately 29 ha within the northern area of the mine pit, utilising stripped and stockpiled topsoil.
Year 8	11	Rehabilitation of approximately 5 hectares in the central area of the mine pit and approximately 6 hectares on the southern end of the Western Emplacement Area. Topsoil utilised for this rehabilitation will be obtained from stripped and stockpiled sources.
Year 9	25	Rehabilitation of two areas within the northern and central areas of the mine pit, totalling approximately 25 hectares. Topsoil utilised for this rehabilitation will be obtained from stripped and stockpiled sources.
Year 10	11	Rehabilitation of approximately 11 hectares at the southern end of the Western Emplacement Area, utilising stripped and stockpiled topsoil.
Year 11 and End of Mine Life	160	Rehabilitation of the remaining 160 hectares, utilising stripped and stockpiled topsoil.
Total	**358**	



Rehabilitated Areas - Year 1



Rehabilitated Areas - Year 2



Rehabilitated Areas - Year 3

LEGEND

- Project Site Boundary
- Total Rehabilitated Bushland
- Total Rehabilitated Pasture
- Total Potential Disturbance Area
- Final Void Access

0 400 800m

Base Plan Source: MMG Civil P/L

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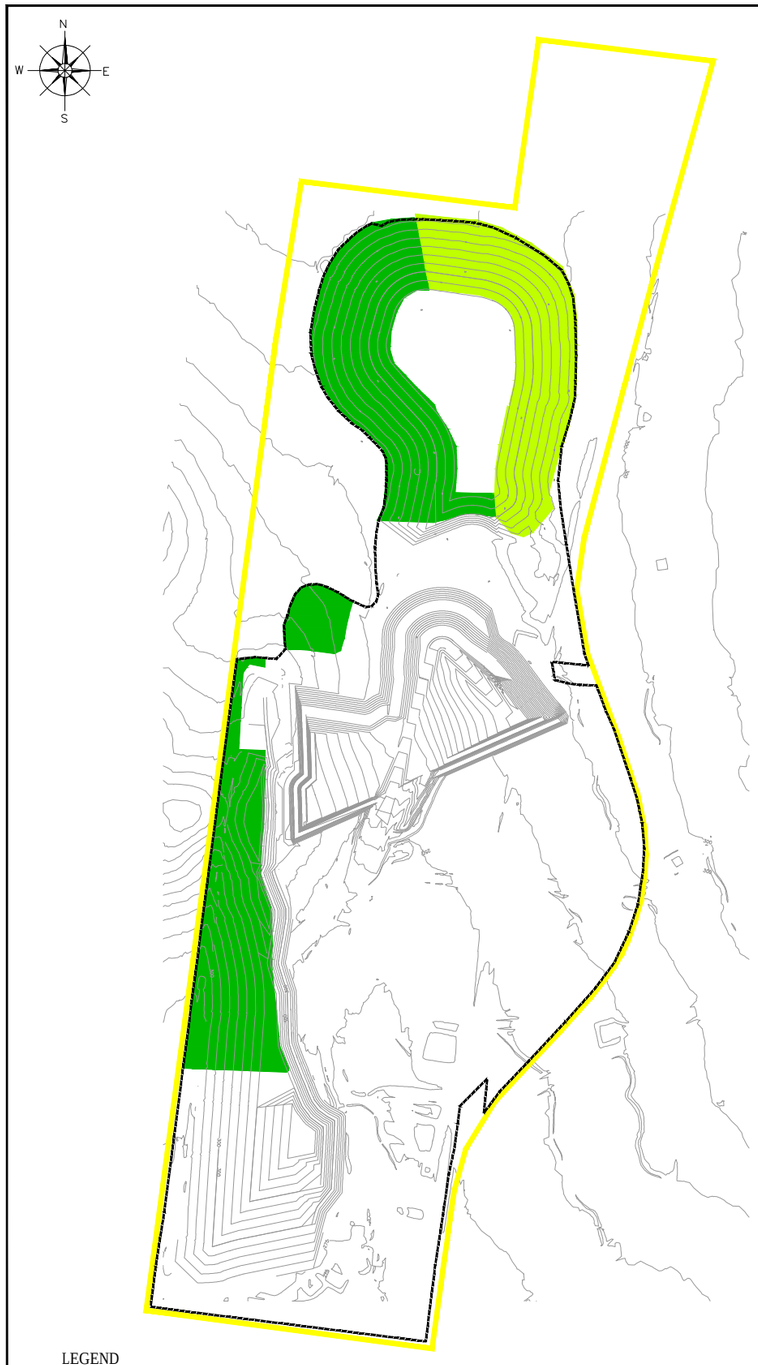
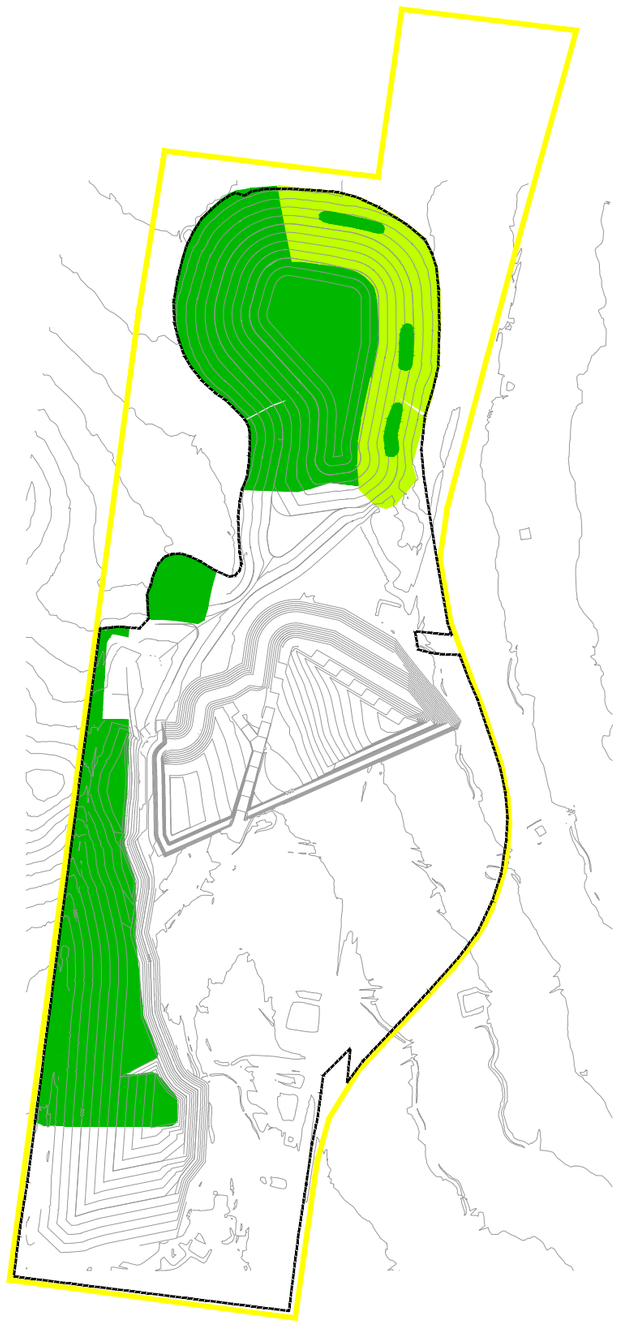
Rocglen Coal Mine
Progressive Rehabilitation Years 1 - 3

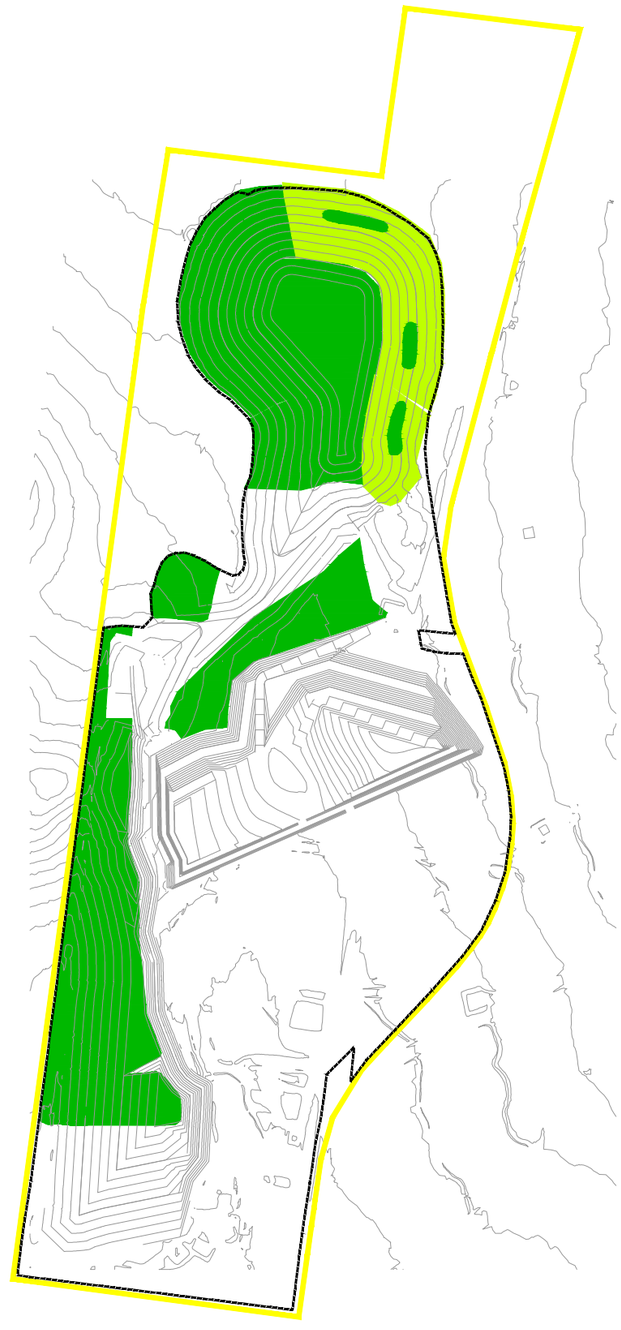
FIGURE 3



Rehabilitated Areas - Year 4



Rehabilitated Areas - Year 5



Rehabilitated Areas - Year 6

LEGEND

- Project Site Boundary
- Total Rehabilitated Bushland
- Total Rehabilitated Pasture
- Total Potential Disturbance Area
- Final Void Access

0 400 800m

Base Plan Source: MMG Civil P/L

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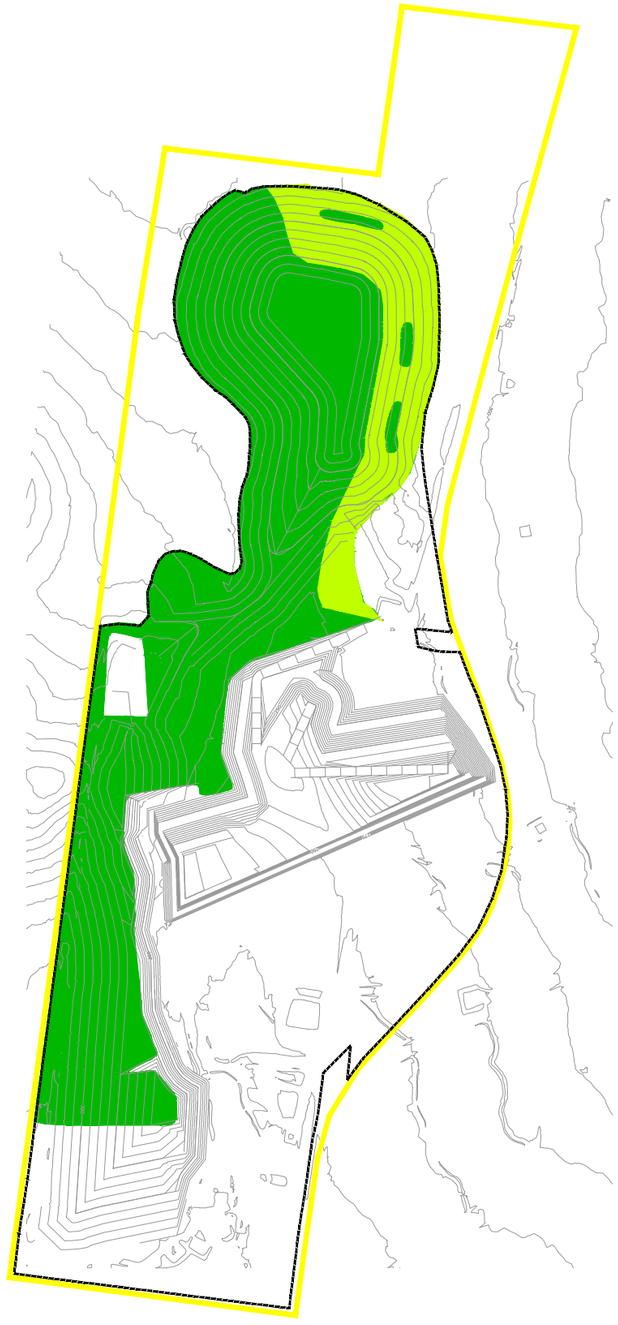
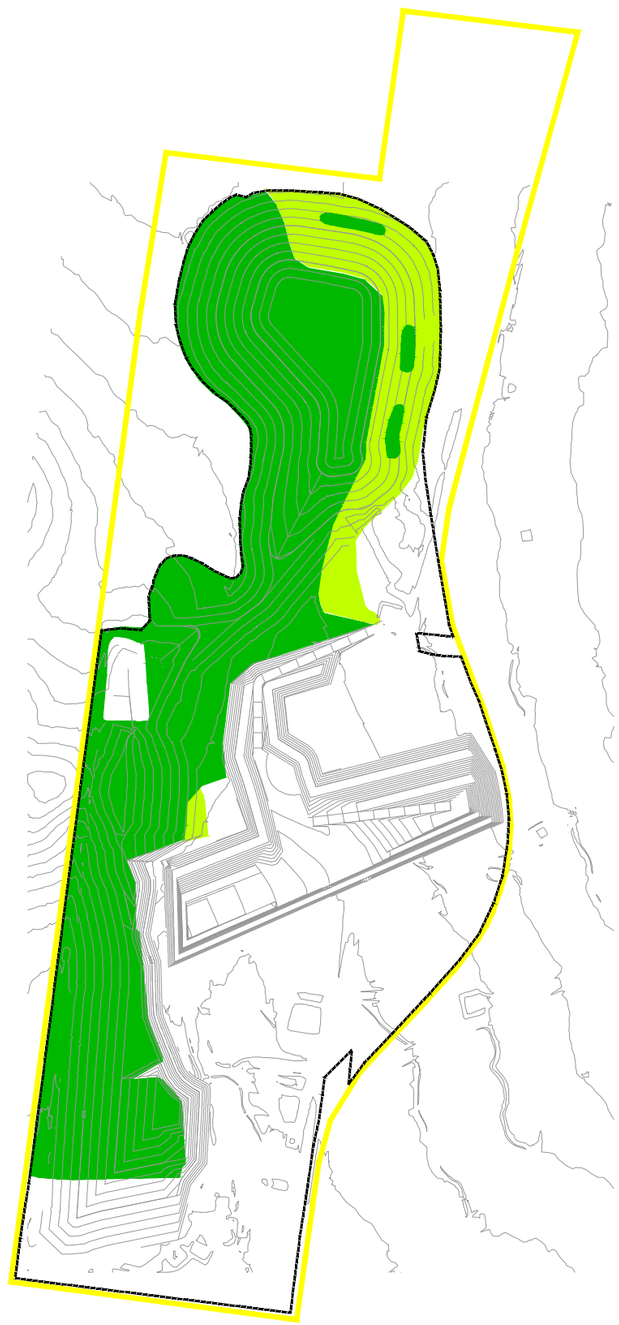
Rocglen Coal Mine
Progressive Rehabilitation Years 4 - 6

FIGURE 4



Rehabilitated Areas - Year 7



Rehabilitated Areas - Year 8

LEGEND

- Project Site Boundary
- Total Rehabilitated Bushland
- Total Rehabilitated Pasture
- Total Potential Disturbance Area
- Final Void Access

0 400 800m

Base Plan Source: MMG Civil P/L

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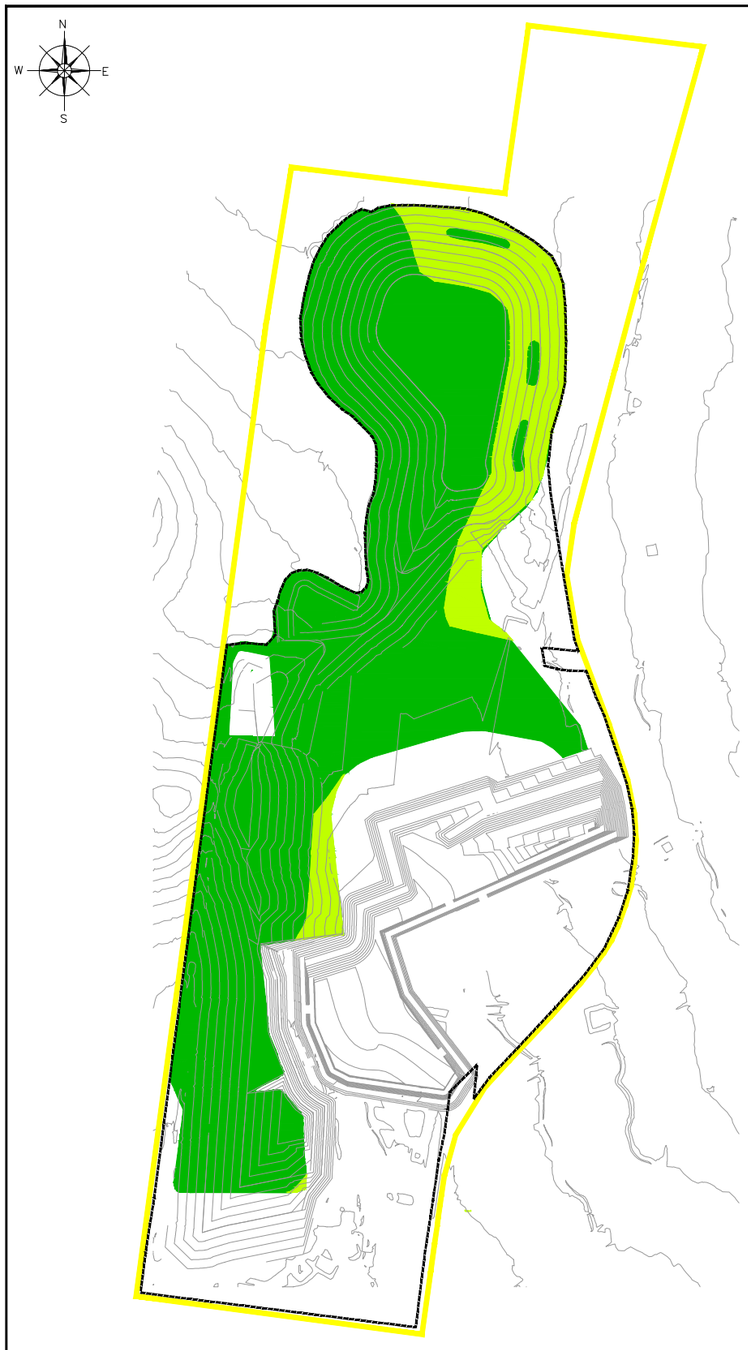
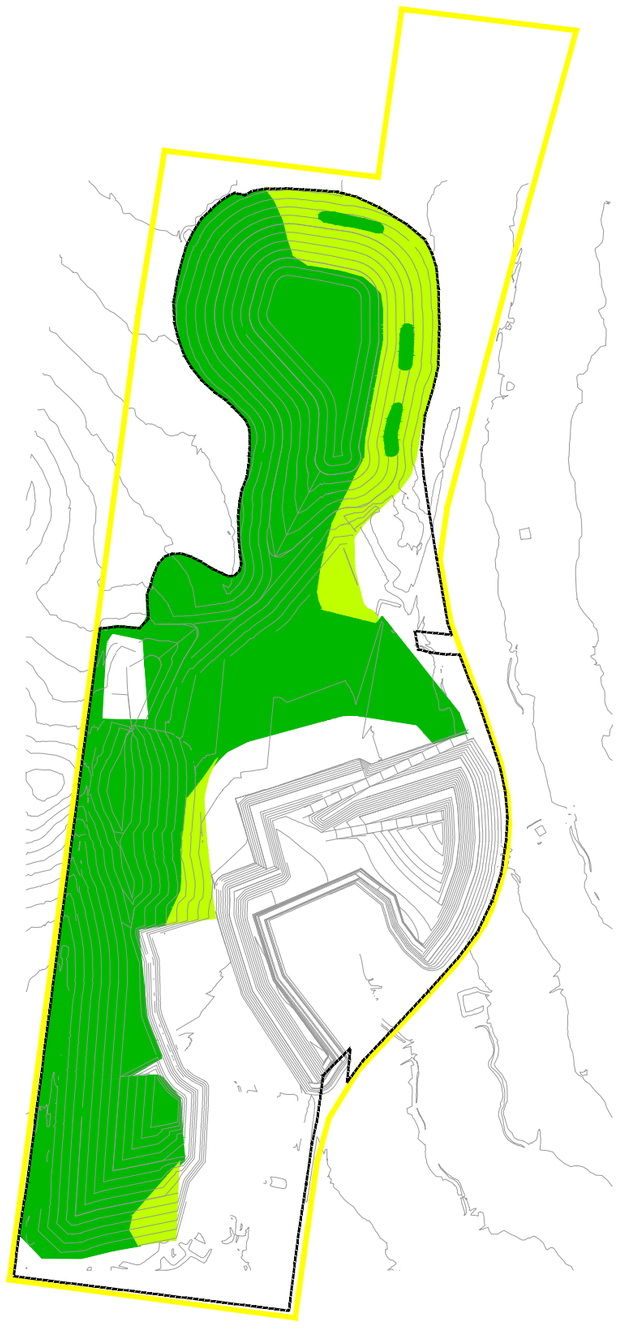
Rocglen Coal Mine
Progressive Rehabilitation Years 7 - 8

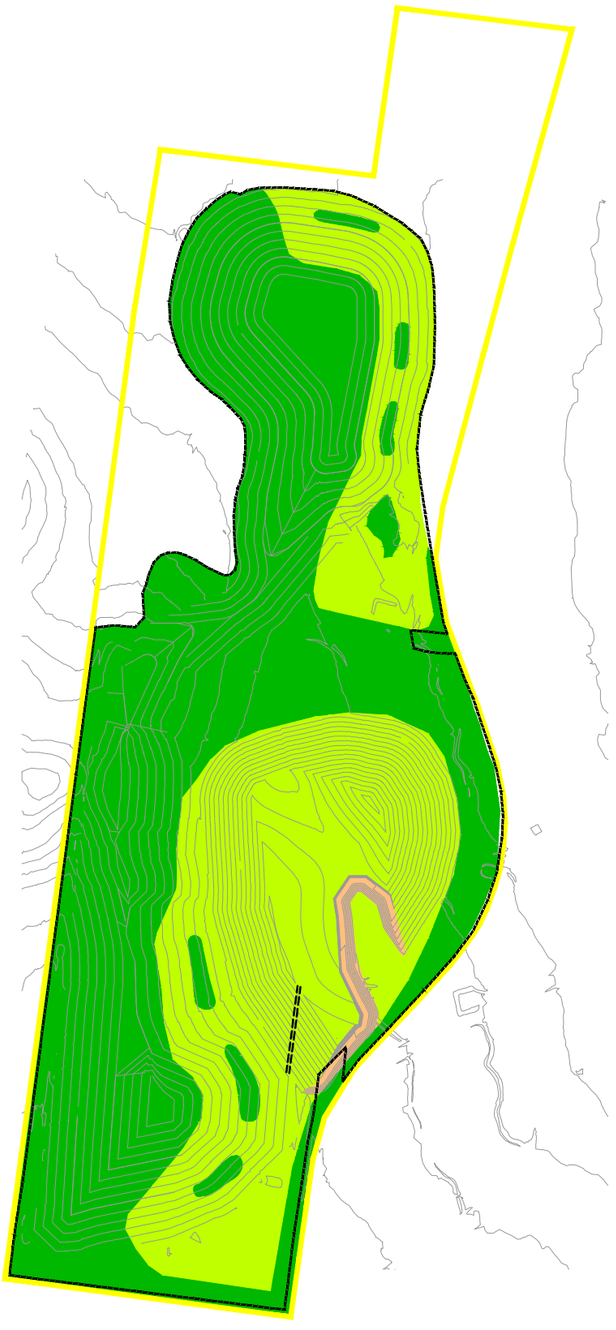
FIGURE 5



Rehabilitated Areas - Year 9



Rehabilitated Areas - Year 10



Rehabilitated Areas - Year 11 / End Of Mine Life

LEGEND

- Project Site Boundary
- Total Rehabilitated Bushland
- Total Rehabilitated Pasture
- Total Potential Disturbance Area
- Final Void Access

0 400 800m

Base Plan Source: MMG Civil P/L

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Rocglen Coal Mine

Progressive Rehabilitation Year 9 - End of Mine Life

FIGURE 6

2.4 Rehabilitation of Disturbed Land

The following sub-sections outline the rehabilitation procedures that will be adopted for each component area within the Project Site. These procedures are generally based on the successful rehabilitation already undertaken at Rocglen and other Whitehaven mines, with additional site-specific input obtained from flora, fauna, soil and surface water consultants. Whitehaven will routinely liaise with offices of the relevant government agencies when planning and/or undertaking rehabilitation activities.

2.4.1 Task 1: Overburden Placement and Shaping

Placement and shaping of overburden to the nominated area at slopes with gradients around 10 degrees 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 rejects placed in the mine void would be covered with at least 3 metres of overburden material.

On-going analysis has not identified any risk of acid generation or soluble salt formation, and, as such, no specific handling or storage requirements are considered necessary.

2.4.2 Task 2: Subsoil and Topsoil Replacement

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 targeted 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. 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.

Tree trunks and branches less than 300 millimetres diameter and other smaller vegetative debris removed during clearing will be spread over those areas to be restored as bushland where practical.

2.4.3 Task 3: Drainage and Surface Water Structure Installation

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 three square metres, 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. Consideration may also be given to trialling other erosion control devices or systems as rehabilitation processes across the site.

2.4.4 Task 4: Agricultural Land Pasture Sowing

The topdressed surface 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, as presented in **Table 4**. Following establishment of these areas, it is anticipated rotational production of pasture and suitable crops will be undertaken at the discretion of the landowner.

In addition to the species mix in **Table 4**, cover crop establishment will generally be sought immediately after replacement of topsoil and will comprise Japanese Millet, Rye Corn, Oats or similar to ensure rapid establishment of cover on the rehabilitated surface. Soil tests will be undertaken on a frequent basis as an aid to match suitable species using appropriate advice from a local agronomist.

Table 4 – Recommended Pasture Species Seed Mix

Pasture Species	Rate (kg/ha)	Fertiliser
Warm Season Grasses		
Bombatsi Panic	1 – 2	250kg/ha
Green Panic *[2]	2 – 4	Di-ammonium Phosphate (DAP)
Purple Pigeon Grass	1 – 2	
Annual Legumes		
Arrow Leaf Clover	4 - 5	
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	
Cool Season Grasses		
Phalaris (Sirolan or Holdfast)	1 -2	
Wallaby Grass	0.3 - 1	

1 - Inoculated with appropriate rhizobia

2 - Specific Soil Conservation Application

2.4.5 Task 5: Native Vegetation Establishment

The topdressed 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 trees. **Table 5** lists possible tree and shrub species for the re-establishment the bushland within the Site.

Table 5 – Recommended Tree and Shrub Species

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

The 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 will 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.

2.5 Topsoil Management

Whitehaven recognises that appropriate soil identification, stripping and management practices are important in terms of achieving successful rehabilitation and the desired post mining land use(s). The *Soil Survey and Land Resource Impact Assessment* (GSSE 2010) prepared for the Rocglen Extension Project (PA 10_0015) EA (GSSE 2011) identifies and outlines effective soil management practices.

Stripping of Topsoil and Subsoil

Careful planning and supervision of topsoil stripping activities is critical in ensuring all suitable material is recovered, while avoiding unsuitable materials such as dispersive or sodic subsoil. Where practicable, topsoil from the bushland and pasture areas will be preferentially stripped and stockpiled separately so that it can be placed in designated areas in accordance with the revegetation types on the site. Some subsoils will be stripped to be used as a topsoil substitute or to establish a more natural soil profile over the reshaped overburden.

A detailed description of the appropriate soil stripping methodologies is included in the *Rocglen Coal Mine Extension Project Soil Survey and Land Resource Impact Assessment* (GSSE 2010).

Minimise Handling of Topsoil

Topsoil will generally be stripped ahead of the mining activities, transported and re-spread using a scraper. Direct placement is always the best management option as it reduces soil degradation and minimises later compaction. Where direct placement is not possible stockpiling will be necessary.

Stockpiling

Ideally, where possible, topsoil should not be stockpiled. However, difficulties associated with mining and rehabilitation sequencing typically necessitate stockpiling. Stockpiles should be constructed to minimise deterioration of seed, nutrients and soil biota by avoiding topsoil collection when saturated following rainfall, thus avoiding composting and compaction, and by forming stockpiles to a suitable height. Topsoil stockpiles should be no higher than 3 metres. There is generally no requirement for limiting the height of subsoil stockpiles, however, if there is adequate available stockpiling area, 3 metres is good practice. Clayey soils should be stored in lower stockpiles for shorter periods of time compared to sandier soils (GSSE 2010).

The duration of stockpiling should be minimised (where possible), as periods longer than about 6 to 12 months may cause structural degradation and death of seeds and micro-organisms, especially when soil moisture content is high. Seeding of the stockpile with an appropriate grass/legume mixture will minimise erosion, enhance weed control and reduce the loss of beneficial micro-organisms. Stockpiles should be placed outside of drainage areas where water is likely to be backed up. Where stockpiles become weed infested, the top 150 millimetres should be scalped off and discarded prior to the remaining material being utilised for rehabilitation.

It is recommended that Whitehaven investigate the mulching of trees to be removed in order to incorporate this material into the topsoil prior to spreading over the areas to be restored to bushland.

A detailed list of appropriate soil stripping and stockpiling methodologies is included in the *Rocglen Coal Mine Extension Project Soil Survey and Land Resource Impact Assessment* (GSSE 2010).

2.6 Weed Management

The presence of weed species has the potential to have a major impact on revegetation and regeneration outcomes. In addition to this, the presence of weed species within the surrounding land has the potential to significantly impact on the biodiversity value of rehabilitated areas. Weed management will be a critical component of mine rehabilitation and landscaping activities.

Whitehaven is conscious of the potential problem of noxious weed infestation and will take the necessary precautions to prevent the excessive development of weeds within the rehabilitated areas. When appropriate, this should include campaign weed spraying prior to the stripping of topsoil. The appropriate noxious weed control or eradication methods and programs should be undertaken in consultation with the relevant government agency and/or the local Noxious Weeds Inspector.

Weed control measures include:

- Hosing down equipment in an approved wash down area before entry to site;
- Herbicide spraying or scalping weeds off topsoil stockpiles prior to re-spreading;
- Rehabilitation inspection to identify potential weed infestations; and
- Identifying and spraying existing weed populations on-site together with on-going weed spraying over the life of the mine.

The monitoring and control of weed populations using herbicides, particularly in the areas to be stripped and on topsoil stockpiles, will also assist.

Weed control, if required, should be undertaken in a manner that will minimise soil disturbance. Any use of herbicides should be carried out in accordance with the requirements of relevant government agencies. Records should be maintained of weed infestations and control programs implemented according to best management practice for the weed species concerned.

2.7 Water Management (Rehabilitation Land)

Where practicable, water management structures such as contour banks and drains will be constructed with longitudinal gradients that permit the transfer of water at non-erosive velocities (for example, 1:200 (V:H)). Consequently, specialised rehabilitation treatments should generally not be required. However, to aid in ensuring the newly constructed water management structures are well grassed, outlet channels will be seeded with a fast establishing cover crop. During the groundcover establishment phase, hay bales and/or sediment fencing will be installed at strategic locations along the channel length of the water management structure to reduce the potential for sediment transfer.

Rock-lined drains constructed on the slopes of the emplacements and final void will be retained and allowed to revegetate naturally. However, in the event that unacceptable levels of erosion are observed, fast growing species identified as having a particular soil conservation application and/or specialised treatments such as bitumen/jute meshing or rock lining will be applied.

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.

2.8 Rehabilitation Monitoring and Maintenance

A commitment to effective rehabilitation involves an on-going monitoring and maintenance program throughout and beyond the operation of the mine. Areas being rehabilitated will be regularly inspected and assessed against the long and short-term rehabilitation objectives. 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 should 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 tube stock if grazing by native animals is found to be excessive.

If drainage controls are found to be inadequate for their intended purpose or compromised by grazing stock or wildlife, these should 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 soil material and/or the redesigning of water management structures to address erosion will be undertaken.

No time limit has been placed on post-mining rehabilitation monitoring and maintenance. Maintenance should continue until such time as the objectives are met, although it is generally accepted that it will be at least five years beyond closure.

Monitoring should be conducted periodically by independent and suitably skilled persons at locations that are representative of the range of conditions on the rehabilitating areas. Annual reviews should be conducted of monitoring data to assess trends and monitoring program effectiveness. The outcome of these reviews will be reported in the AEMR/Annual Report.

In developing the rehabilitation monitoring program, the following aspects should be taken into consideration:

- Replicated monitoring sites should be established in representative rehabilitation areas of different ages. One monitoring site per 20 to 40 hectares is appropriate for each major age class of the rehabilitation areas.
- Sites should be monitored 12 months after establishment and then every two years.
- A standard monitoring plot design for areas rehabilitated with trees should be used:
  - 2 metre by 2 metre quadrats – these will provide some estimate of statistical variance, so that if required, statistical analyses can be undertaken to objectively compare different rehabilitation treatments and changes over time;
  - a 20 metre by 10 metre plot overlying the 2 metre quadrats and located 5 metres either side of the centerline, for ease of monitoring; and
  - a 50 metre erosion monitoring transect on contour, running through the centre of the plot.

Plate 1 shows the monitoring plot design to be adopted for the monitoring of an area revegetated with trees.

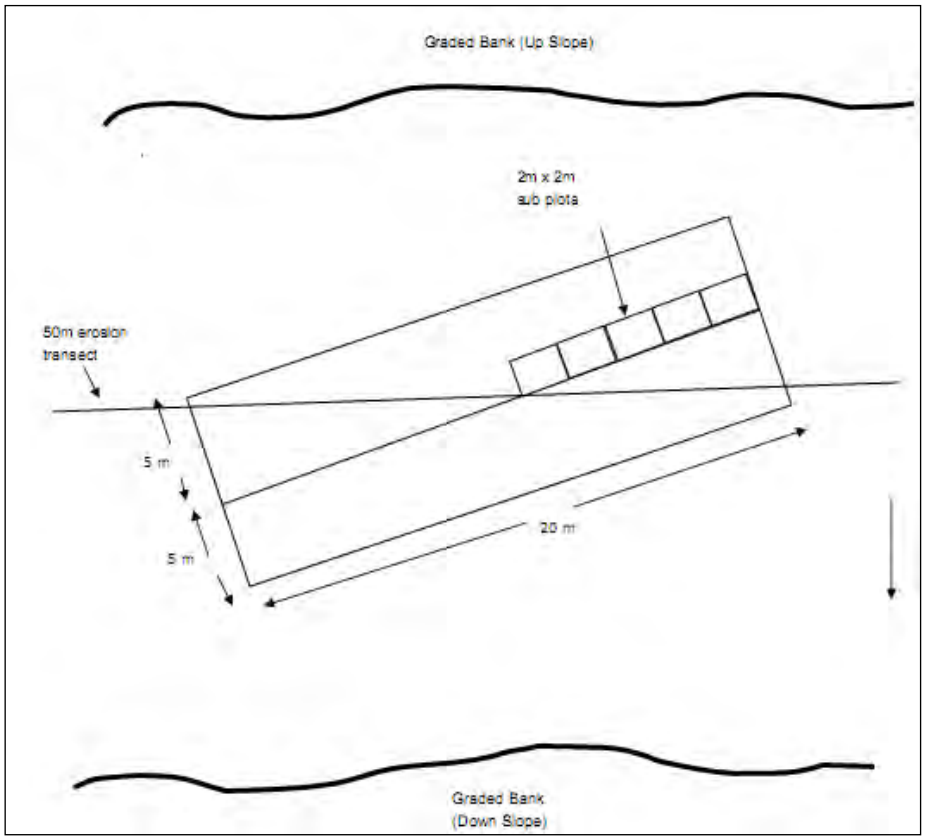


Plate 1 – Typical Monitoring Plot Design (Areas Revegetated to Bushland)

For the areas rehabilitated as pasture, it is proposed that a 100 metre transect be established across a 'typical' section of rehabilitation at the site and monitored for:

- Grass cover in 2 metre by 2 metre (4 square metres) plots every 20 metres;
- Pasture species present;
- Weed species present and percentage area noted;
- Percentage of bare ground; and
- Extent and type of erosion.

Along the 100 metre transect general comments such as rocks present, presence/absence of topsoil and other factors likely to influence rehabilitation development should be noted.

Table 6 presents the monitoring program, including the specific aspects and elements to be monitored and monitoring frequencies for the various aspects.

Table 6 – Rehabilitation Monitoring Program

Aspect of Rehabilitation	Elements to be Monitored	Monitoring Frequency
Ecosystem Establishment		
General Description	• Describe the vegetation in general terms, e.g. mixed eucalypt woodland with grass understorey and scattered shrubs, dense Acacia scrub, etc.	12 months after establishment and then every 2 years
2m x 2m Quadrats	• Count the number of plants of all species, excluding grass • Measure live vegetation cover for understorey and grasses (separately) using a line intercept method • Record details of ground cover (litter, logs, rocks etc.)	12 months after establishment and then every 2 years
20m x 10m Plots	• Count, by species, all trees >1.6m tall. • Tag and measure DBH of trees >1.6m tall, to a maximum of 10 for any one species. • Record canopy cover over the whole 20m centreline when trees are tall enough • Subjectively describe tree health, by species if relevant, noting signs of stress, nutrient deficiencies, disease and severe insect attack. Where health problems are noted, record the percentage of unhealthy trees. • Record any new plant species not present in the smaller plots, including any problem and declared noxious weeds • Take five surface soil samples (e.g. at approx. 5m intervals along the centreline) and bulk these for analyses of: pH, EC, chloride and sulfate; exchangeable Ca/Mg/K/Na; cation exchange capacity; particle size analysis and R1 dispersion index; 15 bar and field capacity moisture content; organic carbon; total and nitrate nitrogen; total and extractable phosphorus; Cu, Mn and Zn.	12 months after establishment and then every 2 years
50m Transect	• Along the 50m erosion monitoring transect, record the location, number and dimension of all gullies >30cm wide and/or 30cm deep. • Erosion pins should be established in plots located in newer rehabilitation to record sheet erosion if present	12 months after establishment and then every 2 years
Rehabilitation in General	• When traversing between monitoring plots, note the presence of species of interest not previously recorded (e.g. key functional or structural species, protected species, noxious weeds), as well as obvious problems including any extensive bare areas (e.g. those greater than 0.1 ha). • Observations such as this can provide useful, broad scale information on rehabilitation success and problems.	12 months after establishment and then every 2 years

Aspect of Rehabilitation	Elements to be Monitored	Monitoring Frequency
Photographic Record	• For each 20m x 10m plot, a photograph should be taken at each end of the plot, along the centreline looking in.	12 months after establishment and then every 2 years
Habitat	• General observations relating to the availability and variety of food sources (e.g. flowering/fruiting trees, presence of invertebrates etc). • Availability and variety of shelter (e.g. depth of leaf litter, presence of logs, hollows etc). • Presence/absence of free water in the rehabilitated areas	12 months after establishment and then every 2 years
Fauna	• General observations of vertebrate species (including species of conservation significance). • Detailed fauna surveys including presence and approximate abundance and distribution of vertebrate species (focussing on species of conservation significance).	After rehabilitation is three years old undertake monitoring biennially in both Autumn and Spring
Weeds and Pests	• Species identity. • Approximate numbers/level of infestation. • Observations of impact on rehabilitation (if any).	Quarterly during the first 2 years and biennially after that. Inspections should be opportunistic after significant rainfall events.
Geotechnical Stability		
	• Assessment of the stability of batters and also looking at surface settlements (sink holes). In particular where these features could impact on the performance of any surface water management system. • Surface integrity of landform cover/capping (measurement of extent of integrity failure). • Presence / absence of landform slumping.	Annually
Surface and Groundwater		
	• Groundwater quality and depth. • Efficiency of landform surface water drainage systems (integrity of banks and drains) • Water quality including pH, EC and total suspended solids of water in water storages, and pits, sedimentation dams.	Quarterly or following rainfall events. Monitoring of receiving waters.

2.9 Biodiversity Offset Strategy

To address and offset the impacts of the Rocglen Coal Mine, Eco Logical Australia prepared a *Biodiversity Offset Strategy* as part of the Rocglen Extension Project. The quantum (area) of offset required was calculated using the *NSW BioBanking Assessment Methodology*, which calculates the number of "credits" required at the impact site based on the area and condition of each vegetation type impacted and the number of credits generated at a BioBank Site based on the improvement in biodiversity values via conservation management.

In summary, the *Biodiversity Offset Strategy* is to retire the full 4,859 credit requirement (as calculated by Eco Logical Australia) from the Whitehaven Regional BioBank Site (see **Figure 1**), which is 100 percent owned by Whitehaven. It provides an offset to impact ratio of 4.75:1.

The Regional BioBank Site will be protected on title by a *BioBanking Agreement* entered into with the NSW Minister for the Environment under the *Threatened Species Conservation Act 1995* (TSC Act) and will be managed in perpetuity in accordance with a *BioBanking Management Plan* approved by the Minister with management funds (calculated for in-perpetuity management) held in Trust.

The *BioBanking Management Plan* provides for the management of access, weeds and feral animals across the entire BioBank Site, the enhancement of woodland areas and restoration of derived grassland areas by permanent exclusion of grazing, and targeted planting of tree, mid storey and ground cover species.

Agreement has been reached with the NSW National Parks and Wildlife Service (now part of the OEH) to transfer the land at the end of year 10 for dedication as an addition to the adjoining Community Conservation Area (CCA) Zone 2 Kelvin, subject to the site meeting key benchmarks. A *BioBanking Agreement* is the highest level of protection that a conservation area can receive other than dedication under the NP&W Act. Only the NSW Minister for the Environment can approve any detrimental activities within a BioBank Site and these must be offset.

The improvements in conservation values at the Whitehaven Regional Biobank Site (through the cessation of grazing and implementation of conservation management practices outlined in the *BioBank Site Management Plan*, including enhancement tree and shrub planting and weed control) will lead to an 'improve and maintain' conservation outcome.

3.0 CONCEPTUAL FINAL LANDFORM AND LAND USE

3.1 Conceptual Final Rehabilitated Landform

The intended 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.

Rehabilitation planning will ensure the total area of disturbance at any one time is minimised to reduce the potential for wind-blown dust, visual impacts and increased sediment-laden run-off.

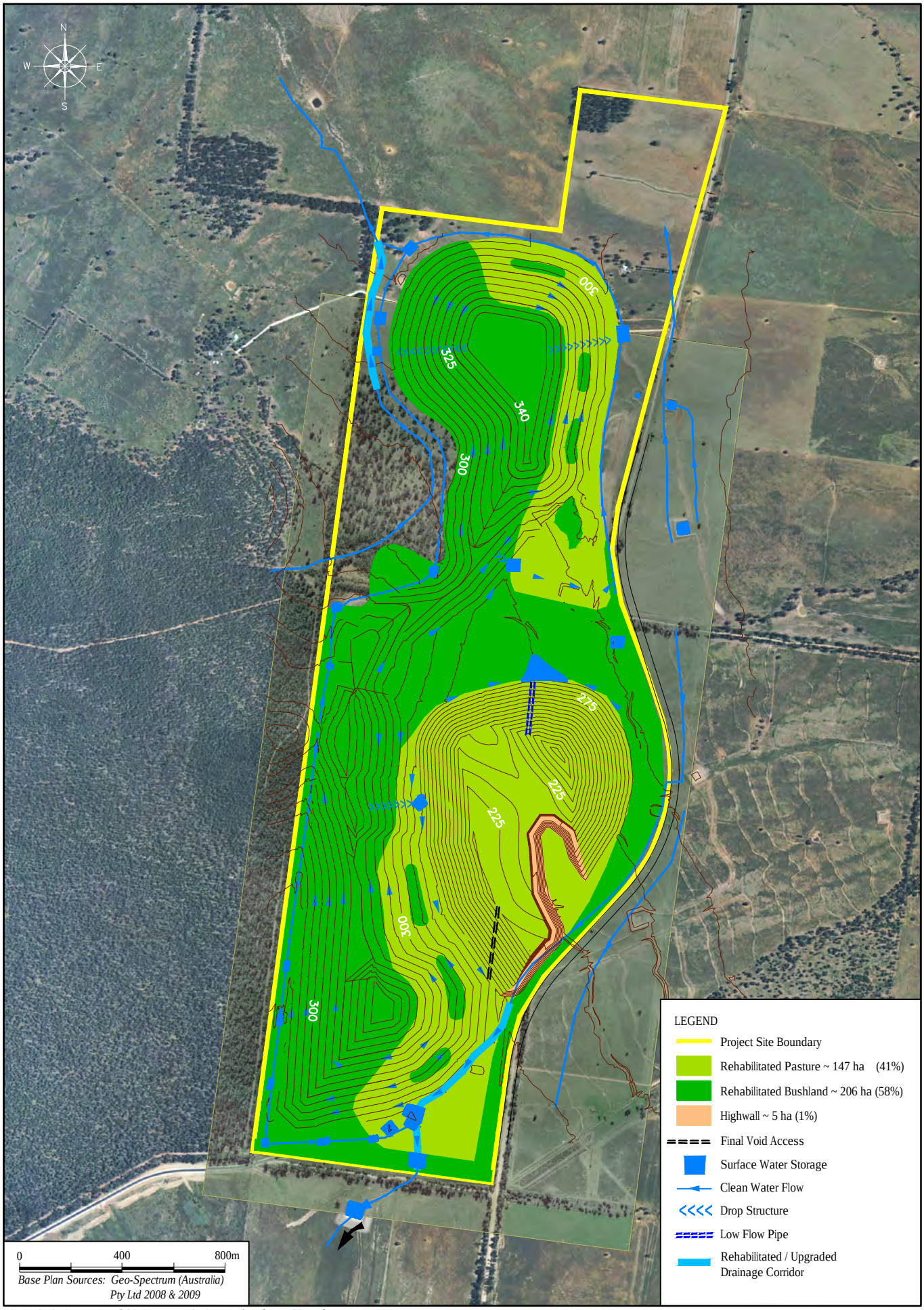
The rehabilitation should generally be designed to achieve a stable final landform compatible with the surrounding environment. This involves the reshaping of the majority of overburden emplacement slopes to 10 degrees or less using large dozers. Should slopes exceed 10 degrees, additional drainage and revegetation works should be carried out to ensure sediment and erosion control and groundcover establishment is achieved.

Figure 7 presents the conceptual final rehabilitated landform. **Figure 8** illustrates the surface water management proposed for the final landform. The major features of the 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 Australian Height Datum (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 (1V:6H to 1V:3H) 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 (1V:1H) through blasting.

  The cost to infill or batter back the final void slopes further than intended 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 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.

- An elevated landform to the north, being the Northern Emplacement Area. This knoll will have a maximum design height of approximately 50 metres above the pre-mining landform, which is the approximate height of the adjacent ridge to the west of the Project Site at 340 metres AHD. Reshaping will ensure that final batter slopes will not exceed 10 degrees (1H:6V).



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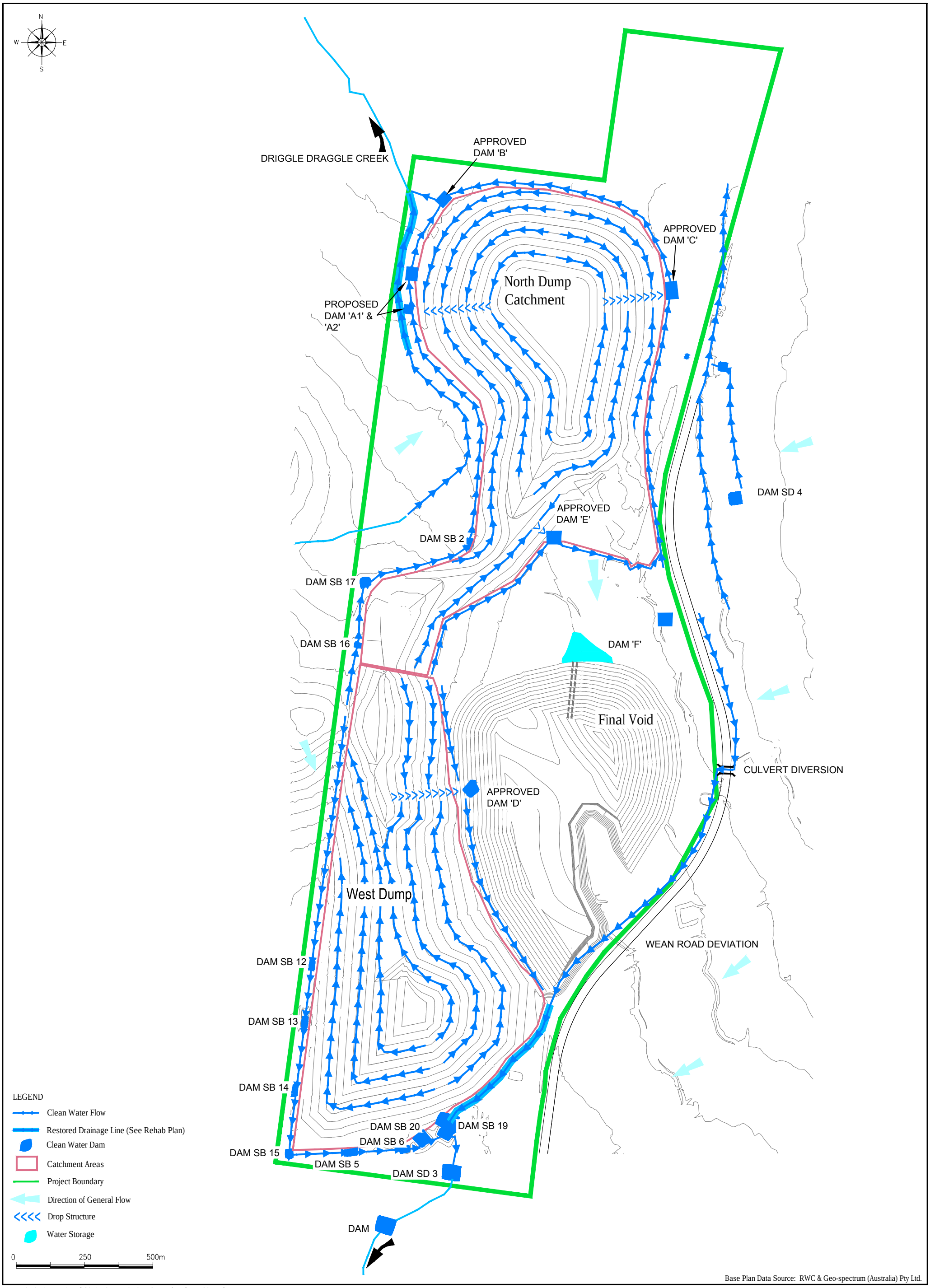
Rocglen Coal Mine
Post-Mining Landform and Land Use

FIGURE 7



Base Plan Data Source: RWC & Geo-spectrum (Australia) Pty Ltd.

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Rocglen Coal Mine
Surface Water Management Plan - Final Landform

FIGURE 8

- An elevated ridgeline extending southwards adjacent to the Vickery State Forest along with western boundary of the Project Site, being the Western Emplacement Area. The maximum design height of this ridgeline will, again, be approximately 50 metres above pre-mining landform, which is the approximate height of the adjacent ridge immediately to the west at 340 metres AHD. Reshaping will ensure that final slopes will generally be 10 degrees (1H:6V). In the northern section the eastern batters of this ridgeline will graduate to the gently sloping landform north of the final void, while in the middle section the ridgeline batters will blend with those of the final void. In the section extent, the eastward and south facing batters of the ridgeline will blend into the undisturbed landform.

- **Figure 8** shows how 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. Runoff from the Northern Emplacement Area will be directed to Dams A, B, C and E and discharged from the site into Driggle Draggle Creek. Runoff from the southern extent of the site, including the Western Emplacement Area, will flow southwards through Dam D to the east of the Western Emplacement and a s eries of small sediment dams to the west of the Western Emplacement before entering Dam SB 19.

  Overflows from Dam SB 19 will enter Dam SD 3 prior to leaving the site via an existing drainage line that eventually drains into the Namoi River approximately 10 kilometres from the Project Site. Rehabilitation of this drainage line, and others within the Project Site, will seek to reinstate the natural hydraulic functions and provide a revegetated riparian corridor in accordance with the *Blue Book* (LandCom 2004 and DECC 2008) and the *Guidelines for Controlled Activities – In-Stream Works* (DWE 2008).

- **Figure 8** also shows an additional Dam F that will be constructed to the north of the final void to assist with the prevention of surface water runoff entering into the void. Dam F will be sufficiently large (in the order of 15 megalitres) to capture large storm events (for example, 10 year Annual Recurrence Interval events) and allow this water to be used for stock watering purposes and evaporated to minimise discharges to the final void. A low flow pipe will be installed (below the primary spillway) to safely convey dam overflows to the base of the final void. Extreme rainfall events will result in flows over the spillway and into the final void.

- Other mine-related features forming part of the final landform within the Project Site will be the use rock-lined drop structures, water storage dams and sediment basins used for surface water management and erosion and sediment control. The final landform would also incorporate contour/graded banks installed progressively as part of the rehabilitation program. The spacing and ultimate dimensions of these structures would be a f unction of the final slope and catchment area and, consequently, would be determined at the time of installation. On the steeper slopes, bank spacing should generally range between 50 and 80 metres.

Unless otherwise directed by Gunnedah Shire Council, the upgraded section of Shannon Harbour Road will be retained, with maintenance responsibilities passing to Council. However, if instructed, Whitehaven will remove the entire bitumen pavement, any emplaced construction materials and water management structures, and re-profile, topsoil and seed the land to its pre-development landform.

3.2 Geotechnical Stability of Final Void

GE Holt and Associates (2011) prepared a pr eliminary geotechnical assessment of the short and l ong term stability of the eastern highwall of the expanded open cut pit adjacent to the approved Wean Road realignment. The open pi t limits can be adjusted as mining progresses to ensure there is solid unmined ground to prevent instability collapsing the ground in a m anner that could affect Wean Road as a r esult of the identified fault structures. Such adjustments will allow some flexibility if the fault structure changes location from that suspected at present.

Alterations to a mine plan are not uncommon in any mining operation affected by geology and sufficient flexibility is needed in the mine plan to accommodate changes in geological conditions. It will be some years before the pit approaches within 150 metres of the realigned Wean Road providing time to monitor and amend the limit of the open pit shell and highwall design should any other stability issues arise.

While the final landform configuration shown on **Figure 7** provides a minimum 50 metre separation distance between the highwall to be retained as part of the final void and the realigned Wean Road, as recommended by GHA (2011), Whitehaven will undertake progressive stability reviews and monitoring of geological conditions once the pit moves within 250 metres of the realigned Wean Road to ensure geotechnical stability and safe conditions. If any unfavourable conditions are observed or detected, a detailed assessment will be undertaken by a suitably qualified geotechnical engineer before mining is allowed to continue towards Wean Road. The exact location and nature of the Belmont Fault, the location of the Belmont Seam in relation to the fault and the stability of the highwall are just some of the issues that will become more accurately known as mining advances.

Stability recommendations to be adopted as the pit progresses and the final landform is developed are summarised below.

Low Walls

The low wall is considered to comprise mixed, disturbed and fragmented material. Stability of the low wall will be achieved in the following manner:

- The low wall will be battered back from the angle of repose to ensure the long term geotechnical stability of the face. Determination of geotechnical stability and recommendations as to the final slope will be undertaken by a qualified geotechnical engineer on the basis of an assessment of the overburden material, the likely degree of settlement, and the degree of weathering expected in the long term. It is expected that the low wall sides of the final void will be battered back to a maximum of 18 degrees with a goal of 10 degrees being optimal.
- Surface water drainage on and over the low wall will be minimised through the construction of drainage control structures, the construction of Dam F and the diversion of as much of the catchment as possible away from the final void and back into the surface water system.
- Erosion of the low wall should be controlled by limiting the length of slope through the use of contour and graded drains, minimising the slope and by the establishment of suitable vegetation (as detailed in this report).

Highwall

The highwall is considered to comprise undisturbed, solid material generally occurring above the economically lower-most limits of the mineable seam in the final void. Depending on the geology of the deposit, the highwall material may comprise a range of natural occurring soil or rock materials of varying strengths or states of weathering. To ensure the safety of the final void, the surrounding final slopes will be left in a condition where the risk of slope failure is minimised. The highwall of the final void will be left at 45 degrees to ensure long term geotechnical stability. This will be assessed by a suitably qualified geotechnical engineer.

The following will be considered when assessing the geotechnical stability of the highwall:

- Long term final void water level;
- Height and inclination of slope and number and spacing of intermediate benches (as may be required to achieve the final slope);
- Shear strength of the high wall soils and rocks;

- Density and orientation of fractures, faults, bedding planes, and any other discontinuities, and the strength along them; and
- The effects of the external factors, such as surface runoff.

3.3 Conceptual Post-Mine Land Capability and Agricultural Suitability

Land Capability

Table 7 listed the pre-mining and conceptual post-mining land capability classes within the Project Site as advised by GSSE (2010). **Figure 9** illustrates these land capability classes.

Table 7 – Pre and Post-Mining Land Capability

Land Class	Pre-Mining Area		Post-Mining Area	
	Hectares	Percent (%)	Hectares	Percent (%)
Class I	0	0	0	0
Class II	0	0	0	0
Class III	265	58	82	18
Class IV	0	0	57	12
Class V	102	22	29	6
Class VI	93	20	217	47
Class VII	0	0	68	15
Class VIII	0	0	7	2
Totals	**460**	**100**	**460**	**100**

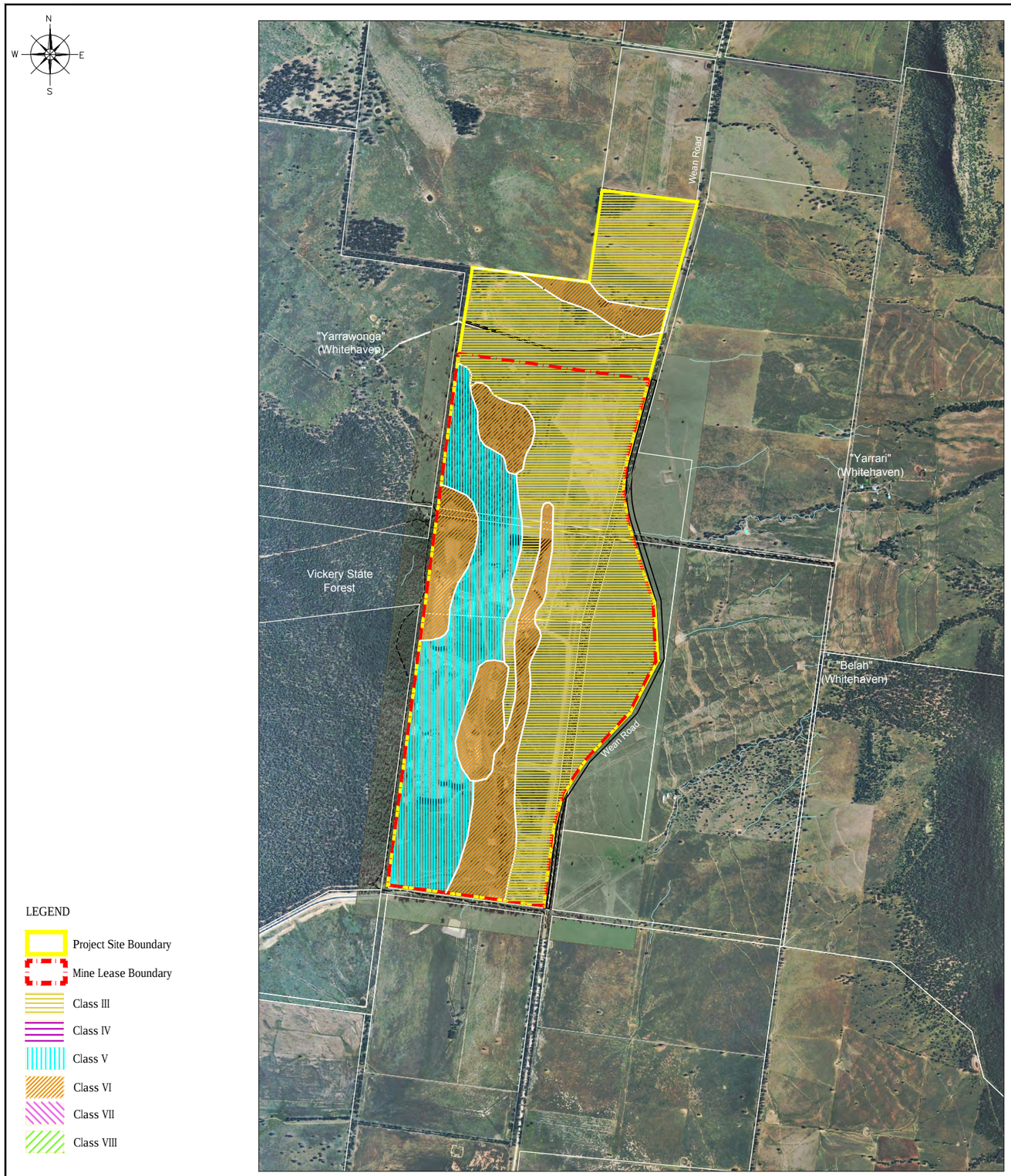
Based on the soil resources available within the Project Site and the proposed post-mining landform, GSSE (2010) predicts that the post-mining land capability within the Project Site will predominately comprise Classes III, IV, V and VI. These land classes range from being suitable for regular cultivation to grazing with active management. The final void area is predicted to comprise Class VII land, and the small area around the eastern margin of the void, being the highwall, has been determined as Class VIII land.

Agricultural Suitability

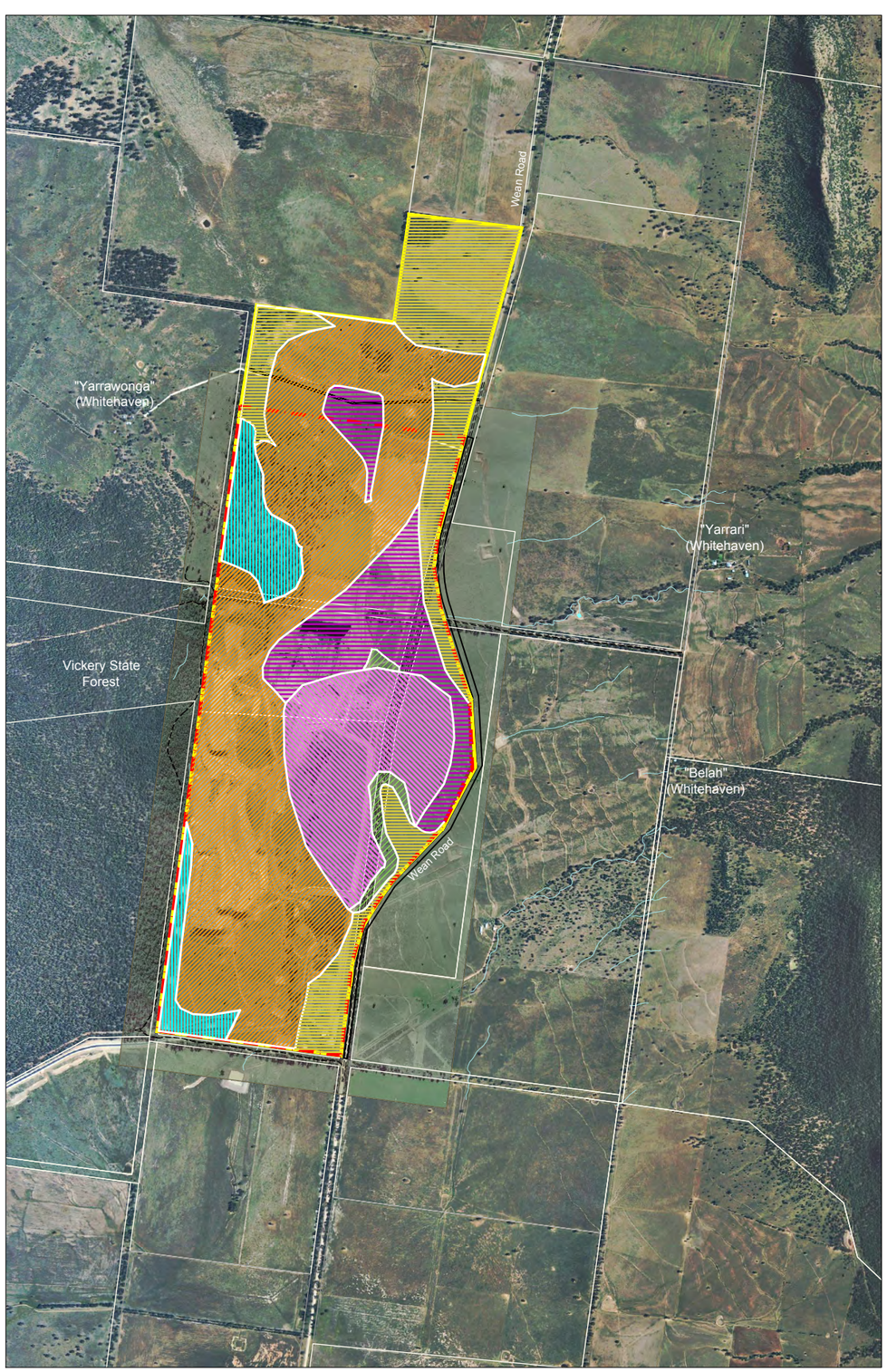
Table 8 lists the pre-mining and conceptual post-mining agricultural suitability classes within the Project Site as advised by GSSE (2010). **Figure 10** illustrates these agricultural suitability classes.

Table 8 – Pre and Post-Mining Agricultural Suitability

Land Class	Pre-Mining Area		Post-Mining Area	
	Hectares	Percent (%)	Hectares	Percent (%)
Class 1	0	0	0	0
Class 2	0	0	0	0
Class 3	348	76	82	18
Class 4	112	24	302	66
Class 5	0	0	76	16
Totals	**460**	**100**	**460**	**100**



PRE-MINING



POST-MINING

Base Plan Sources: Geo-Spectrum (Australia) Pty Ltd. 2008 & 2009

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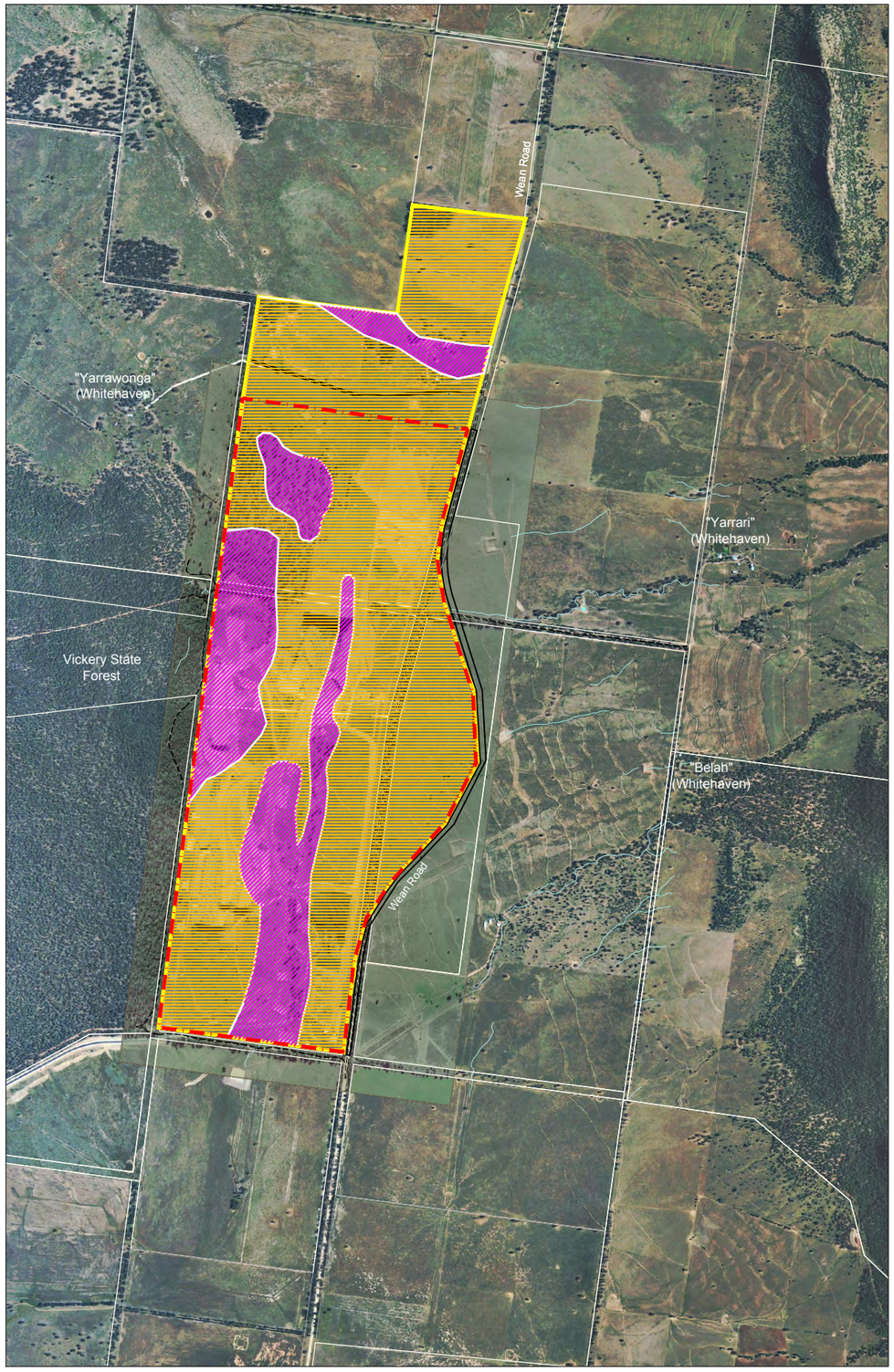
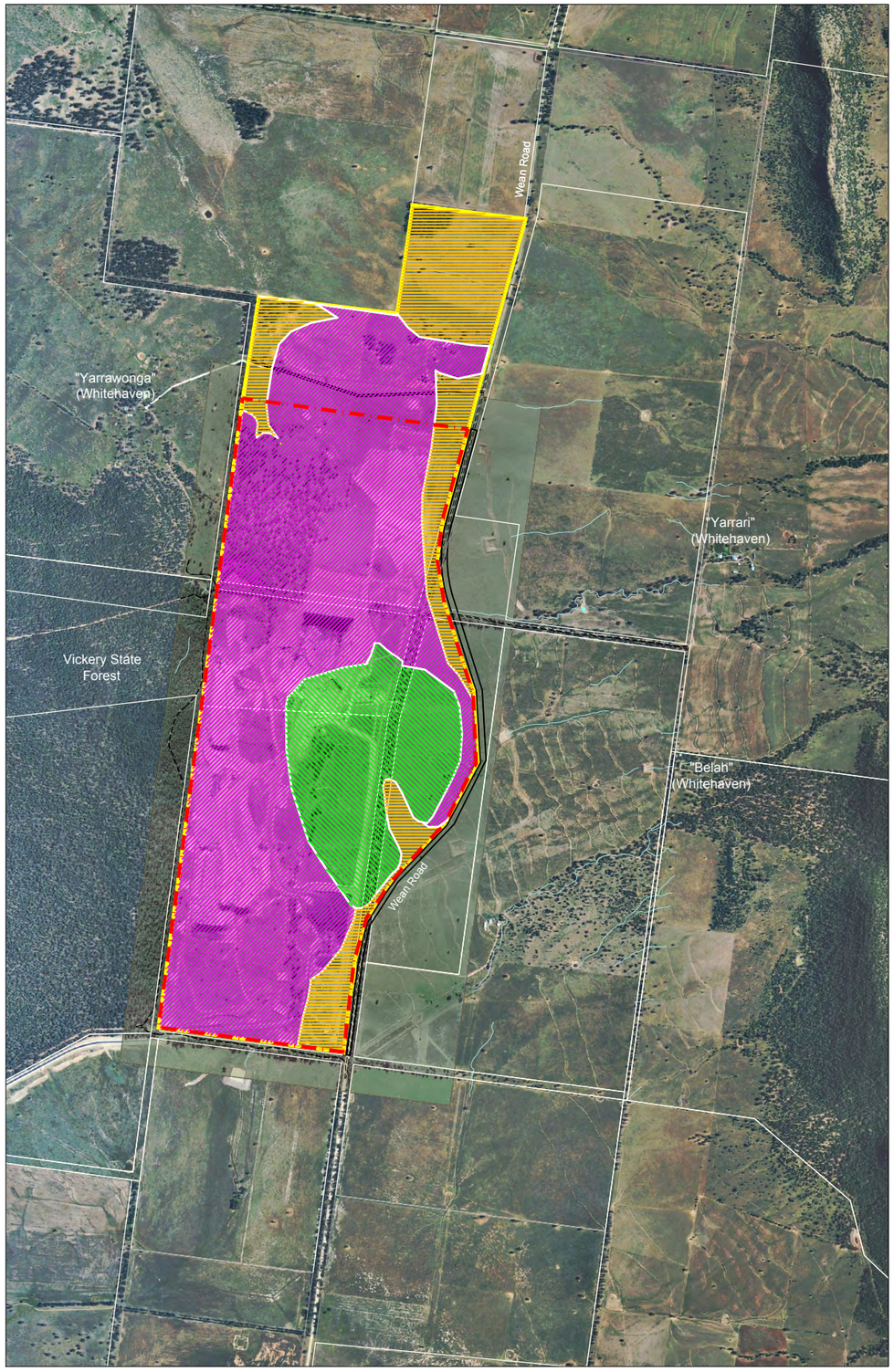
Environmental, Land and Project Management Consultants

Rocglen Coal Mine
Pre and Post-Mining Land Capability
FIGURE 9



PRE-MINING



POST-MINING

N
W
E
S

LEGEND

- Project Site Boundary
- Mine Lease Boundary
- Class 3
- Class 4
- Class 5

0 400 800m

Base Plan Sources: Geo-Spectrum (Australia) Pty Ltd. 2008 & 2009

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Environmental, Land and Project Management Consultants

Rocglen Coal Mine
Pre and Post-Mining Agricultural Suitability
FIGURE 10

Based on the soil resources available within the Project Site and the proposed post-mining landform, GSSE (2010) predicts that the post-mining agricultural suitability will predominately comprise Class 4 land, including all the rehabilitated overburden emplacement areas. There are also smaller areas of Class 3 land, and the final void will be Class 5 land generally unsuitable for agriculture.

Final Void

The final void area is predicted to comprise Class VII land capability and Class 5 agricultural suitability, which are generally considered unsuitable for agriculture.

The cost to infill or batter back the final void slopes to less than 10 degrees 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 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.

Whilst land capability Class VII and agricultural suitability of Class 5 is generally representative of land best protected by green timber, in the case of re-establishing vegetation following mining, pasture species are often used to stabilise surface material and protect against erosion on slopes greater than 10 degrees. In fact, planting and establishing grasses/pastures on final void low walls is a standard practice. These grasses/pastures are not intended to be grazed and have therefore been classified as land capability Class VII. Given that the area is not intended to be grazed, it is expected, overtime, that the area will be naturally invaded by adjoining bushland vegetation.

3.4 Conceptual Post-Mining Land Use

3.4.1 Overview

Figure 7 presents the conceptual post-mining land uses at the completion of the Rocglen Project. Of the total anticipated disturbance area of approximately 358 hectares, it is intended to restore approximately 206 hectares as rehabilitated bushland (58 percent), 147 hectares as rehabilitated pasture (41 percent), with the remaining five hectares comprising the retained highwall (one percent). Furthermore, there will be areas of retained remnant vegetation within the Project Site.

The area of the Project Site that is within the “Roseberry” property will be predominately returned to rehabilitated pasture, with grazing able to recommence once a stable vegetative cover is established. The western area of the property will be restored as rehabilitated bushland to link in with the existing remnant bushland to the west (Vickery State Forest) and create a viable connection with the surrounding environment.

The area of the Project Site formally known as the “Belmont” property will be established predominantly with rehabilitated bushland, with the south-eastern area returned to rehabilitated pasture. A corridor from the western rehabilitated bushland will extend between the Northern Emplacement Area and the final void to connect with remnant vegetation to the east of the Project Site and create a wildlife corridor.

The western slopes of the Northern Emplacement Area within the “Glenroc” property will be restored to rehabilitated bushland, which will connect to and enhance the existing areas of remnant native vegetation that are to remain undisturbed. The remaining sections of the property will be rehabilitated to pasture, potentially allowing for the re-commencement of grazing activities.

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.

The large area within the Project Site intended to be rehabilitated to bushland, including 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 create viable connections with the surrounding environment. In particular:

- The western area of the Project Site will be rehabilitated to bushland to link in with the existing remnant bushland to the west in the adjacent Vickery State Forest and "Yarrawonga" property; and
- A corridor from the western rehabilitated bushland will extend between the Northern Emplacement Area and the final void to connect with remnant vegetation to the east of the Project Site and create an east-west link to the Whitehaven Regional BioBank Site and CCA Zone 2 Kelvin.

Furthermore, strategically placed bushland tree lots to be established within rehabilitated pasture areas will break-up the landform and act as wildlife refuges and linkages.

3.4.2 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.

Whilst land capability Class VII and agricultural suitability of Class 5 is generally representative of land best protected by green timber, in the case of re-establishing vegetation following mining, pasture species are often used to stabilise surface material and protect against erosion on slopes greater than 10 degrees. In fact, planting and establishing grasses/pastures on final void low walls is a standard practice. These grasses/pastures are not intended to be grazed and have therefore been classified as land capability Class VII. Given that the area is not intended to be grazed, it is expected, overtime, that the area will be naturally invaded by adjoining bushland vegetation.

Control of Surface Water Inflow

The control of surface water inflow into the final void is essential for the long-term management of water quality and will also aid in the control of erosion to low walls and highwalls. Surface water is a possible cause of slope deterioration and ultimate failure. Drainage will be 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 will be minimised through constructing surface water diversions. The catchment area of the final void will be minimised by the installation of diversion drains.

Public Safety Considerations

At mine closure, one of the main priorities for the final void will be to render it safe in terms of access by humans, livestock and wildlife. In order to achieve this, the following key activities will be considered:

- Instability of the low wall can induce failures or mass movement. The low walls will be battered back to ensure stability;
- Instability of the highwall can also induce failures and mass movement. To ensure the stability of the highwalls that are to be retained post closure, an appropriately qualified geotechnical engineer will be consulted on final highwall design;
- Where possible, the exposed coal seams will be covered with inert material to prevent ignition either from spontaneous combustion, bushfires or human interference;
- A physical barrier will be constructed at a safe distance from the perimeter of the void to prevent human access. The highwall areas will be secured by the construction of a trench and a 2 metre safety berm. Addition security measures will be installed as required by the relevant government agencies;
- Suitable signs, clearly stating the risk to public safety and prohibiting public access, will be erected at 50 metre intervals along the entire length of the fence;
- Surface runoff from land surrounding the void will be diverted so as to prevent any potential development of instability of the void walls; and
- Where practicable, grasses and shrubs/trees selected to conform to the agreed post-mining rehabilitation criteria and land use will be planted along the outside edge of the bund wall to lessen any visual impact of the wall.

3.5 Remaining Features

Figure 7 presents the conceptual final landform and land uses at the completion of the Rocglen Project and lease relinquishment. As evident, the only notable features anticipated to be retained are the highwall of the final void and the surface water management system. However, this is a conceptual design only, with the next MOP and detailed mine closure plan to be prepared within five years of the planned mine closure to focus on final rehabilitation and mine closure in detail.

Site Services

All services, including power, water, data and telephone, will be isolated and disconnected. Underground infrastructure will typically be made safe and left buried, while overhead infrastructure will typically be removed and the materials (for example, power poles and wire) recovered for potential re-sale or recycling as applicable.

Infrastructure and Buildings

All buildings, including the administration building, workshop, crushing equipment and fixed plant will be demolished and removed from the site. Where possible assets may be re-used or sold to other mines.

All items of equipment will be de-oiled, degassed, depressurised and isolated, as required, and all hazardous materials removed from the site by an appropriate contractor. All sumps will be de-watered and de-silted prior to the commencement of demolition.

Any additional remaining items will be demolished, removed and transported from the site as required. All recoverable scrap steel will be sold and recycled, with the remaining non-recyclable wastes either taken to a licensed landfill or buried in the areas being backfilled if available at the time of closure. Prior to disposal, all wastes will be assessed and classified in accordance with the *Waste Classification Guidelines* (DECC 2008).

All concrete footings and pads will be broken up to at least 1.5 metres below the surface, with the waste concrete crushed to produce an aggregate that can be beneficially used off-site beyond mine closure.

Fuel Farms and Chemical Storage Areas

Leading up to mine closure, a preliminary sampling and analysis program (Phase 1) will be implemented to determine whether a more detailed assessment (Phase 2) is necessary. This will assist in identifying and quantifying any contaminated material requiring bio-remediation on-site or transport off-site for disposal at a licensed facility.

Roadways, Car Parks and Hardstands

Bitumen roadways, car parks and hardstand areas around the workshop and administration areas will be ripped up and the inert waste material placed in the open cut void and buried.

4.0 OTHER RELEVANT MANAGEMENT PLANS

4.1 Environmental Management Strategy

Whitehaven is committed to ensuring progressive rehabilitation of areas of disturbance (and sequencing activities to enable earliest revegetation consistent with operational requirements) in order to minimise the areas of exposure and hence potential environmental and social impacts.

Rocglen's *Environmental Management Strategy* provides the overarching framework for the mine site's environmental management system and clearly defines the roles, responsibilities and mitigation measures committed to by Whitehaven for environmental management across the Rocglen Coal Mine. This *Rehabilitation Management Plan* forms part of that environmental management system.

Reference to activities undertaken in accordance with *Rehabilitation Management Plan* should also give due consideration to the broader management measures prescribed in the *Environmental Management Strategy*.

4.2 Water Management Plan

Rocglen's *Water Management Plan* addresses rehabilitation relating to erosion and sediment control and longer term surface water management. Rehabilitation issues addressed include design and management of the final void, re-establishment of drainage lines and revegetation of disturbance areas. The ultimate objective of rehabilitation in relation to water management is to create a low maintenance, geotechnically stable and safe landform, which is not prone to degradation and downstream impact through erosion and sedimentation.

As outlined in this *Rehabilitation Management Plan,* following shaping of the overburden emplacements, a series of contour banks and rock-lined drop structures will be installed around the batter slopes to ensure runoff is safely conveyed down the slopes and into the adjacent dirty water diversion channels. These structures will be progressively installed as shaping and rehabilitation is undertaken. Works within the restored drainage lines will generally be undertaken in accordance with *Managing Urban Stormwater: Soils and Construction Volume 1* and the *Guidelines for Controlled Activities – In-Stream Works* (DWE 2008) for watercourse rehabilitation and riparian zone rehabilitation.

Until such time as suitable vegetation cover is established on rehabilitation areas and surface water runoff is verified to be of a suitable quality for release to the surrounding environment, all runoff from these areas will continue to be considered as dirty water and will be retained on-site for reuse or treatment and discharge. If erosion is identified on a rehabilitating landform or in the operational area, it will be remediated as quickly as practical to reduce the potential for further impacts. Areas previously rehabilitated will be inspected regularly to ensure rehabilitation works are effective.

Rehabilitation will seek to achieve a long-term enhancement of the ecological values of the drainage lines through the restoration of natural hydraulic conditions and appropriate revegetation of a riparian corridor.

The performance of water management for the final landform, including the final void and shaped emplacement areas, will be determined through visual site inspections and on-going monitoring. Water quality within sediment dams receiving runoff from the rehabilitation areas and within the final void will provide the key performance indicator for the success of rehabilitation and post-mining water management. The water quality targets listed in the *Water Management Plan* will be adopted as the key performance criteria for rehabilitation in terms of water being discharged off-site following effective site rehabilitation.

4.3 Air Quality and Greenhouse Gas Management Plan

As part of Rocglen's Air Quality and Greenhouse Gas Management Plan, the following vegetation clearing and soil stripping measures are identified to improve air quality and achieve progressive rehabilitation goals:

- Cleared trees and branches are to be retained for the use in stabilising slopes identified for restoration to rehabilitated woodland. No burning of vegetation is permitted on-site; and
- Where practicable, soil stripping will be undertaken at a time when there is sufficient soil moisture to prevent significant dust lift-off and at a time that avoids periods of high winds. Where this is not possible, dust suppression by water application will be undertaken to increase soil moisture.

Whitehaven will continue to 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 promptly shaped, topdressed and vegetated to provide a stable landform. In turn, this will reduce dust generation and emissions of particulate matter.

5.0 STAKEHOLDER CONSULTATION

Whitehaven has developed and continues to utilise a number of mechanisms for on-going consultation with 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.

Environmental management and rehabilitation activities undertaken in the previous 12 months are reported in the AEMR/Annual Report, which is submitted to relevant government agencies and made available to the public via publication on Whitehaven's website. The AEMR/Annual Report summarises activities undertaken in the previous reporting period and planned activities for the subsequent period, including rehabilitation activities, management and monitoring.

Outcomes of rehabilitation activities are also communicated through the Rocglen Community Consultative Committee (CCC). Community representatives act as the point of contact between the mine and the community. The CCC comprises representatives from local government, the community and Whitehaven, and typically meets every three months.

The primary stakeholders that have an interest in the rehabilitation of Rocglen and this *Rehabilitation Management Plan* are:

- State and local government agencies, including:
  - Department of Infrastructure and Planning (DP&I);
  - Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS);
  - NSW Office of Environment and Heritage (OEH);
  - NSW Office of Water (NOW);
  - Namoi Catchment Management Authority (CMA); and
  - Gunnedah Shire Council.
- Surrounding residents and the wider community; and
- Local Aboriginal groups.

Consultation regarding the rehabilitation of Rocglen was primarily undertaken during the preparation of the EA for the Rocglen Coal Mine Extension Project. This consultation revolved around developing and refining a final landform, through progressive rehabilitation, in consideration of operational, environmental, economic and land ownership concerns.

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 to ensure that a low maintenance, stable and safe landform is established 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 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.

Complimentary to the extensive consultation undertaken throughout all stages of the Rocglen Coal Mine Extension Project assessment and approval process, specific consultation was conducted with the DTIRIS during the preparation of the Rocglen MOP in 2011.

As previously undertaken, Whitehaven will provide a draft copy of this *Rehabilitation Management* Plan to all relevant stakeholders for review and comment prior to finalisation.

6.0 REVIEW OF REHABILITATION MANAGEMENT PLAN

This *Rehabilitation Management Plan* is to be a dynamic document. While it has initially been prepared to satisfy Condition 36 of Schedule 3 of Project Approval PA 10_0015, it will be continually reviewed and updated throughout the life of the Rocglen operation. Five years prior to mine closure, a more detailed Rehabilitation and Mine Closure Plan will be prepared.

Throughout the life of the operation, the key triggers for a review of this *Rehabilitation Management Plan* will include, but not be limited to, the following:

- Amendments to the mining operation and/or Project Approval;
- Changes in legislation or policy that applies to the operation; and
- Progressively throughout the life of the operation, in particular when there is a change in operations (scheduling or other associated variation to the mining plan) that may impact on r ehabilitation timing and/or extent.

7.0 ENVIRONMENTAL AND REHABILITATION RISK ASSESSMENT

To identify activities, processes and facilities within the Rocglen Project Site that require control strategies to ensure environmental protection and compliance with lease, license and approval conditions, a broad brush risk assessment was undertaken as part of the MOP for Rocglen prepared in 2011. This process involved a qualitative risk assessment methodology developed in accordance with the *Australian and New Zealand Standard AS/NZS 31000:2009 Risk Management - Principles and Guidelines*.

The broad brush risk assessment resulted in the Environmental Risk Identification Matrix presented in **Table 9.** The Matrix identifies the various mine site activities, processes and facilities that have the potential for environmental impact during the term of the MOP (seven years), along with an evaluation of the significance level of the risk (low, moderate or high) and the subsequent need for strategies to mitigate and/or manage the risk and impacts.

In evaluating the significance level of the risks, consideration was given to various factors, including, but not limited to, the duration or extent of the activity, the proximity to surrounding residences and other mining operations, sensitivity of the surrounding landscape, current and final landform and geological stability.

While the risk assessment did not identify any high risk issues, a number of issues ranked as medium risks. The Rocglen EA and MOP contain a comprehensive list of environmental mitigation, management and monitoring commitments to address these risks. This *Rehabilitation Management Plan* also identifies and details measures to minimise and/or avoid risks relating to site rehabilitation.

Table 9 – Environmental Risk Identification Matrix

	Mining Activity, Process or Facility													
Issue	Exploration	Land Preparation (including stripping activities)	Construction Activities (including earth moving)	Mine Development and Mining	Use and Maintenance of Roads and Vehicles	Overburden Emplacement Management	Processing Facilities and Operations	Product Stockpiling and Handling	Water Management (including storm events)	Hazardous Materials	Sewerage	Rubbish Disposal	Rehabilitation Activities	Rehabilitated Land and Remaining Features
Air Quality Emissions	Low	Medium	Medium	Medium	Low	Medium	Medium	Medium					Medium	Low
Erosion and Sedimentation	Low	Medium	Medium	Medium	Medium	Medium	Low	Low	Low				Medium	Medium
Surface Water Impact	Low	Medium	Medium	Medium	Low	Medium	Medium	Medium	Medium	Medium	Medium		Low	Low
Groundwater Impact	Low	Low	Low	Medium	Low	Low	Low	Low	Medium	Medium	Low		Medium	Medium
Land Contamination	Medium	Low	Medium	Medium	Low	Low	Medium	Low	Low	Medium	Medium	Medium		
Flora and Fauna Impact	Low	Medium	Medium	Medium	Low	Low	Low	Low	Medium	Low	Low	Low		
Weed Control	Low	Medium	Medium	Low	Medium	Medium			Low			Low	Medium	Medium
Operational and Traffic Noise	Low	Medium	Medium	Medium	Low	Medium	Medium	Medium						
Blasting and Vibration				Medium										
Visual Amenity	Low	Medium	Medium	Medium	Low	Medium	Medium	Medium					Medium	Medium
Aboriginal Heritage	Low	Medium	Medium	Medium	Low	Medium	Low	Low	Low				Low	Low
European Heritage														
Spontaneous Combustion	Low	Low	Low	Medium	Low	Medium	Medium	Medium					Low	Low
Bush Fire	Low	Medium	Medium	Medium	Medium	Medium	Medium	Medium		Medium		Low	Medium	Medium
Public Safety	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Low	Medium	Low	Low	Medium	Medium

Key:

- Low Risk
- Medium Risk
- High Risk

8.0 REFERENCES

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