MGO

MT OWEN / GLENDELL

GLENCORE

Rehabilitation Strategy

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1 Introduction

1.1 Background

Mount Owen Glendell Operations (MGO) is located within the Hunter Coalfields in the Upper Hunter Valley of New South Wales (NSW), approximately 20 kilometres north-west of Singleton, 24 kilometres south-east of Muswellbrook and to the north of Camberwell (refer to **Figure 1.1**).

MGO includes the Mount Owen and Glendell open cut coal operations, which are currently owned and operated by Mount Owen Pty Limited (Mount Owen), a subsidiary of Glencore Coal Pty Limited. Mount Owen open cut coal operations include the Mount Owen (North Pit) and Ravensworth East (Bayswater North Pit) operations approved under the Mount Owen Continued Operations Project Development Consent (SSD-5850) granted on 3 November 2016. The Glendell open cut operations (Barrett Pit) operate under the Development Consent (DA 80/952).

MGO also includes areas previously disturbed as a result of past mining activities and includes the West Pit Void (formerly part of the Ravensworth East operations) which is currently receiving tailings from the Mount Owen coal handling and preparation plant (CHPP). The mining operations at MGO include the integrated use of the Mount Owen CHPP and other operations forming part of the Greater Ravensworth Area Water and Tailings Scheme (GRAWTS), coal stockpiles and the rail load out facility.

Mount Owen (North Pit) has an approved production rate of 10 million tonnes per annum (Mtpa) of run of mine (ROM) coal, and blended with Ravensworth East (approved 4 Mtpa) and Glendell (approved 4.5 Mtpa) ROM coal, feed the Mount Owen CHPP and associated infrastructure, which has a current approved processing capacity of 17 Mtpa of ROM coal.

Processed coal, both semi soft and thermal, is transported via the Main Northern Rail Line to the Port of Newcastle for export, or by conveyor for domestic use as required.

Mount Owen expects, subject to market conditions, that mining will be completed within the currently approved area of the North Pit and the Bayswater North Pit (BNP) by 2037 and 2022 respectively; and Barrett Pit by 2022.

1.2 Statutory Requirements

The following Rehabilitation Strategy was prepared to meet the requirements of Condition 43 of the Mount Owen Continued Operations Development Consent SSD – 5850 (as modified) (Mt Owen Consent). Three modifications have been approved to SSD-5850. Modification 1 (MOD1) facilitated the construction of a water pipeline to convey mine water from Integra Underground Mine to MGO and was granted on 15 September 2017. Modification 2 (MOD 2) approved an extension to the mining area at North Pit to enable access to an additional approximately 35 Mt of ROM coal. MOD 2 also approved an extension of the Mount Owen Mine life by an additional 6 years to 2037 and was granted on 6 September 2019. On the 30 January 2020 an administrative modification (MOD 3) was approved which includes an additional land parcel to the Schedule of Land. There were no changes to statutory conditions associated with MOCO MOD 3.

The Rehabilitation Strategy does not apply to any aspect of the ongoing operations at Glendell Mine.

It is further noted, this rehabilitation strategy does not apply to any earthmoving works undertaken for landforms that have been approved and constructed under previous consents.

For the purposes of the Strategy document, the Project is described as those parts of MGO regulated by the Mt Owen Consent and does not include operations regulated solely by the Glendell Consent.

The requirements of the Mt Owen Consent and where they have been addressed within this document are outlined in **Table 1.1**.

Table 1.1 SSD-5850 Rehabilitation Objectives and Rehabilitation Strategy Requirements

Condition Reference	Condition	Section Addressed
Schedule 3, Condition 28	**Threatened Species** The Applicant must ensure that the Biodiversity Offset Strategy summarised in Table 9 and the Rehabilitation Strategy for the development focus on the regeneration, enhancement and/or re-establishment of: (a) significant and/or threatened flora communities, including: • Central Hunter Grey Box — Ironbark Woodland EEC; and • Central Hunter Ironbark — Spotted Gum — Grey Box Forest EEC; and (b) habitat and/or foraging resources for other significant and/or threatened flora and fauna species, including: • Spotted-tailed Quoll; • Squirrel Glider; • Koala; • Swift Parrot; • Regent Honeyeater; • Green and Golden Bell Frog; • Brush-tailed Phascogale; • Eastern Bent-wing Bat; • East-coast Freetail Bat; • Southern Myotis; • Speckled Warbler; • Little Lorikeet; • Grey-crowned Babbler; • Diamond Firetail; and • Masked Owl.	**Section 3, 5.1 & 5.7.1**

Condition Reference	Condition	Section Addressed
Schedule 3, Condition 42	**Rehabilitation** **Rehabilitation Objectives** The Applicant must rehabilitate the site to the satisfaction of Resources Regulator. This rehabilitation must be generally consistent with the proposed rehabilitation activities described in the documents listed in condition 2(a) of Schedule 2 (and shown conceptually in the Rehabilitation Plans in Appendix 7), and comply with the objectives in Table 10 [of the Mt Owen Consent]. *Note: The longterm conservation of the Rehabilitation Woodland Offset area identified in Table 9 will be satisfied in accordance with condition 29. The conservation values of the remaining native woodland restored under this condition will be established in accordance with the Rehabilitation Strategy required under condition 43, and managed and enhanced, in accordance with the Rehabilitation Management Plan required under condition 45.*	**Sections 3** and **5.7**
Schedule 3, Condition 42A	**Rehabilitation Objectives** The rehabilitation objectives in Table 10 apply to all the entire site, including all landforms constructed under either this consent or previous development consents. However, they do not require any additional earthmoving works to be undertaken for landforms that have been approved and constructed under previous consents.	Noted
Schedule 3, Condition 43	**Rehabilitation Strategy** The Applicant must prepare a Rehabilitation Strategy for the Mount Owen Complex to the satisfaction of the Secretary. This strategy must:	This Document
	(a) be prepared in consultation with Resources Regulator and Council, and be submitted to the Secretary for approval prior to the commencement of development under this consent, unless the Secretary agrees otherwise	**Section 2.3**
	(b) build upon the Rehabilitation Objectives in Table 10 and the Rehabilitation Plans shown in Appendix 7, including identification of opportunities for increasing the areas of woodland and habitat connectivity within the rehabilitated landscape;	**Section 3 & 5**[1]**.** See also **Sections 1.4, 2** and **Figure 2.1**

[1] The areas within the approved project disturbance area with greatest potential for increasing the area of woodland in the rehabilitated landform are the open woodland/grazing areas identified in Table 1.4. These areas will also be among the last to be decommissioned but also offer the most potential for higher value end land uses. Opportunities to increase woodland and habitat connectivity beyond that identified in **Figure 1.4** will be considered as part of the detailed mine closure planning process.

Condition Reference	Condition	Section Addressed
	(c) include details of the canopy, sub-canopy, understorey and ground strata species to be established in the rehabilitation areas, with a particular focus on ensuring the achievement of an appropriate level of diversity and mix of functional groups within each target community;	**Section 5.7** and **Appendix A**
	(d) identify opportunities for the incorporation of preferred feed trees, foraging resources and habitat for threatened fauna species identified in condition 28;	**Section 5.7**
	(e) align with strategic rehabilitation and mine closure objectives and address the principles of the Strategic Framework for Mine Closure (ANZMEC and MCA, 2000);	**Section 2.2**
	(f) identify and describe all rehabilitation domains, and define completion criteria for each;	**Section 3**
	(g) include indicative mine plans and scheduling for life-of-mine rehabilitation showing each domain;	**Section 5.7**
	(h) describe how rehabilitation will be integrated with the mine planning process, including a plan to address premature or temporary mine closure;	**Section 2.1 & 5.7**
	(i) investigate opportunities to refine and improve the final landform void outcomes over time;	**Section 2.1 & 5.4**
	(j) include a risks and opportunities assessment and risk register; and	**Section 5.10 & Appendix B**
	(k) include a stakeholder engagement plan to guide rehabilitation and mine closure planning processes and outcomes	**Section 2.3**

The purpose of this document is to outline the proposed mine closure and rehabilitation strategy for the Project, which has been developed in consideration of a number of factors including site opportunities and constraints, ecological and rural land use values and existing strategic land use objectives, including the integration of rehabilitation with the strategies developed for surrounding Glencore operations.

As part of the continuation of coal mining operations, the details regarding mine closure and rehabilitation will be documented within the Rehabilitation Management Plan (RMP) for the Project.

1.3 Features

The key features of MGO relevant to the Rehabilitation Strategy are outlined in **Table 1.2**. For a detailed description of the existing approved operations refer to:

- Section 2 of the MOCO EIS (Umwelt, 2015);
- Section 2.0 of the MOCO Response to PAC Review Report (Umwelt, 2016).
- Section 2 of the MOCO Modification 2 (MOD 2) Statement of the Environmental Effects (SEE) (Umwelt, 2018).

Table 1.2 Key Features

Key Feature	Approved Operations
Mine Life	• Mining operations approved to 31 December 2037 • Rehabilitation Activities approved until completed.
Limits on Extraction	• North Pit – up to 10 Mtpa ROM. • Ravensworth East (Bayswater North Pit) – up to 4 Mtpa ROM. • Mining depths to approximately 380 m (North Pit). • Total additional mineable coal tonnes of approximately 121 Mt ROM (comprising 74 Mt ROM from MOCO and 35 Mt ROM from MOCO MOD 2) from the North Pit and 12 Mt ROM from the BNP.
Mining Methods	• Truck and Shovel Operations
Tailings Facilities	• Continued co-disposal of coarse reject and overburden within the North Pit, BNP and Glendell as mining progresses. • Tailings emplacement in Ravensworth East voids (including West Pit), within in-pit tailings cells in North Pit or the BNP void. • Receipt of tailings from other mines in accordance with relevant approvals. Continued participation (receipt and transfer of tailings) as part of the Greater Ravensworth Area Water and Tailings Scheme (GRAWTS).
Mount Owen CHPP, MIA and other infrastructure	• CHPP throughput of up to 17 Mtpa ROM (includes the processing of ROM coal from Glendell). • product stockpiles; • Water management infrastructure including water storages • Rail loading facilities • Rail loop • Crushing plant • Conveyor to Liddell for transfer of crushed rock material

The key features of MGO are shown on **Figure 1.2**.

The approved disturbance footprint associated with the Project is shown in **Figure 1.3.**

The Conceptual post mining land use design for the Project Area is shown on **Figure 1.4.**

Figure 1.1 Locality Plan

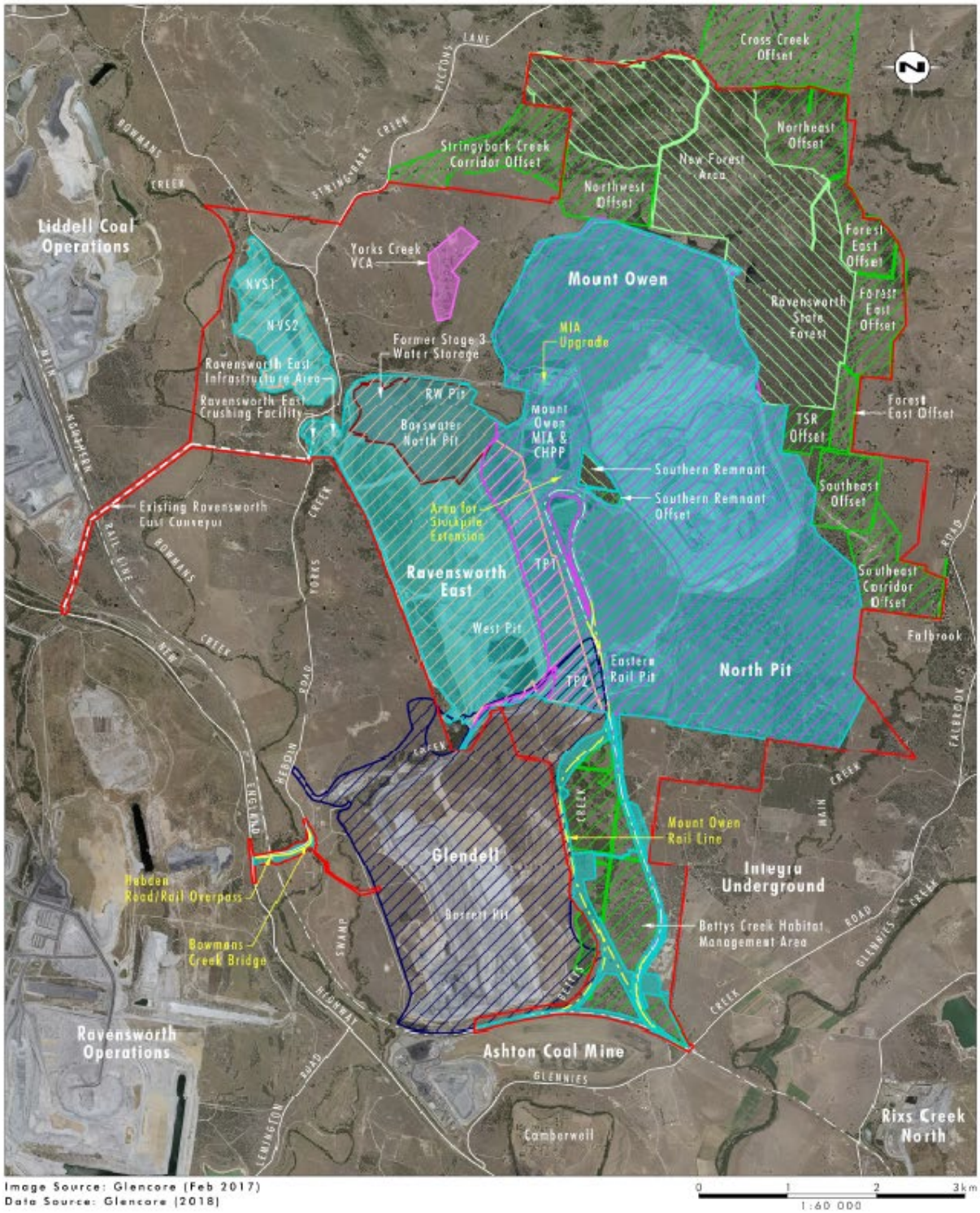


Figure 1.2 Mount Owen Glendell Operations

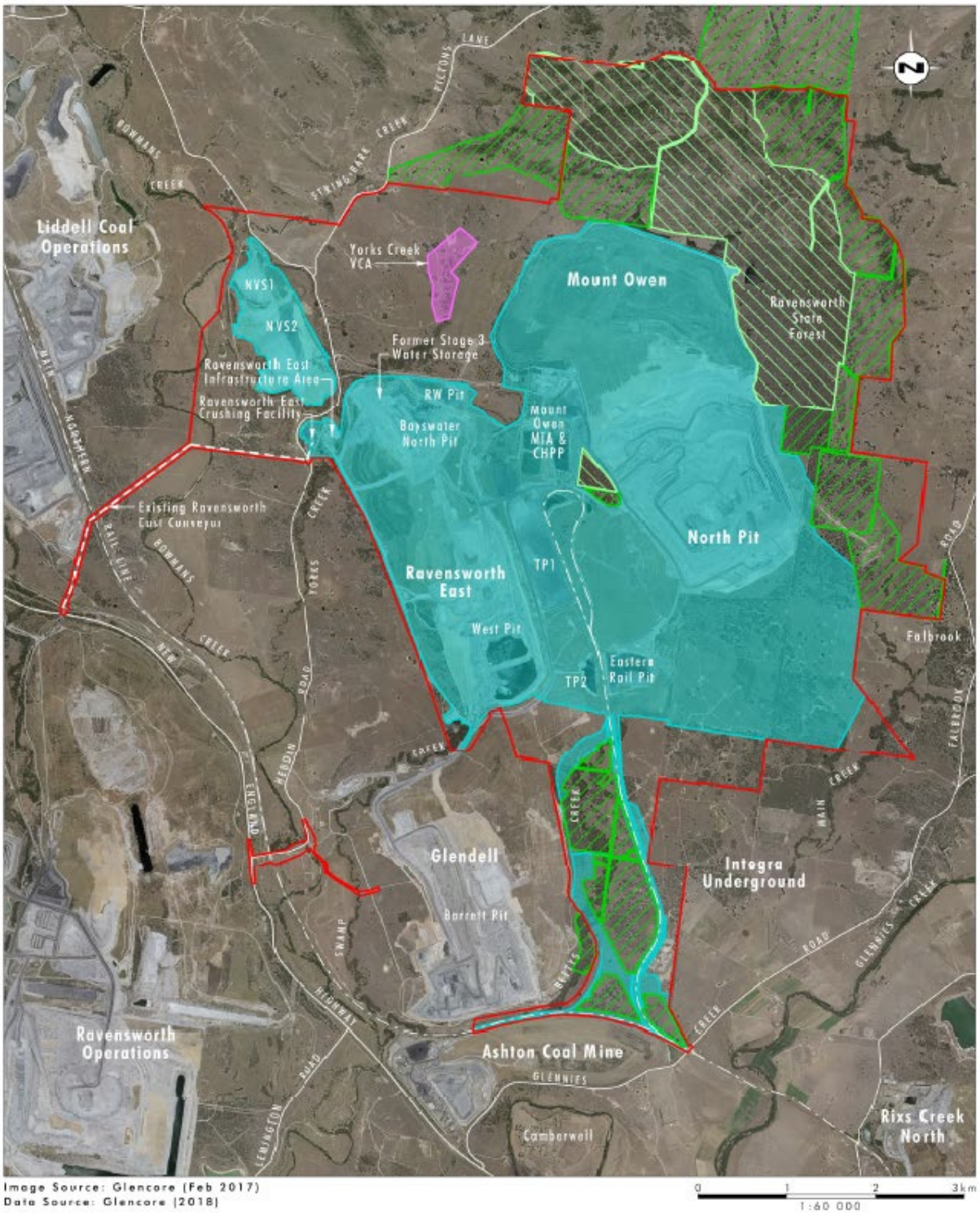


Figure 1.3 Mount Owen Continued Operations (SSD 5850)

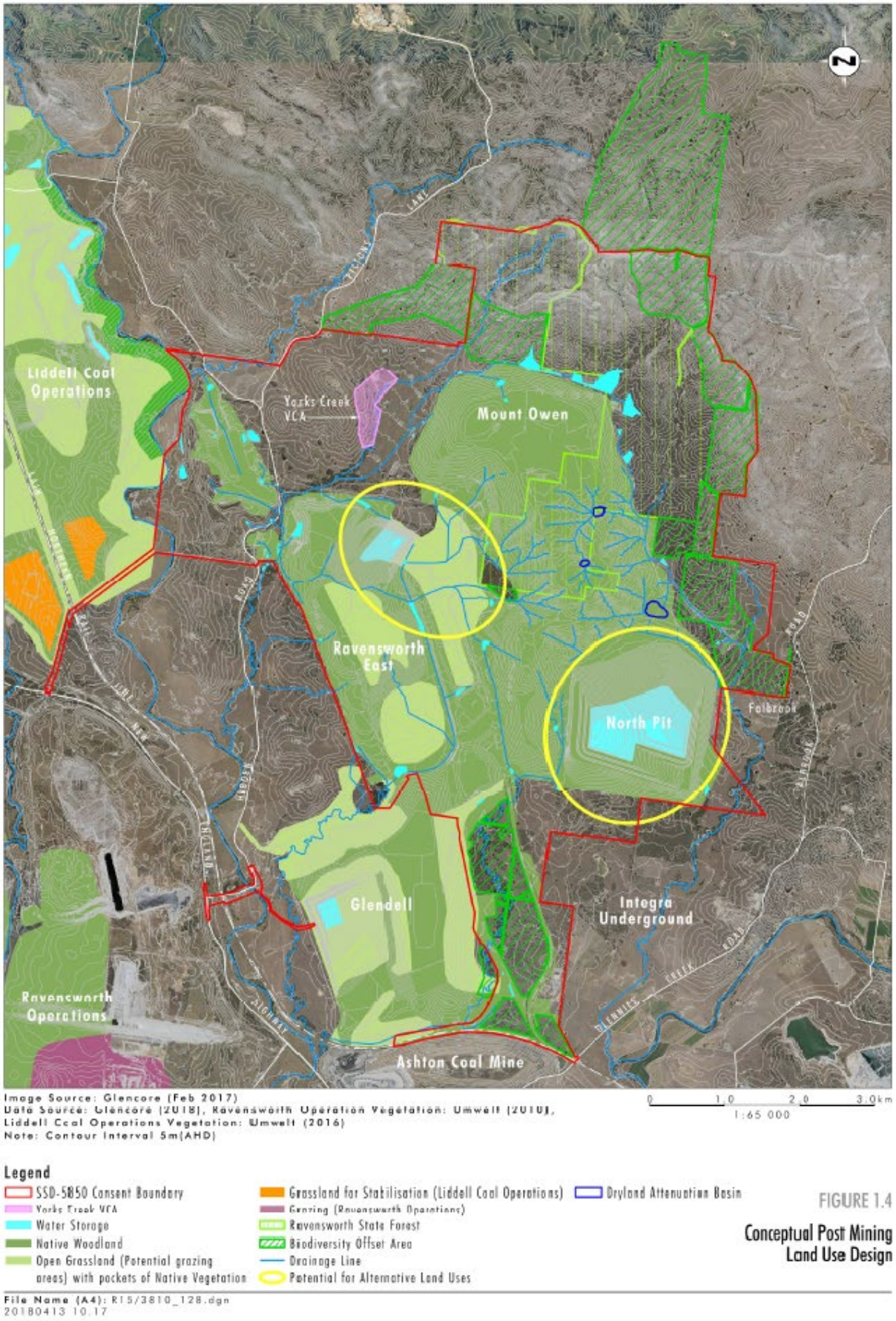


Figure 1.4 Conceptual Post Mining Land Use Design

1.4 Existing Rehabilitation Processes and Performance

Several forms of ecological rehabilitation and restoration have been undertaken to date at MGO, comprising:

- mine rehabilitation on spoil material;
- revegetation (active management) of pasture grasslands outside of the mine disturbance areas through plantings; and
- passive regeneration of grasslands outside of the mine disturbance areas where adequate canopy seed sources are located nearby.

Previous and current mine rehabilitation practices on mine spoil has involved direct seeding with canopy species.

Forest topsoil and woody mulch from areas cleared by mining has been used on a large portion of the rehabilitation, and this has provided a valuable seed source for the rehabilitation.

In the absence of forest topsoil, pasture topsoil has been used as a replacement and planted with tube stock.

A range of fauna impact mitigation and management measures have been implemented. These measures have included the installation of nest boxes to compensate for the loss of hollow-bearing trees as a result of approved mining operations; and the construction of green and golden bell frog habitat in two frog conservation zones within Biodiversity Offset Areas and also within mine rehabilitation.

The rehabilitation strategy at the Mount Owen Complex has benefited from extensive research undertaken in partnership with the Centre for Sustainable Ecosystem Restoration (CSER) at the University of Newcastle. An initial goal of the Mount Owen Mine research program was to re-establish sustainable nutrient acquisition and cycling using natural root-microbe associations. This soon expanded to include research into the use of available bulk materials and amelioration techniques for mine rehabilitation when forest topsoil would eventually run out. Since commencement, the research has included over 40 experiments and investigations established to date.

Mount Owen is now listed as a 'Highly Commended' site on the Global Restoration Network of the Society for Ecosystem Restoration, International. Mount Owen has also participated in several Australian Coal Association Research Program (ACARP) projects on mine site rehabilitation. Mount Owen has also undertaken, in collaboration with the University of Newcastle, the Ravensworth State Forest Vegetation Complex Research Program which has as its objective, the development of effective methods to establish dry sclerophyll and other native forest communities on rehabilitated overburden emplacement areas.

Assessments of ecological outcomes of mine rehabilitation, regeneration and revegetation at the North Pit (Umwelt 2014a) has indicated that rehabilitation areas sampled are trending very strongly towards the *Central Hunter Ironbark – Spotted Gum – Grey Box Forest in the NSW North Coast and Sydney Basin Bioregions* EEC. In addition, other key findings included:

- natural recruitment of canopy species is present across the rehabilitation areas;
- rehabilitation communities provide known habitat for a range of threatened fauna species including small terrestrial mammals, birds and micro-bats;
- a wide range of common fauna species have been recorded utilising mine rehabilitation areas within the Mount Owen Complex including:
    - common brushtail possum (*Trichosurus vulpecula*);
    - Australian magpie (*Cracticus tibicen*);
    - eastern rosella (*Platycercus eximius*);
    - welcome swallow (*Hirundo neoxena*);
    - superb fairy wren (*Malurus cyaneus*);
    - olive-backed oriole (*Oriolus sagittatus*);

  - brown-headed honeyeater (*Melithreptus brevirostris*); and
  - yellow-faced honeyeater (*Lichenostomus chrysops*) and yellow-rumped thornbill (*Acanthiza chrysorrhoa*).
- a range of threatened species listed under the *Biodiversity Conservation Act 2017* and/or *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) are also known to utilise this habitat including:
  - spotted-tailed quoll (*Dasyurus maculatus*);
  - New Holland mouse (*Pseudomys novaehollandiae*);
  - eastern bentwing-bat (*Miniopterus schreibersii oceanensis*);
  - east coast freetail-bat (*Mormopterus norfolkensis*);
  - speckled warbler (*Chthonicola sagittata*); and
  - grey-crowned babbler (*Pomatostomus temporalis temporalis*).
- areas of derived native grassland in biodiversity offset areas that have been revegetated with canopy species provide high quality fauna habitat (including several threatened fauna species); and
- rehabilitation communities provide appropriate levels of species diversity for the age of vegetation and the majority of target species and groups of fauna species are repeatedly achieving benchmark species diversity values.

However, the assessment report (Umwelt 2014b) also outlines that ongoing management of these sites is required to continue to improve their condition and function and to ensure long term self-sustainability.

The rehabilitation strategy as presented in this document has been designed to build off the success of these existing techniques and based on the learnings derived from previous monitoring and research, be adaptive to include new measures aimed at continual improvement.

2 Context for Rehabilitation Strategy

2.1 Glencore Mine Closure Planning Process

Glencore has implemented a proactive approach to rehabilitation and mine closure by developing a range of standards that are to be implemented across its business units, including MGO. These standards require that planning for closure is an integrated part of the life of mine planning process.

Specific guidance is provided for developing, implementing and reviewing mine closure plans taking into consideration economic, social and environmental factors so that each of Glencore's operations meet statutory requirements and achieves a sustainable post-closure land use.

The Glencore Mine Closure Planning Protocol includes the scope of mine closure activities required at each phase of mining, with closure planning commencing at the exploration phase, continuing through the operational phase and eventually to government sign-off of rehabilitation and successful mining lease relinquishment.

The level of detail required in a closure plan increases as the operation proceeds towards the planned closure date. Specifically, Glencore standards require that when a mine is within five years of the planned closure date that a detailed closure planning process is to be initiated. The process involved:

- Confirmation of final land use options;
- Identification of any closure issues and appropriate solutions;
- Budgeting for specific closure costs; and
- Development of a Mine Closure Plan

The latter plan will be developed and submitted to the relevant regulatory agencies five years prior to the cessation of mining operations.

The existing Conceptual Closure Plan (CCP) will be revised as part of the implementation of the Project. As such, this plan will be updated in consideration of the commitments outlined within the MOCO EIS (Umwelt 2014a), the Response to the PAC Review Report (Umwelt 2016), MOCO MOD 2 SEE (Umwelt, 2018) and will include details regarding final land use objectives and closure criteria, rehabilitation and final void management strategies.

The CCP also includes provisions in the event of an unplanned or imminent mine closure. This is also a legal requirement stipulated by the Resources Regulator as a condition of the relevant mining leases.

Costs associated with the unplanned or imminent closure of MGO is calculated via the Resource Regulator's Rehabilitation Cost Estimate (RCE) Tool. Costs are calculated as part of the Mining Operations Plan (MOP) and reviewed and revised on an as needs basis during the review and revision of the MOP document. As a minimum it is undertaken approximately every 7 years.

2.2 Alignment with Strategic Land Use Objectives

The strategic land use objectives for the area, which have been considered as part of the concept closure planning process for the Project, include those within the Singleton Local Environment Plan (LEP) 2013, Synoptic Plan and the Strategic Regional Land Use Plan for the Upper Hunter (Upper Hunter SRLUP) (Department of Planning and Infrastructure (DP&I) 2012).

This document has also been developed to fulfil the key principles of the Strategic Framework for Mine Closure.

Discussion of the alignment of the rehabilitation strategy for the Project with these strategies is outlined below.

2.2.1 Singleton Local Environmental Plans

The rehabilitation and closure strategy has been developed in consideration of the objectives of the Singleton LEP. Amendments that may occur to the LEP will be evaluated as part of ongoing revisions to the Project's mine closure plan. The Project Area is situated within an area classified as RU1 Primary Production. The objectives of RU1 zone are outlined below:

- to encourage sustainable primary industry production by maintaining and enhancing the natural resource base;
- to encourage diversity in primary industry enterprises and systems appropriate for the area;
- to minimise the fragmentation and alienation of resource lands; and
- to minimise conflict between land uses within this zone and land uses within adjoining zones.

In consideration of the LEP 2013, provision has been included within the rehabilitation strategy to maintain the rural landscape by re-establishing grassland areas (refer to **Section 3**). The Rehabilitation Strategy aims to return areas of Ravensworth State Forest to woodland communities resembling those which existed pre-mining, which provides opportunities for forestry industries similar to what the State Forest would previously have provided. The additional areas of woodland to be planted will also expand the area of woodland vegetation potentially available for forestry use, should this be warranted as a primary industry into the future.

The infrastructure available to the post mining landform and the availability of water lend the site to potential use for intensive plant agricultures (permissible without consent) and some intensive livestock uses and potentially aquaculture (both permitted with consent). These and other potential post-mining land uses will be investigated as part of the detailed mine closure planning process.

2.2.2 Singleton Land Use Strategy

The Singleton Land Use Strategy was developed in 2008 and outlines key land use policies and principles for the Singleton local government area (LGA), and provides the planning context for the preparation of local environmental plan provisions. The Strategy had a time frame of 25 years, to 2032. The end land use for MGO is therefore at the tail end of the planning horizon covered by the Land Use Strategy. The Singleton Land Use Strategy was developed during the early stages of the mining investment boom. The Strategy specifically addresses Coal Mining lands and buffers:

> *Coal mining is probably the most significant land use and economic activity affecting the future of the LGA. In Singleton, coal production and employment is reaching its expected peak, and is likely to be stable or increase for the next 10 – 15 years and then progressively decline as easily accessible coal resources are depleted. ... Mining has a range of environmental and social impacts which need to be taken into account in future land use planning.*

The Land Use Strategy does not specifically target the development of employment generating industries to mitigate the effect of mines reaching the end of their productive lives however it does provide the following Strategic Action for Coal mining lands and buffers:

> *Support a strategic review by the NSW Government of future coal mining proposals within the Upper Hunter Region, including rehabilitation, infrastructure and land use options, and an update of the … Synoptic Plan* [refer to **Section 2.2.3]** *for rehabilitation of mined landscapes.*

The Singleton LEP (see **Section 2.2.1**) also contains a broad range of uses permissible with and without consent that are potentially suitable for post mining landforms. The Land Use Strategy specifically identifies former coal mines as potential sites for adaptive reuse, particularly where they:

> *[H]ave existing infrastructure (e.g. water allocation and supply), wastewater treatment, roads, rail access, electricity, etc.) and are separated from urban areas. Limited by current rural zoning.*

The following broad location criteria are identified for any new industrial areas:

- *Located within or adjacent to an existing urban area (or within reasonable proximity to Singleton or Branxton) on relatively flat land which is not visually prominent.*
- *Proximity to major transport facilities such as major roads and with railway access.*
- *No direct access for individual industrial developments to the New England or Golden Highway, but otherwise convenient, suitable standard access.*
- *Must have direct connection to water and sewer, provision for adequate electricity. Require water allocation and reticulated water supply and sewer for all new industrial lots.*
- *Availability, or possible extension, of essential infrastructure such as water, sewer, electricity, sealed road access.*
- *Must support an industrial land hierarchy, with industrial service land located close to town, and large lot industrial/mining related development separated from town.*
- *Located so as to not have any adverse environmental impacts (e.g. visual impacts).*
- *All large new areas for heavy industrial to be serviced by rail access.*
- *Not subject to development constraints such as flooding, bushfire hazard, or biodiversity issues.*
- *Access to industrial areas should avoid traversing residential areas and areas are to be accessible by public transport (if available).*

Infrastructure areas and facilities at MGO satisfy each of the above criteria.

The Land Use Strategy is currently under review by Council and it is envisaged that this strategy will have greater focus on the transition of mine sites towards end land uses which provide opportunities into the future. Updates to the Land Use Strategy will be considered in the development of the Mine Closure Plans for the Complex.

2.2.3 Synoptic Plan

The *Synoptic Plan: Integrated landscapes for coal mining rehabilitation in the Hunter Valley of NSW* (Department of Mineral Resources, 1999) (the Synoptic Plan) aims to provide a basis for the development of a long term integrated strategy for the rehabilitation of mines sites. The rehabilitation of mined areas at Ravensworth East and Mount Owen Mines is specifically identified in the Synoptic Plan as part of a broad north-south / east west corridor linkage (refer to **Figure 39** in the Synoptic Plan).

The rehabilitation strategy for the Project has been developed to meet the intent of the Synoptic Plan and considers the potential regional outcomes for visual amenity, biodiversity and sustainable post closure use. The conceptual final land form (refer to **Figure 1.4**) includes woodland rehabilitation to establish and enhance native vegetation corridors to promote regional fauna movements across the MGO and surrounding region. The habitat corridors created through the proposed rehabilitation strategy are shown in **Figure 2.1**. These corridors will be developed throughout the project through progressive rehabilitation of in-pit and out of pit emplacement areas (refer to **Section 5.6**).

As part of the commitments for the Project, active regeneration will be also be undertaken in the Additional Active Revegetation Area (refer to **Figure 1.4** and **Figure 2.1**) to enhance this connectivity during the operational phase and mitigate impacts to north south connectivity associated the extension of the North Pit approved under the Mount Owen Continued Operations Project.

These corridors link to existing remnant vegetated areas of Ravensworth State Forest as well as the significant areas of woodland area being planted and regenerated in offset areas associated with Mount Owen Complex approvals and offsets lands for other mining projects in the area (e.g. Liddell Coal Operations offsets to the north west). The linkages are also focussed on enhancing biodiversity connectivity between major creek systems (in particular Glennies Creek and Bowmans Creek) and plugging 'missing gaps' in the local and regional biodiversity corridors. The biodiversity corridors established will be suitable for a range of threatened fauna species including but not limited to the spotted-tailed quoll (Dasyurus maculatus).

The development and enhancement of habitat corridors proposed as part of the conceptual final land uses is consistent with the intent of the broader regional corridor system outlined within the Synoptic Plan.

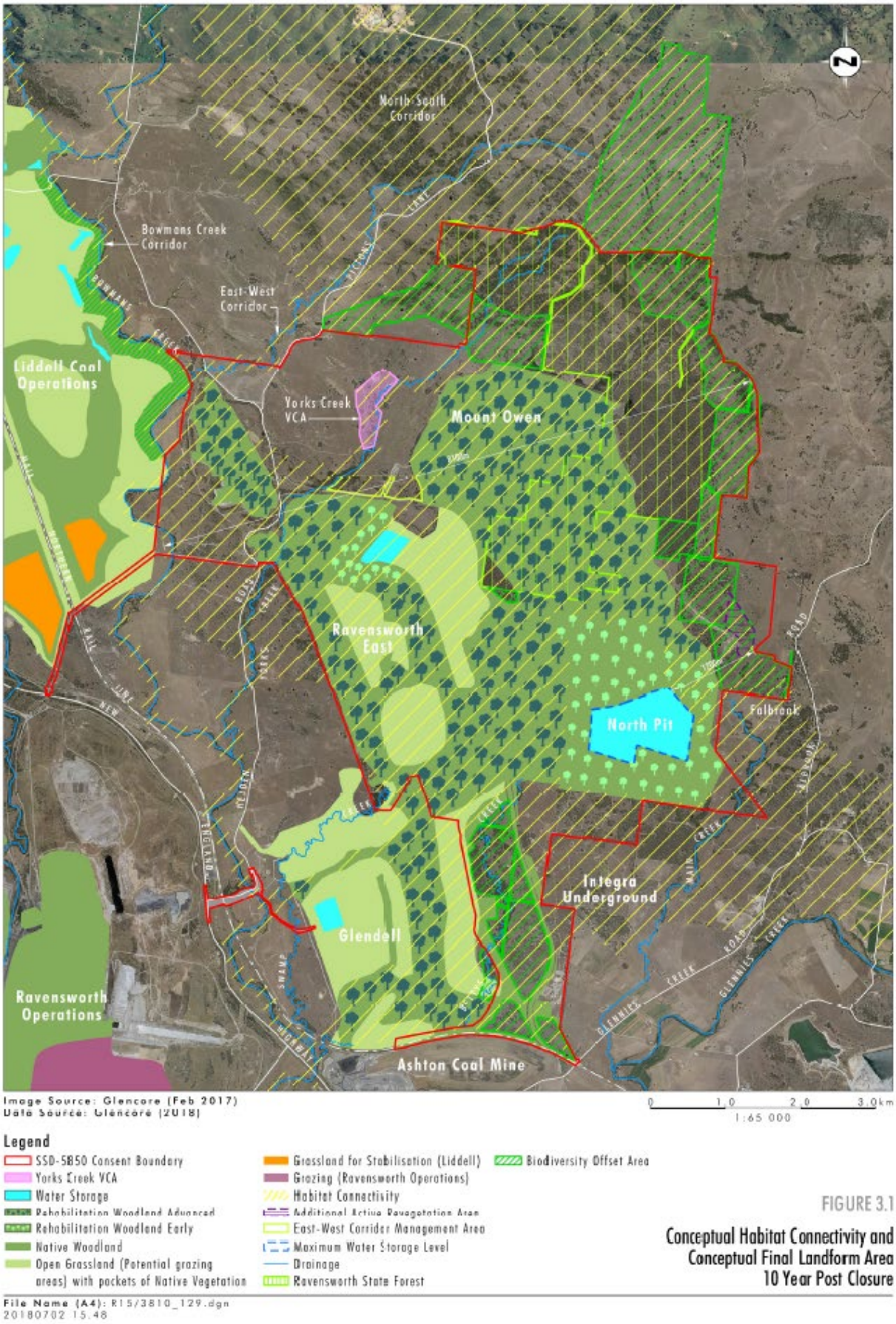


Figure 2.1 Conceptual Habitat Connectivity and Final Landform Area 10 Year Post Closure

2.2.4 Upper Hunter Strategic Regional Land Use Plan and Upper Hunter Strategic Assessment

The Upper Hunter SRLUP has been developed to provide a strategic framework for delivering the necessary context for government investment priorities, servicing strategies and local environmental plan making for the Upper Hunter Valley. The stated objective of the Upper Hunter SRLUP is to balance the strong economic growth in Regional NSW with the protection of valuable agricultural land and the sustainable management of natural resources. In particular, the Upper Hunter SRLUP identifies the importance of minimising the land use conflicts arising from the rapid growth of coal mining activities and the recent emergence of the coal seam gas industry.

The Strategy emphasises the importance of the protection of biodiversity through strategic land use planning. It recognises that post mining rehabilitation has the potential to contribute to biodiversity conservation in the longer term and that the location and design of rehabilitation can be used to maximise its landscape value in the future. Importantly, the plan outlines that effective planning will be required to design a post-mining landscape that will allow a number of different land uses including conservation. Other than the Synoptic Plan there is limited strategic planning to guide the development of rehabilitation to improve biodiversity outcomes in the Hunter Valley. Notwithstanding, as outlined in **Sections 2.2.3,** and **3**, the establishment of vegetation corridors identified in the Final Land Use for the Mount Owen Complex (refer to **Figure 1.4**) facilitates regional linkages with the biodiversity values of the broader area whilst not precluding opportunities for other post-mining land uses. These linkages are discussed in further detail in **Section 2.2.3**.

The indicative post mining land use will primarily involve the establishment of Central Hunter Ironbark – Spotted Gum – Grey Box Forest in the post-mining landform and selected areas of grassland for agriculture. The ecological value of successful post-mining rehabilitation areas will contribute to the overall biodiversity offset strategy for the Project.

2.2.5 Hunter Regional Plan 2036

The Hunter Regional Plan 2036 is the NSW Government's strategic long term plan for guiding land use planning decisions for the Hunter Region until 2036. The Regional Plan sets out four regionally focused goals for the Hunter Region, being:

- the leading regional economy in Australia
- a biodiversity-rich natural environment
- thriving communities
- greater housing choice and jobs.

The regional plan aims to strengthen the region's economic resilience, protect its well established economic and employment bases and build on its existing strengths to foster greater market and industry diversification. In particular, the intent of the Regional Plan 2036 is to transform the productivity of the Upper Hunter, plan for greater land use compatibility, protect and connect natural areas and sustain water quality and security. The Rehabilitation Strategy aligns to the following 'directions' in the Regional Plan:

- Direction 5 Transform the productivity of the Upper Hunter specifically to identify the land and infrastructure requirements to develop the Hunter's Coal and alternative energy resources.
- Direction 11 is aimed at managing the ongoing use of natural resources and notes 'the combination of undeveloped coal resources in the Hunter and Newcastle coalfields and the export capability of the Port of Newcastle provide significant opportunities for growth'.
- Direction 13 is based on managing the compatibility of land uses in particular identifying and protecting important agricultural land, including intensive agricultural clusters

- Direction 14 is aimed at protecting and connecting natural areas, including developing a holistic approach across both public and private lands will protect and manage natural ecosystems and ensure connectivity between habitats

- Direction 15 notes the importance of monitoring and managing the impacts of existing land uses, and in the future those associated with growth will be essential to protect the quality and security of the region's water supplies.

Directions 5 and 11 are relevant as they relate to the economic benefits of the Project through development of economic coal resources. Direction 13 is related to how the rehabilitation Strategy aligns with the Upper Hunter SRLUP.

Direction 14 is addressed through the proposed revegetation of the site to predominately woodland communities which recreates and enhances local and regional habitat connectivity (refer also to **Section 2.2.4** and **Figure 2.1**).

Direction 15 is addressed through the range of management, mitigation and monitoring measures committed to for the Project and those discussed in **Section 6**. The investigation of alternative, higher economic value and employment generating industries for the site post mining as part of the mine closure planning processes (refer to **Sections 1.4** and **2.1**) is also consistent with Direction 15.

2.2.6 Strategic Framework for Mine Closure

The Strategic Framework for Mine Closure (ANZMEC & MCA 2000) has evolved as a cooperative development between the Australian and New Zealand Minerals and Energy Council (ANZMEC) and the Australian Minerals Industry represented by the Minerals Council of Australia (MCA) that provides a framework of issues to be considered as part of a mine closure plan.

The strategy for mine closure as outlined in this document has been developed in consideration of the six key objectives as identified by this framework document. Each of these objectives is outlined in ***Table 2.1***, along with the relevant section of this document where they are addressed.

Table 2.1 Key Objectives from the Strategic Framework for Mine Closure

Key Objectives	Relevant Section of Document
To enable all stakeholders to have their interests considered during the mine closure process.	**Sections 2.3**
To ensure the process of closure occurs in an orderly, cost-effective and timely manner.	**Sections 5**
To ensure that the cost of closure is adequately represented in company accounts and that the community is not left with a liability.	**Section 6**and security required under Mining Leases which is based on assessed rehabilitation liability associated with approved MOP
To ensure there is clear accountability and adequate resources for the implementation of the closure plan.	**Section 6**
To establish a set of indicators which will demonstrate the successful completion of the closure process.	**Section 3**and **Section 6**
To reach a point where the company has met agreed completion criteria to the satisfaction of the responsible authority.	**Sections 3** and **6**

2.3 Stakeholder Consultation

One of the key focus areas for ongoing dialogue with stakeholders will be progress with the mine closure and rehabilitation planning and implementation process. As part of the Project approval process, Mt Owen sought stakeholder feedback on the mine closure and rehabilitation aspects of the Project through various forums including meetings with regulatory authorities, community groups and surrounding landowners. At these meetings a range of different closure options were identified and discussed. These included agricultural use, conservation for biodiversity and a number of other more specific land uses. The existence of infrastructure associated with the current mining operations (e.g. road access, power, water and rail access) would also provide opportunities for other uses of the post mining landform including opportunities for industrial uses. In a general sense, there was a view that the landform returned should be 'natural looking' and should, as closely as possible, retain the original landform that existed prior to mining through effective rehabilitation practice (Coakes Consulting / Umwelt 2014).

Consultation was undertaken with Department of Planning, Industry & Environment (DPIE), the NSW Resources Regulator and Singleton Council during the development of this Rehabilitation Strategy, a number of iterations were made to incorporate the feedback received during this process.

Additional consultation was undertaken with the NSW Resources Regulator, DPIE and Singleton Council during Late 2017/early 2018 as well as during preparation of the Statement of Environmental Effects and subsequent assessment process for the Mount Owen Continued Operations Project Modification 2 regarding the proposed final landform options and Rehabilitation Strategy for that Modification. Comments received during this consultation process have been addressed through further amendments to this Rehabilitation Strategy.

Key processes to enable all stakeholders to have their interests considered during the mine closure process will include but not necessarily be limited to the following:

- ongoing review and update of the RMP/ MOP for Mount Owen;
- development of a detailed mine closure plan;
- submission of annual reviews and conducting associated meetings with government regulators to seek feedback in relation to the progress with rehabilitation activities;
- MGO Community Consultative Committee (CCC);
- Community meetings and information days;
- Community newsletters; and
- One-on-one meetings with stakeholders.

3 Indicative Post Mining Land Use

The indicative post mining land use for the Project Area (refer to **Figure 1.4**) will primarily involve the establishment of woodland areas, specifically a vegetation community consistent with the Central Hunter Ironbark – Spotted Gum – Grey Box Forest and selected areas of grassland for agriculture. The North Pit and Bayswater North Pits will include pit lakes which will recover over time. The Rehabilitation Strategy will also include the establishment of other communities in appropriate parts of the terrain such as Hunter Lowland Red Gum Forest and wet variants of Central Hunter Ironbark-Spotted Gum-Grey Box Forest. The primary objective is to create a native vegetation corridor network that promotes fauna movements between the Mount Owen Complex, Ravensworth Operations, Liddell Coal Operations, Lake Liddell and the Ravensworth Operations Hillcrest Offset Areas, as well as throughout the region (refer to **Figure 2.1**).

There is no Biophysical Strategic Agricultural Land (BSAL) land in the Project Disturbance Area due to soil fertility constraints. The combination of terrain and soil constraints in the rehabilitated final landform will restrict Land and Soil Capabilities (LSC) to LSC Class 4 and higher.

Portions of the Project Area, including the tops of overburden dump areas associated with Ravensworth East, the flatter area to the north of the North Pit void as well as capped tailings dams (refer to **Figure 1.4**) will be revegetated with open grassland with pockets of native vegetation. Depending on outcomes of final land use analysis to be completed as part of the detailed closure planning process five years from closure, it is the intent that these areas could be used for sustainable agricultural purposes such as grazing. As such, revegetation may involve the use of both native and suitable exotic pasture species for the establishment of grasslands in these areas. In this instance, pockets of native vegetation may be established as shelter belts to support grazing activities. Consistent with rehabilitation objectives, opportunities for some of these areas for additional woodland vegetation will also be considered as part of the detailed closure planning process.

Two voids are currently planned for incorporation into the final landform following cessation of mining: one within the North Pit and one in the Bayswater North Pit. Where necessary, the high walls surrounding these voids will be battered back to improve stability. This will result in a slight increase in overall void footprint, but also provide opportunity for selective woodland plantings (refer to **Section 5.4.1**).

The Conceptual final land use strategy for the Project is shown in **Figure 1.4**. As discussed in **Section 5.4**, micro-relief features will be implemented in the parts of the final landform developed as part of the new approval. The landform in existing areas already top dressed with topsoil and revegetated will not be revisited.

In consideration of the proposed operational life of the Project to 31 December 2037 the potential for other sustainable and economically productive post-closure land uses will be investigated in light of the local and regional land use strategies that may have further evolved towards the end of the mine life this includes the potential options to utilise voids for either water storage areas or tailings emplacement from other mines. Other options may include potential industrial uses, particularly in consideration of the availability of the rail line as well as the suitability of infrastructure associated with the workshop, office complex and other surface facilities including lay down storage areas, stockpiles and water management structures. The areas with most potential for these land uses are shown in **Figure 1.4**. Some grassland areas will also be investigated for increased areas of woodland development. The investigation of post mining land uses and opportunities to maximise the value of existing infrastructure on the site will be undertaken as part of the detailed mine closure process and in consultation with relevant stakeholders.

Rehabilitation activities will be undertaken progressively throughout the life of mine to allow maximum opportunities for the development of vegetation prior to mine closure. Areas with greatest potential for alternative land uses will be the areas rehabilitated latest however it is noted that these areas will remain operational until the end of mining operations.

3.1 Rehabilitation Objectives

Rehabilitation objectives for MGO have been developed in consideration of a number of factors including site opportunities (i.e. proximity to remnant native vegetation areas) constraints (i.e. slope, substrate quality etc.), ecological and rural land use values and existing strategic land use objectives.

The rehabilitation objectives identified in Schedule 3 Condition 42 of SSD 5850 (as modified) and as outlined in **Table 3.1** have been developed to ensure rehabilitation at MGO is appropriately guided to achieve the proposed post-mining land use design.

Table 3.1 Rehabilitation Objectives

Feature	Objective
Mine site (as a whole)	• Safe, stable and non-polluting • Final landforms (including final voids) designed to incorporate micro-relief and integrate with surrounding natural landforms# • Constructed landforms maximise surface water drainage to the natural environment (excluding final void catchments) • Minimise long term groundwater seepage zones • Minimise visual impact of final landforms as far as is reasonable and feasible • Final landforms designed in consideration of water licensing requirements, as calculated through consultation with DPI Water
Final voids	• Designed as long-term groundwater sinks to prevent the release of saline water into the surrounding environment, unless further mine planning and final landform design processes identify a more suitable outcome for the final voids (see condition 43 of Schedule 3) • Designed as to ensure sufficient freeboard at all times to minimise the risk of discharge to surface waters • Minimise to the greatest extent practicable: o Highwall slopes (excluding slopes below the post-mining standing water level); o the size and depth of final voids; o the drainage catchment of final voids; o any high wall instability risk; and o the risk of flood interaction for all flood events up to and o including the Probable Maximum Flood • Vegetate upper benches with a mixture of native species of varied heights
Rehabilitation areas and other vegetated land	• Restore at least 2037 ha of self-sustaining native woodland ecosystems characteristic of vegetation communities found in the local area, as shown conceptually in **Figure 1.4** including at least 518 hectares of woodland which conforms to the Central Hunter Ironbark – Spotted Gum – Grey Box Forest EEC • Establish areas of self-sustaining: o riparian habitat, within any diverted and/or re-established creek lines and retained water features o potential habitat for threatened flora and fauna species and o wildlife corridors, as far as is reasonable and feasible, and as shown conceptually in **Figure 2.1**
Agricultural land	• Rehabilitate grassland areas identified in **Figure 1.4** as being potential grazing areas to support sustainable grazing activities

Feature	Objective
Creek restoration works	• Engineered to be hydraulically and geomorphologically stable • Incorporate erosion control measures based on vegetation and engineering revetments • Incorporate structures for aquatic habitat • Revegetate with suitable native species
Surface infrastructure	• To be decommissioned and removed, unless Resources Regulator agrees otherwise
Water Quality	• Water retained on the site is fit for the intended post-mining land use/s • Water discharged from the site is suitable for receiving waters and is capable of supporting existing aquatic ecology and riparian vegetation
Community	• Ensure public safety • Minimise adverse socio-economic effects associated with mine closure

Note: The rehabilitation objectives detailed in Table 10 apply to the entire site, including all landforms constructed under either this consent or previous consents. However, they do not require any additional earthmoving works to be undertaken for landforms that have been approved and constructed under previous consents.

Further detail in regards to specific rehabilitation methodology related to the establishment of these areas as outlined above are included in Section **5.0**.

3.2 Rehabilitation Completion Criteria

Completion criteria are objective target levels or values assigned to a variety of indicators (i.e. slope, species diversity, groundcover etc.) which can be measured against to demonstrate progress and the ultimate success of rehabilitation. As such, they provide a defined end point, at which point in time rehabilitation can be deemed successful.

The rehabilitation completion criteria for the Project is outlined in **Table 3.2** to **Table 3.7**. The criteria have been developed considering specific issues for the site, rehabilitation objectives, Glencore's standards. Completion Criteria have also been developed in reference to the 2005 ACARP study entitled 'Development of Rehabilitation Completion Criteria for Native Ecosystem Establishment on the Coal Mines in the Hunter Valley'.

Further details regarding rehabilitation processes are contained in **Section 5.0**. Detailed management activities and processes undertaken throughout the Project to achieve these criteria will be set out in the RMP/MOP.

These criteria will be reviewed and revised throughout the life of the mine considering:

- the results of rehabilitation monitoring programs;
- any relevant research trials; and
- consideration of stakeholder feedback.

The completion criteria will be finalised as part of the detailed mine closure planning process and presented in the Mine Closure Plan for approval by the relevant government agencies.

The achievement of the completion criteria (and progression towards completion criteria) will be monitored and reported within the annual reports submitted to relevant government agencies.

Table 3.2 Preliminary Closure and Rehabilitation Criteria

Aspect	Objective	Preliminary Closure Criteria
Decommissioning	All infrastructure that is not to be utilised as part of the future intended land use are removed to make the site safe and free of hazardous materials.	• All surface infrastructure which does not have a potential future use associated with the post mining land use has been removed, unless such removal has a greater environmental impact than rehabilitating the area with the infrastructure remaining in place. • All demolition work has been carried out in accordance *with AS2601-2001: The Demolition of Structures* or its latest version • Services: all services are disconnected and infrastructure removed (or marked on plans where left in-situ by agreement with the Resources Regulator and/or landholder). • Mount Owen CHPP and associated infrastructure: removal of the CHPP and all associated conveyors and structures (unless required for future approved uses). • Rail provisioning facility, train loading system and loop: removal of all infrastructure, rail provisioning facility, train loading system and loop, including ballast material, should a suitable alternate future use for the rail infrastructure not be identified. • Office and Workshop: demolition and removal of all offices and workshop related facilities including refuelling facilities. • All pumps and associated water management infrastructure which does not have a potential future use associated with the post mining land use has been removed, unless such removal has a greater environmental impact than rehabilitating the area with the infrastructure remaining in place. All tailings infrastructure (pipelines, pumps and related infrastructure) has been decommissioned and removed. • Sediments accumulated in mine water and sediment dams is removed from the dam floor and emplaced in the final void as documented by records. This material will be buried under a minimum of 2 m on inert overburden material. • Lay down areas: All plant and equipment has been removed. • All groundwater monitoring bores not required for long term monitoring have been decommissioned (piezometers and standpipes removed) and sealed in accordance with EDG01 – Borehole Sealing Requirements on Land. • All drill holes (and excavations that remain abandoned from previous mining or exploration), have been backfilled and sealed in accordance with EDG01 – Borehole Sealing Requirements on Land.
	All infrastructure that is to remain as part of the future land use is made safe	• Potential hazards (i.e. electrical, mechanical etc.) have been effectively isolated. • Where underground pipelines or other services are to remain *in situ*, the location of the infrastructure has been marked on the final landform plan and a suitable caveat developed to provide that they are readily identifiable for future land holders. • The structural integrity of the infrastructure has been inspected by a suitably qualified engineer and determined to be suitable and safe as part of the intended final land use. • Appropriate security measures have been implemented to minimise the potential for unauthorised access during the period that the site is transitioned to the intended final land use.

Aspect	Objective	Preliminary Closure Criteria
	There is no residual soil contamination on site that is incompatible with intended land use or that poses a threat of environmental harm.	• Hazardous materials have been identified and removed from site including hydrocarbons, chemicals, explosive products, asbestos containing materials (ACMs), lead paints, synthetic mineral fibres (SMFs) and polychlorinated biphenyls (PCBs) (verified by Certificates of disposal) • A contamination assessment for infrastructure exposed to contaminants including the CHPP, workshops and rail loader has been undertaken prior to demolition. • Contamination will be appropriately remediated if required, so that appropriate guidelines for land use are met. • Where practical, exposed carbonaceous material has removed and co-disposed within the overburden emplacement areas or suitably capped *in situ*. • Monitoring records verify that there is no evidence of active spontaneous combustion. • Net acid generating materials has been capped by a minimum of 5 m inert material • Surface layer is free of any hazardous materials.

Aspect	Objective	Preliminary Closure Criteria
Final Landform	Landform suitable for final land use and compatible with surrounding landscape as sustainable native ecosystem.	• Rehabilitated slopes (excluding retained sections of the highwall) are generally 10 degrees. However, to allow for the creation of local relief in topography on the top of overburden dumps as well as the creation of alternative stable slope or waterway designs (i.e. if concave profiles are utilised or steeper slopes associated with watercourse/streamflow development and management are required), slope angles may exceed this criteria to achieve an appropriate landform design. • Low walls are graded (where required) to less than 18 degrees unless otherwise agreed with the Resources Regulator (or contemporary equivalent). • Local micro-relief of the final landform is designed and constructed to be geomorphically stable (within the context of a dynamic naturally evolving landscape) and visually consistent with the surrounding area. • Landform survey verifies constructed landform is generally in accordance with the approved landform design, including approximate approved heights of: • WOOP emplacement area: 190 mAHD • Ravensworth East emplacement: 185 mAHD • Mount Owen emplacement area: 230m AHD • Overburden emplacements will be shaped to include informal undulations, supported by survey. • There is no evidence of slumping or uncontrolled erosion that would cause a safety issue or compromise the land capability • Monitoring verifies there are no gully or tunnel erosion features, or rill erosion >200 mm deep. • Drainage structures (including drainage lines established in the final landform) are stable and there is no evidence of overtopping (beyond design specifications), active gully heads, tunnel erosion, bank failure or significant scouring as a result of runoff. • Rehabilitated areas are designed to be free draining (for areas not forming part of the catchment areas of final voids) • Landform is designed to have regard to minimising long term groundwater seepage zones. • Where practicable, exposed carbonaceous material have been removed and co-disposed within the overburden emplacement areas or suitable capped *in situ* • Tailings storage areas have been capped in accordance with an approved Detailed Capping Design. • Capped tailings storage facilities are confirmed by survey to be free draining following the expected settlement period. • Runoff water quality from rehabilitation areas is within the range of water quality data recorded from analogue sites and does not pose a threat to downstream water quality. • The final landform reestablishment design has regard to potential habitat resources suitable for significant and/or threatened species (refer to **Section 5.6.1**). • Sufficient water licences are held to account for net take from water systems covered by licensing requirements or can be obtained prior to modelled take occurring

Aspect	Objective	Preliminary Closure Criteria
Sustainable native woodland **Highwalls**	Highwalls are safe and stable and do not represent a risk to the long term future potential uses of the final void or final landform	• Retained highwalls to be designed to achieve long-term geotechnical stability by a suitably qualified person. • Designs of retained highwalls are to consider stabilising design features such as intermediate benches and batter angles specific to the long-term stability of interburden materials present in the highwall. • Retained highwalls are to include appropriate safety features such as a safety berm and/or security fence constructed at the void crest that provides an adequate long-term engineered barrier for vehicles and livestock. • Surface drainage is to be directed away from the top of the retained highwall, unless the highwall is designed to convey surface water into the void.
	Landform suitable for final land use and compatible with surrounding landscape as sustainable native ecosystem (Cont)	• Areas identified for grazing land use are assessed to have a Land and Soil Capability Class of 6 or better.
Sustainable agriculture	Landform suitable for final land use and compatible with surrounding landscape as sustainable native woodland ecosystem	• Rehabilitation monitoring verifies more than 75% of trees are healthy and growing as indicated by rehabilitation monitoring. • Rehabilitation monitoring verifies species diversity for each stratum (canopy, mid storey and ground cover) is comparable to analogue sites. • Rehabilitation monitoring verifies second generation tree seedlings are present or likely to be, based on monitoring in comparable older rehabilitation sites. • Habitat features such as woody debris and water bodies are incorporated into native rehabilitation areas comparable with analogue sites. • Woodland areas are compatible with adjacent rehabilitation areas and in line with the objectives of the Synoptic Plan. • Weed species are comparable to density of analogue sites.
	Landform suitable for final land use and compatible with surrounding landscape as sustainable agriculture ecosystem	• Areas identified for grazing land use are assessed to have a Land and Soil Capability Class of 6 or better. • Pasture production is trending comparable to similarly managed analogue sites. • Rehabilitation monitoring has verified succession through second-generation pasture plants. • No significant erosion is present that poses a safety hazard. • At least 75% of species monitored consist of grasses and legumes appropriate to the local area. • Weed species are comparable to density of analogue sites.

Aspect	Objective	Preliminary Closure Criteria
Water Management	Final voids are designed as to ensure sufficient freeboard at all times to minimise the risk of discharge to surface waters Minimise to the greatest extent practicable: • the size and depth of final voids; • the drainage catchment of final voids; • any high wall instability risk; and • the risk of flood interaction for all flood events up to and including the Probable Maximum Flood	• Final Voids are developed and rehabilitated in accordance with the Mine Closure Plan • Final voids are designed to have sufficient freeboard to avoid spills to the environment • Final void design to consider minimising size, depth, drainage catchments and flooding risks having regard to proposed final land use and water quality, and demand requirements. • Modelling of final void design indicates projected water quality and pit lakes are consistent with EIS predictions (refer to **Section 5.4.1**) and /or appropriate for approved final land uses. • Final Voids are designed to avoid potential for flood ingress up to and including the Probably Maximum Flood • Final voids are designed with consideration to providing sufficient freeboard and minimising size, depth, drainage catchments and flooding risks. • High walls and internal final void batter slopes have been assessed by a qualified geotechnical engineer to validate that they are stable and do not pose a safety risk;
Creek lines and diversion	Creek lines are hydraulically and geomorphologically stable and incorporate structures for aquatic habitat	• Constructed water courses include suitable natural and engineered structures to aid erosion control and provide aquatic habitat appropriate for the creek line and its location in the terrain. • Creek diversions are assessed to be 'stable' as defined by the CSIRO Ephemeral Stream Assessment. • Creek diversions are constructed in accordance with the relevant approved detailed designs and are performing consistent with design specifications. • Drainage structures (including drainage lines established in the final landform) are stable and there is no evidence of overtopping (beyond design specifications), active gully heads, tunnel erosion, bank failure or significant scouring as a result of runoff.
Growing Media Development	Growing media is capable of supporting sustainable vegetation growth.	• The rehabilitation surface is a suitable growing medium (as evidenced by vegetation establishment). • Soil pH to be in the range of analogue sites. • Monitoring demonstrates soil profile development in rehabilitated areas (e.g. development of organic layer, litter layer). • Rehabilitation monitoring indicates evidence of nutrient recycling (e.g. presence of fungi).

Aspect	Objective	Preliminary Closure Criteria
Ecosystem Establishment	Revegetation is sustainable for the long term and only requires maintenance that is consistent with the intended final land use.	• Within the Mount Owen Consent Boundary, restore at least 2037 ha of self-sustaining native woodland ecosystems characteristic of vegetation communities found in the local area, including at least 518 hectares of woodland which conforms to the Central Hunter Ironbark – Spotted Gum – Grey Box Forest EEC. • Revegetation areas contain flora species assemblages characteristic of the desired native vegetation communities. • Second generation trees are present or likely to be, based on monitoring in comparable older rehabilitation sites (i.e. evidence of fruiting of native species observed). • More than 75 per cent of trees (non-pioneer species) are healthy and growing as indicated by the long term monitoring program. • There is no significant weed infestation such that weeds do not compromise a significant proportion of species in any stratum. • Appropriate bushfire hazard controls have been implemented on the advice from the NSW Rural Fire Service.
Ecosystem Development	Revegetation areas will provide habitat value in the future.	• Rehabilitated areas provide a range of vegetation structural habitats (e.g. eucalypts, shrubs, ground cover, developing litter layer, etc.) to encourage use by native fauna species. • Vegetation communities established on rehabilitated areas are visually consistent with the surrounding area or are trending towards communities consistent with vegetation in Ravensworth State Forest or surrounding agricultural land.
Socio-economic Impacts and Public Safety	Minimise Socio-economic impacts	• Mine Closure Plan has been implemented (refer to **Section 4.0)** • A public safety risk assessment to be completed with all identified actions implemented and closed out. • Hazardous materials have been identified and removed from site including hydrocarbons, chemicals, explosive products, asbestos containing materials (ACMs), lead paints, synthetic mineral fibres (SMFs) and polychlorinated biphenyls (PCBs) (verified by Certificates of disposal) • A safety berm and/or security fence is constructed at the void crest (highwalls and endwalls) that provides an adequate engineered barrier for vehicles. • Access to final Bayswater North Pit Final Void is restricted through the construction of an appropriate barrier to prevent vehicle, human and animal access; • Final landform design and final land use has had regard to potential socio-economic impacts associated with closure and has considered options for minimising socio-economic impacts associated with closure.

4 Scope of Mine Closure Decommissioning Works

At the end of the proposed operational life of the Project, with the exception of that which is required for the final land use, Mount Owen proposes to decommission all on site infrastructure and associated facilities not required for any post-mining land uses as part of the mine closure process.

Closure monitoring and maintenance works would continue after mine closure activities are complete until it can be demonstrated that the relevant completion criteria have been met (refer to **Section 3.2**).

In accordance with Schedule 3 Condition 46 of the Mt Owen Consent, a Mine Closure Plan will be developed and submitted to the Secretary for approval at least five years prior to mine closure date.

Development of the Mine Closure Plan will involve consultation with a range of stakeholders including:

- Singleton Council;
- DPIE;
- Resources Regulator;
- Biodiversity Conservation Division of DPIE;
- Forestry Corporation NSW;
- other relevant government agencies; and
- local community.

This plan will specifically address the major aspects of decommissioning and rehabilitation and define the future rehabilitation care and maintenance requirements developed to achieve these criteria.

A summary of the general decommissioning activities that will be undertaken as part of the closure and decommissioning is outlined in ***Table 4.1***.

Table 4.1 General Approach to Decommissioning Activities

Mine Closure Aspect	General Approach
Site Services	Where not required for approved future land uses, the following activities will occur: • Electricity services to any remaining infrastructure will be removed prior to the commencement of building demolition works. • Telecommunications, water supply and other services will also be disconnected and removed where practical. • Where services are buried (i.e. pipelines, cables etc.) and their retrieval may lead to further disturbance, the infrastructure may be left in situ provided that they don't pose constraints to the post mining land use. In this situation, the location of the services will be surveyed and marked on the site plan and a suitable caveat developed to provide that they are readily identifiable for future land holders.

Mine Closure Aspect	General Approach
Buildings and Fixed Plant	• All buildings, fixed plant and other infrastructure which are not required as part of the post-closure land use will be demolished and removed. Where appropriate the materials recovered during demolition will be sold for re-use or recycled. • Concrete footings and pads along with other potential inert building waste will be broken up and buried with overburden in the pit area or used in rehabilitation where appropriate. • Where it does not pose a constraint to the proposed final land use, structures such as footings, underground water pipelines and disconnected power cables may be left in situ. This may include where it is not practical to retrieve the structures or where their removal may lead to environmental damage. These remaining structures will be surveyed and recorded on a plan.
Rail loop and rail siding (if not required as part of the final land use)	• The management of the rail loop and rail siding at closure will be dependent upon the outcomes of the final land use analysis. • In the event that the rail infrastructure is not required as part of the final land use, the rail lines will be deconstructed and removed. This will involve the removal of all railway sleepers and ballast material, which depending on their condition may be reused or disposed of in accordance with the appropriate waste guidelines. • The rail siding and loop will be reshaped and revegetated as part of rehabilitation activities. • Spillages of potential carbonaceous or contaminated material will be managed as per below.
Removal of Carbonaceous/ Contaminated Material	• Excess coal material remaining at closure will be scraped up and either reprocessed or disposed of within the tailings/coarse reject emplacement areas. • Any remaining carbonaceous material (e.g. coal reject) on the base of the coal stockpile area will be either capped with inert material in accordance with relevant guidelines or scraped up and removed to the tailings/coarse reject emplacement area. • Where there is potential that contamination may have occurred as a result of operational activities (e.g. re-fuelling areas, workshops, etc.), investigations will be undertaken to determine the presence and extent of any contamination. Where identified, contaminated material will be bio-remediated on site or managed in accordance with the appropriate waste guidelines.
Equipment Storage Areas	• Any redundant plant or equipment will either be sold for reuse, recycled (i.e. scrap metal) or disposed of at an appropriate landfill facility. • Storage areas will be assessed for potential contamination (e.g. hydrocarbons) and remediation undertaken as required.
Hardstand Areas, Roadways and Car Parks	• Hardstand areas, roadways and car parks will be removed with the waste material (e.g. bitumen, concrete) being placed and capped in the tailings/overburden emplacement areas or incorporated into the final voids.

Mine Closure Aspect	General Approach
Hazardous Materials Management	• All remaining hydrocarbons such as diesel and lubricants and other hazardous materials will be either utilised or disposed of via an authorised waste contractor. • The storage tanks will be removed and depending on their condition either sold or disposed of at an authorised facility.
Dangerous Goods	• It is envisaged that the majority of dangerous goods remaining on-site will include gas bottles and cleaning agents, which will be utilised during decommissioning activities or disposed of off-site in accordance with the regulatory arrangements applicable at the time.
Water Management Infrastructure (e.g. Main Water Storage Dam)	• Depending on the chosen final land use, issues that will be addressed as part of the post-mining water management system will likely include: ○ the removal of the oily water treatment system following the demolition of the workshop and associated facilities; ○ removal of excess sediment (i.e. saline sediment) from the surface dams for future use by the subsequent land owner or alternatively filling or removing the dams if they are no longer required; ○ re-shaping dams (where required) in accordance with their intended use. This may involve re-sizing, facilitating stock access (if required) or reshaping to enhance habitat functionality for specific fauna species; ○ where dams are to be retained, design drainage structures to capture runoff from sufficient catchment area so that the dam can be utilised for its intended use; and ○ the installation of appropriate sediment and erosion control measures. • Sediment material extracted from surface dams will be analysed to determine the potential for contamination and, if present, will be appropriately disposed.
Final Void Management	• High and Low walls of final voids rehabilitated as per geotechnical recommendations to provide wall stability; • Drainage structures constructed to divert water away from final voids; • Drainage structures constructed as required within final void areas to prevent instability from erosion; • Rehabilitation of high and low walls as defined in the final void management plan; • Monitoring of groundwater impacts and water quality within the final void during the care and maintenance phase of the project; • Option to utilise remaining voids as a future water storage or tailings storage facility for future use in the Greater Ravensworth Area Water and Tailings Scheme based on future approvals

5 Rehabilitation Strategy

Rehabilitation will be undertaken progressively in accordance with the RMP/MOP. The RMP/MOP will be developed in accordance with this Rehabilitation Strategy and will include the detailed measures and schedules for all rehabilitation activities. The ongoing review and refinement of rehabilitation completion criteria (refer to **Section 3**) will be undertaken as part of the RMP/MOP.

Consistent with DRG policy, the RMP/MOP will identify rehabilitation domains for the site. This includes specific management and rehabilitation objectives for each domain area, at different stages of the development. These objectives are consistent with the objectives described in Section 3.0.

The monitoring of rehabilitation performance against the completion criteria will be reported in the Annual Review.

5.1 Management of Biological Resources for Utilisation in Rehabilitation

5.1.1 Seed Collection and Propagation

Native revegetation activities in rehabilitation areas will preferentially use local provenance seed for direct seeding or tubestock propagation. Mount Owen has developed a seed collection program to maximise the amount of viable seed of local provenance for use in rehabilitation and revegetation activities. The program includes:

- a seed calendar that contains information relating to fruiting and seed collection times for key native species;
- data on seed collection including species, collection location and date of collection;
- seed assessment of native vegetation within the pit shell in order to allow for seed collection prior to or immediately following clearing;
- required volumes of seed to be collected in order to enable adequate supply of native seed for reuse; and
- the utilisation of record sheets and a GIS database to track collection, storage and utilisation of the seed resource.

The seed collection program adopts innovations to industry best practice techniques, where relevant.

Where adverse seasonal conditions (i.e. drought) affect the availability of local provenance seed, supplementation with non-local provenance seed may be required. Alternatively, revegetation works may be delayed until sufficient stocks of local provenance species are available.

5.1.2 Salvage of Tree Hollows, Stags and Timber

The salvage of hollow bearing trees, hollow logs, fallen timber and boulders will be undertaken, where practical, during the clearing process. The relocation of such habitat resources into post-mining rehabilitation areas and offset and conservation areas (where deemed to be appropriate) is aimed at increasing habitat complexity in these areas, in order to make them more habitable for native species, particularly key threatened species.

5.1.3 Soil Characterisation and Topsoil Management

As outlined in the Agricultural Impact Statement (Umwelt 2014c) for the Project, soil survey and soil testing (including soil structure, texture, pH, sodicity, cation exchange capacity and soil fertility) was conducted in the proposed disturbance area, to verify the soil types present and the actual LSC classes of the Project Area. Based on this analysis, the proposed disturbance area contains LSC Classes 4 to 7 which represent moderate through to very low capability land.

In general there will be the opportunity for reuse of soil and subsoil for rehabilitation purposes, however, subject to further characterisation it is expected that ongoing specialist management practices as outlined further below will be required to overcome constraints. Overall it is expected that there will be a topsoil deficit for the Project and it will be the intention that a detailed topsoil balance will be developed to determine the quantity of other alternative substitutes (e.g. organic material) that may need to be imported on site if direct planting into overburden is not considered to be feasible. The outcomes of this process will be detailed within the Rehabilitation Management Plan/MOP for the Mount Owen Mine.

Mount Owen has existing topsoil stockpile management procedures to maintain the quality of topsoil for subsequent use in rehabilitation. These procedures will continue to be implemented for the Project. Materials management and monitoring techniques to be adopted in this strategy are outlined below:

- Material characterisation of topsoil and subsoil will be undertaken at an appropriate scale across the proposed disturbance area, prior to pre-stripping activities or the re-handling of long term topsoil stockpiles. Representative samples will be taken to characterise the nature of the soil material (e.g. sodicity, acid-generating potential, etc.) to determine the potential limitations to rehabilitation and sustainable plant growth. The results will be used to determine specific ameliorant techniques that may be applied to the soil material in order to overcome potential limitations and enhance vegetation establishment.
- Wherever practicable, topsoil is to be transferred directly from stripping location to areas that have been reshaped for rehabilitation, eliminating the need for storage and re-handling.
- Where the stockpiling of topsoil is necessary due to the unavailability of shaped areas for direct-return, stockpiles will be generally less than 3 metres high to retain biological activity within the topsoil.
- Stockpiles to be kept longer than 3 months will be sown with a suitable cover crop to minimise soil erosion and the invasion of weed species.
- Topsoil and subsoil stripping activities are to be restricted during adverse weather conditions to minimise the potential for dust generation.
- When stripping topsoil and subsoil a water cart is available to minimise dust emissions during stripping activities.
- Topsoil and subsoil will be stripped using appropriate equipment (e.g. dozer or scraper) to the appropriate depths identified in the Agricultural Impact Assessment (Umwelt 2014c) for the Project or in accordance with the outcomes of further investigations undertaken as required.
- Topsoil and subsoil layers will be assessed and managed so that they can be appropriately re-applied in areas to be rehabilitated.
- Topsoil stockpiles are to be located away from traffic areas and at an appropriate distance from watercourses.
- Appropriate sediment controls will be installed around topsoil stockpiles.
- Where required, machinery used to handle and transport topsoil shall be washed down prior to and at the completion of works to minimise the transfer of weeds.
- Weed growth will be monitored and subsequently controlled if necessary.
- Prior to re-spreading, any weed growth will be scalped from the top of the stockpiles to minimise the transport of weeds into rehabilitated areas.
- Stockpiles will be appropriately identified to minimise the potential for inadvertent use or disturbance.

5.2 Overburden and Interburden Handling

5.2.1 Management of Potential Geochemical Constraints to Rehabilitation

Environmental Geochemistry International Pty Ltd (EGI) carried out assessments into the potential for

- acid rock drainage (ARD);
- salinity and elemental solubility (neutral mine drainage (NMD); and
- sodicity potential

to identify any geochemical issues and provide recommendations for materials management and follow up test work (EGI 2013, 2018).

Analysis showed that the majority of the overburden/interburden materials represented by the samples tested are likely to be non-acid forming (NAF), with a significant excess of acid neutralising capacity and low leachable salinity. Whilst there was the occasional thin zone (0.2 metres) of elevated Sulphur (S) identified close to coal seams, dilution and mixing during mining should be sufficient to mitigate any ARD generation. The final pit floor materials will comprise mainly of the Bayswater Seam and as such, the study outlines that the pit floor and margins of the pits are likely to be NAF with possible portions of low capacity potential acid forming (PAF-LC) materials.

In addition to the above, water extracts from NAF overburden/interburden indicated that neutral mine drainage was unlikely to contain significant metal/metalloid concentrations and that results indicated that there was no potential for alkaline drainage.

Furthermore, EGI outlined that weathered Permian materials (that is, sandstone) represented by the samples tested are likely to be sodic and dispersive. It was also found that finer grained fresh Permian materials may also be partly sodic. As such, this material may be subject to surface crusting and high erosion rates if they are incorporated into the surface of the final rehabilitated landform.

Additional analysis, through monitored overburden / interburden leach columns, was subsequently commenced to verify results of the initial analysis. While this study is ongoing, initial preliminary results indicate that mixing PAF overburden/interburden and NAF Sandstone will provide sufficient buffering and delay acid production. This would suggest that the blended material would be suitable for use in rehabilitation.

5.2.2 Summary of Ongoing Management of Mine Materials

In consideration of the above results, the strategies for mine materials management to address potential geochemical constraints for rehabilitation will be undertaken as outlined below.

Periodic sampling and testing of mine water will be continued as part of the water quality testing program to check for ARD generation. A sampling program will be continued to assess the potential for sodic/dispersive materials and be used to maintain management measures to achieve successful rehabilitation.

Where strongly sodic and dispersive material has been identified within the strata profile, the mine materials management process will avoid the placement of this material where it has the potential to affect the quality of final rehabilitation (e.g. within 3 metres of the surface of the final landform).

The handling of non-sodic material, as identified through sampling and testing of the strata profile, will be preferentially selected over sodic material for placement at the surface of the final landform. Where this material cannot be practically or efficiently accessed for selective handling during the mining process, specific amelioration requirements (i.e. gypsum, lime etc.) may be required where sodic material is used in the plant growing horizon, exposed on dump surfaces or used in engineering structures.

In the event that PAF material is to be used for rehabilitation purposes, it will be mixed with suitable NAF material to provide for sufficient buffering to allow for rehabilitation establishment and prevent generation of acid runoff.

5.2.3 Spontaneous Combustion Management

Based on the history of mining operations at Mount Owen Mine, it is considered that there is a low propensity for spontaneous combustion to occur within coal reject and overburden emplacement areas on site. However, the issue of spontaneous combustion and the potential liability for mine closure will continue to be evaluated and managed (if required) as part of the Project.

Material that is potentially prone to spontaneous combustion will be placed at a suitable depth to minimise any potential interference to rehabilitation establishment as well as minimise the potential for spontaneous combustion or ignition of carbonaceous material in the event of bushfire occurring within the revegetated landscape. General practices designed to minimise oxygen exposure pathways to potentially prone material will include the following:

- the capping of tailings emplacement areas;
- coarse reject material will be co-disposed with overburden material and incorporated at a suitable depth into the final landform; and
- spontaneous combustion prone overburden/interburden material that is identified through the routine sampling program will be selectively handled and buried at depth to prevent exposure of this material.

5.3 Coarse Reject and Tailings Dam Decommissioning

5.3.1 Tailings Dam Decommissioning

The tailings emplacement areas will be filled and shaped to the conceptual final landform plan and subsequently capped. The primary objective of the capping design will be to minimise the potential for exposure of potentially environmentally sensitive tailings material in the rehabilitated landform and prevent the occurrence of spontaneous combustion. Following capping, these areas will be revegetated in accordance with the revegetation processes as outlined in **Sections 5.6**.

To promote the geotechnical stability of these areas and avoid the potential sterilisation of land in the post-mining landform, dewatering strategies will be incorporated into the design of the tailings dam. The aim of the strategy will be to progressively dewater the tailings dams and promote the consolidation of material throughout the tailings profile. Water extracted from the process will be re-utilised for on-site purposes such as the processing of coal or for dust suppression. Dewatering of the tailings dam will be managed to enable finalisation of capping and rehabilitation following the cessation of active mining.

5.3.2 Coarse Reject

Coarse reject material will be co-disposed with overburden material and incorporated into the final landform. The coarse reject material will be placed at a suitable depth within the final landform to minimise any potential interference to rehabilitation establishment as well as minimise the potential for spontaneous combustion or ignition of carbonaceous material in the event of bushfire occurring within the revegetated landscape.

As outlined in **Section 5.2.1**, analysis was undertaken by EGI to assess the geochemical constraints and identify potential measures required for materials management and follow-up test work required. As part of the scope of the EGI study included the sampling and testing of coal reject samples from the current Mount Owen CHPP. The results of the samples tested were reported by EGI to be mainly NAF, but may include potentially acid forming (PAF) and PAF-LC portions.

Analysis undertaken by EGI (2013) to assess the ARD potential identified that the vast majority of fine and coarse rejects represented by the samples collected were NAF. However, the Foybrook seam series rejects showed distinctly higher ARD potential than rejects from other seams.

Periodic sampling and testing of mine water will be continued as part of the water quality testing program to identify the potential for ARD generation, assess the performance of management

strategies, and determine and/or refine non-acid forming/potentially acid forming blending ratios and limestone treatment requirements (if required).

5.4 Final Landform Design

The conceptual final landform, as shown in **Figure 5.1**, has been designed to maintain consistency with the local area and will predominantly consist of an undulating landform generally reflecting the dominant features of the existing environment. Consistent with the rehabilitation objectives (refer to **Section 3.0**), micro-relief features will be developed in all parts of the final landform above natural ground level developed under the Mt Owen Consent[2] other than the final void internal slopes. Typical cross-section transects of the final landform design are shown in **Figure 5.2**. Key features of the final landform are discussed below.

5.4.1 Final Voids and Highwall

The proposed final landform will result in two final voids, one in the southern area of the North Pit , and one in the former Bayswater North Pit in the north of the Ravensworth East Mine. On completion of mining in the North Pit, the Bayswater North Pit void will be decommissioned as an operational water storage with batter angles flattened and high-walls stabilised. The North Pit void high-walls will also be stabilised following the cessation of mining. If the BNP is required for tailings emplacement, the BNP void would be partially filled prior to final capping and rehabilitation.

Analysis was undertaken by engineering consultants Pells Sullivan Meynink Consult Pty Limited (PSM) and URS to assess the Life-of-Mine (LOM) geotechnical stability of the North Continuation Pit and BNP respectively.

5.4.1.2 North Pit Geotechnical Assessment

In summary, the assessment found that in regards to the stability of the pit walls, the geotechnical risk is low and tha.t the acceptable stability criteria determined a Factor-of-Safety (FoS) greater or equal to 1.2 was achieved for all pit walls under design static scenarios. Other key findings of the assessment included the following:

- the stability of the eastern lowwall is likely to improve with time as the void is filled with ground and surface water. However, drainage on the lowwall may not be effective in the longer term without maintenance;
- subject to the east lowwall performing satisfactorily during the period of mining, it was assessed that the stability would be adequate and would not be adversely impacted with time. Further, it was assessed that a safe perimeter of the pit crest of the east wall could be achieved;
- in regards to the western and southern highwalls, it was assessed that a safe and stable pit wall and safe perimeter of the pit crest could be achieved, subject to the walls performing satisfactorily during the period of mining. In the event that failure was initiated, it was assessed that it was more likely to be in the southern portion where subsidence impacted rock mass is present. However, if such failure was to occur it was considered that it would be slow and more likely to be in the form of excessive deformation rather than global instability; and
-
- based on the available data there is no indication that any special drainage measures are required.

[2] Parts of the final landform already developed under previous consents do not require the incorporation of microrelief features.

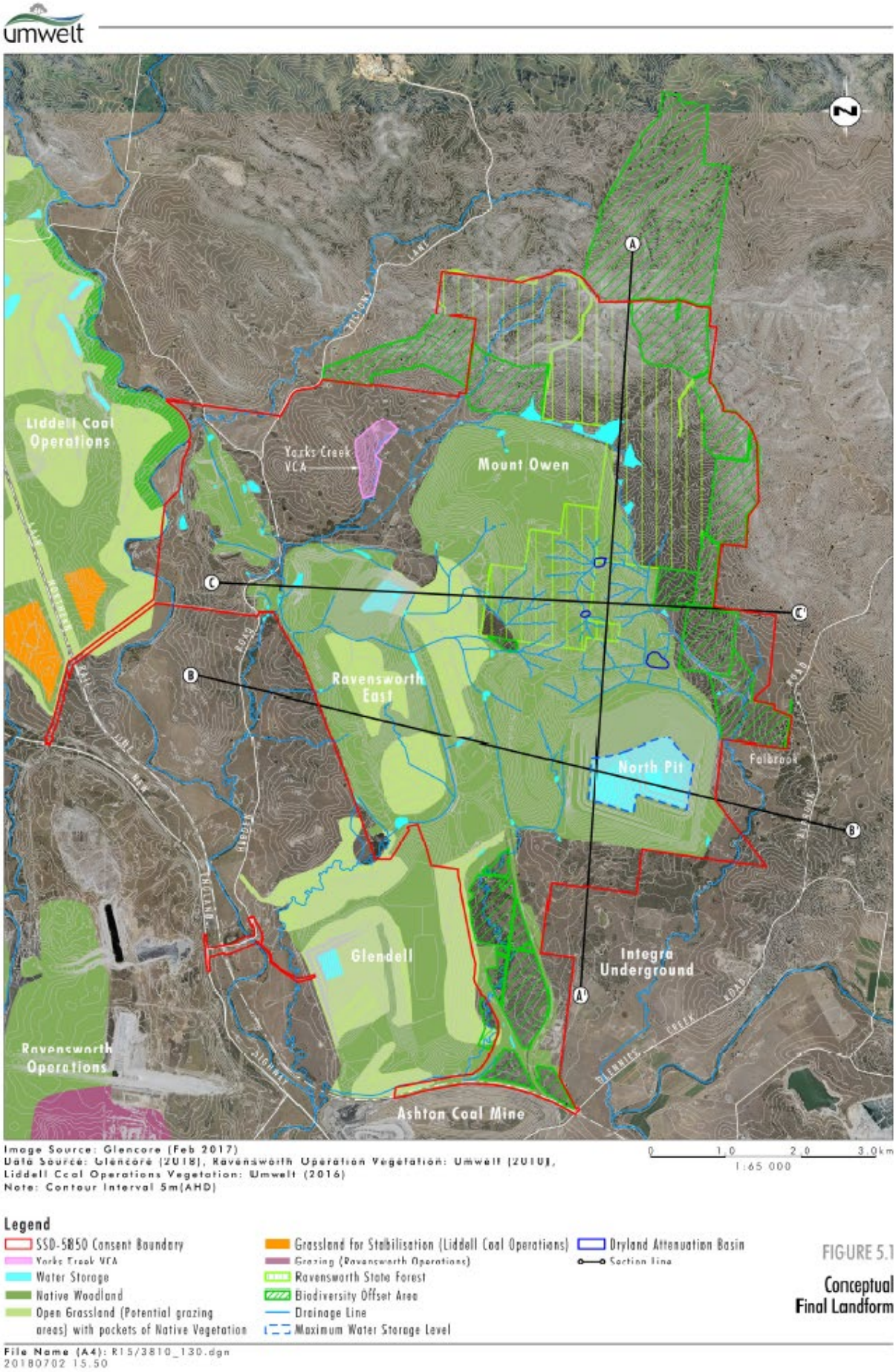


Figure 5.1 Conceptual Final Landform

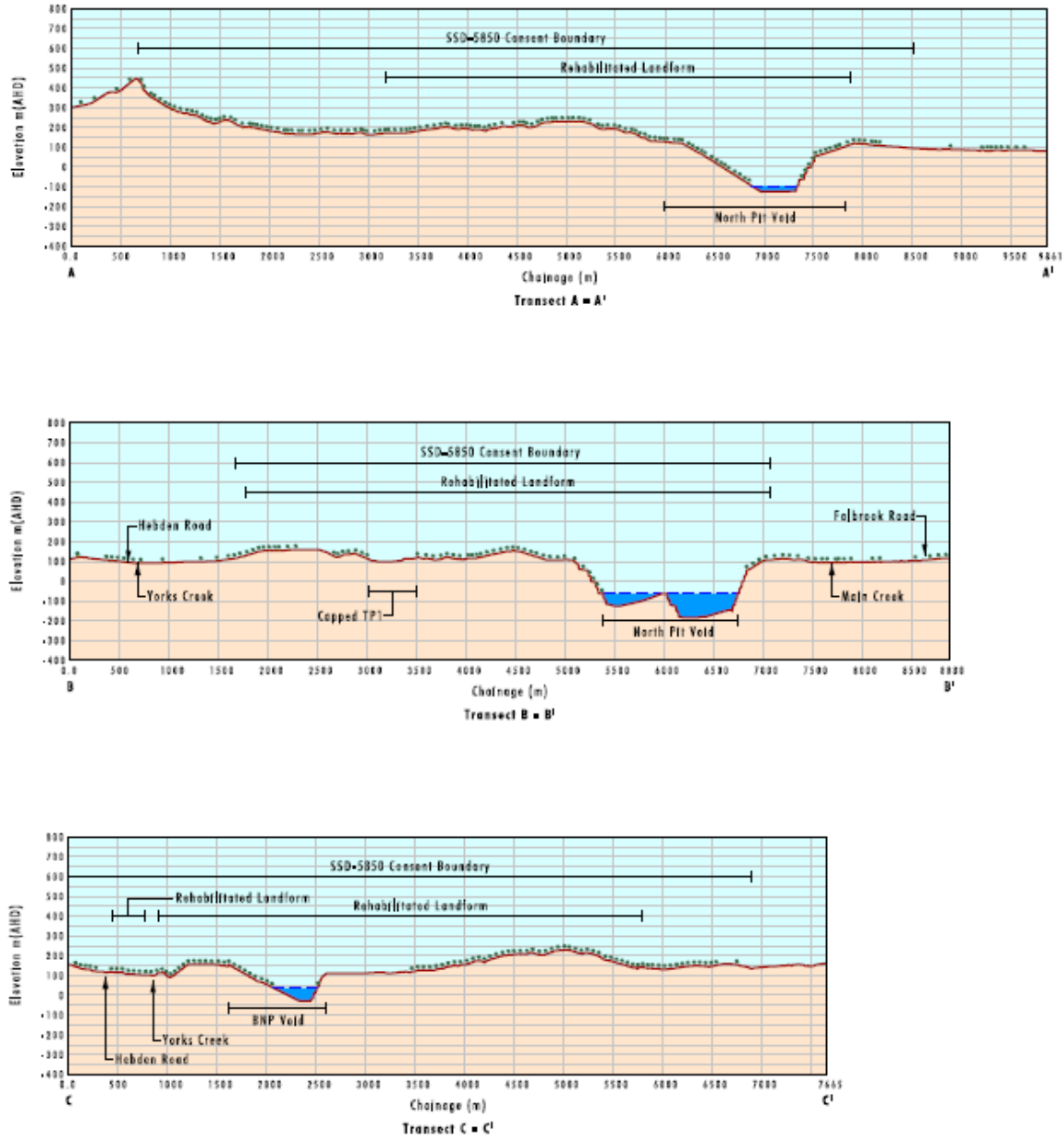


Figure 5.2 Conceptual Final Landform Transects

5.4.1.3 BNP Geotechnical Assessment

To improve the FoS and control the risks for the stability of the northern highwall some specific design parameters will be included for the BNP. This includes greater standoff, larger catch benches and geotechnical monitoring.

Similar management practices have also been recommended for the eastern highwall due to the presence of a number of fractures and bedding associated with the geology of this highwall.

The southern highwall did not have any specific management recommendations regarding stability, however recommendations have been made to continue to monitor this area during excavation to identify potentially unsafe structures.

Groundwater studies have indicated that water storage in the former Stage 3 dam be drained to prevent water over topping or building up behind the highwall.

5.4.1.4 Void Design Process

In consideration of the above for all remaining voids, the key design features and processes associated with the final void, to minimise public safety and long term stability issues include:

North Pit Void

- The upper sections of the western highwall in the North Pit void will be battered upto 18° (refer to **Figures 5.1** and **5.2**).
- The upper sections of the eastern and southern highwall in the North Pit void will be battered to between 18° and 25° depending on constraints posed by the lease boundary (refer to **Figures 5.1** and **5.2**).
- Lower sections of the highwall in of the North Pit will comprise of a series of benches of varying widths that will be constructed progressively as mining operations progress in the lower seams. The stability of the highwall will be assessed on an ongoing basis and appropriate stabilisation measures will be installed (where required) progressively.
- A trench and/or safety berm will be established along the top of the retained section of the highwalls and the top of the battered section of the Southern Highwall if slopes exceed 18°. The bunds will be designed to divert surface water runoff and restrict inadvertent access to the highwall.
- Other internal slopes within the North Pit final void will be battered upto 18°.
- The highwall benches will be seeded with a suitable species mix. Battered slopes will be revegetated to woodland generally consistent with the remainder of the rehabilitated landform.

  There are no additional voids proposed as part of the MOCO Mod 2 modification, however, given the nature of the modification where there is a deeper pit and additional pit area, there is necessary reconfiguration of the North Pit void as seen in the Conceptual Final Landform.

Bayswater North Pit Void

- Overburden batter angles will be flattened to approximately 18°
- Retained sections of highwalls (northern and eastern sections of the Bayswater North Pit void) will comprise of a series of benches of varying widths that will be constructed progressively as mining operations progress in the lower seams. The stability of the highwall will be assessed on an ongoing basis and appropriate stabilisation measures will be installed (where required) progressively.
- A trench and /or safety berm will be established along the top of the retained section of the highwalls. The bunds will be designed to divert surface water runoff and restrict inadvertent access to the highwall.
- The highwall benches will be seeded with a suitable species mix. Battered slopes will be revegetated to woodland generally consistent with the remained of the rehabilitated landform.

Vehicle and machinery access to the battered internal void areas will be required until appropriately stabilised. In some areas, access will be predominately via highwall benches, meaning there are

limited opportunities to implement highwall landform treatments until the low wall areas have reached a level of revegetation appropriate to provide long term stability. Once this level of rehabilitation has been achieved, selective blasting/ battering of parts of the highwalls can occur to increase terrain variability and reduce linearity in the landform. Talus slopes developed through these methods are also able to be revegetated which will further improve the visual amenity of the retained highwalls. An example of these treatments is demonstrated in the Synoptic Plan (refer to Section 2.2.3). Figures 20 to 22, 28 and 29 from the Synoptic Plan are extracted below in Figure 5.3 and 5.4, illustrating the variability in terrain that can be developed through selective blasting and battering of sections of retained highwall.

A surface drainage network will be established across overburden emplacement areas to divert the bulk of surface water away from the final voids so as to maximise replenishment of the local catchment areas. The diversion of water away from void catchments enables upper sections of slope to be developed to 18° with minimal risk of erosion. The use of straw on the rehabilitation of lowwall and void batter slopes above 10° will mitigate the need to extensive drainage structures. The need for ongoing post-mining maintenance of drainage structures will be assessed and appropriate measures will be included within the Mine Closure Plan.

A groundwater assessment of the final landform (at closure) indicates that the void will not discharge to local alluvial aquifers. The final void is predicted to be a source of water to the hard rock aquifers in strata sub-cropping below the water level of the pit lakes. The predicted equilibrium water levels within the North Pit final void and Bayswater North Pit final void are 20 mAHD and 10 mAHD respectively (Umwelt 2016). Modelled salinity levels in North pit will rise slowly with predicted salinity levels of approximately 5000 Mg/L after 400 years. The Bayswater North Pit is likely to have significant fluctuations in salinity during the early stages of the recovery however long term salinity levels are expected to equilibrate between 500 and 1000 mg/L over 200 years post closure. pH levels are expected to be neutral due to the abundant buffering capacity present in overburden material used in in-pit spoils (EGi 2013). These predicted pit lake water salinity levels and the EGI assessment of geochemical characteristics of spoil inflow water quality (EGi 2013) indicates that the water in the pit lakes are suitable for a wide range of alternative land uses.

Updated groundwater and pit lake recovery modelling will be undertaken as part of the mine closure process to assist in refining the final landform. Modelling will commence at least 5 years from cessation of mining. This modelling will update groundwater modelling predictions and evaluate the long term pit lake hydrochemistry and water levels post closure; this modelling will be used to inform potential alternative land uses that may be suitable for the site.

A Final Void Management Plan will be included in the Mine Closure Plan. As outlined in **Section 2.1**, the Mine Closure Plan will be submitted to the appropriate regulatory agencies for approval two years prior to cessation of mining.

The above considerations will be reviewed in light of any alternative final land uses considered for the Project Area, particularly where the alternative land uses include the active use of the voids.

5.4.2 Overburden Emplacement Areas

Key design considerations associated with the overburden emplacement areas are outlined below:

- Final landform slopes for BNP and Northern Pit Continuation will be generally battered to an average of 10° in order to minimise erosion risk. Natural landform design features (micro-relief) will be incorporated into areas of the overburden emplacement areas developed as part of the final landform during the life of the Mt Owen Consent. These micro-relief features are aimed at achieving consistency with surrounding natural landforms and may result in sections of slopes exceeding 10°. However, it is anticipated that steeper profiles will be located within the upper portions of catchment areas where the volume of surface water runoff will be at a minimum.
- Overburden emplacement areas will include variation in vertical relief in order to prevent extended ponding of surface water as well as create a profile that is commensurate with the natural local topography. Heights of emplacement areas are approximately:
    - North Pit emplacement area – up to 230 mAHD
    - WOOP emplacement area – up to 190 mAHD
    - Ravensworth East emplacement area – up to 185 mAHD

- The final landform will generally be designed to direct runoff away from the final voids and into the Main Creek, Yorks Creek, Bettys Creek and Swamp Creek catchments. This will return catchment flows to Yorks Creek and Main Creek and re-instigate some of the natural flows to Bettys Creek and Swamp Creek. Catchments of each of these creeks developed as part of the detailed final landform design will have regard to licensing issues with a general objective of ensuring that there is no change to the area of Glennies Creek (Main Creek catchment) relative to the pre-mining environment.
- Drainage structures will be designed to minimise scouring associated with anticipated runoff. Where practicable, drainage lines will be designed to be commensurate with surrounding natural landforms.

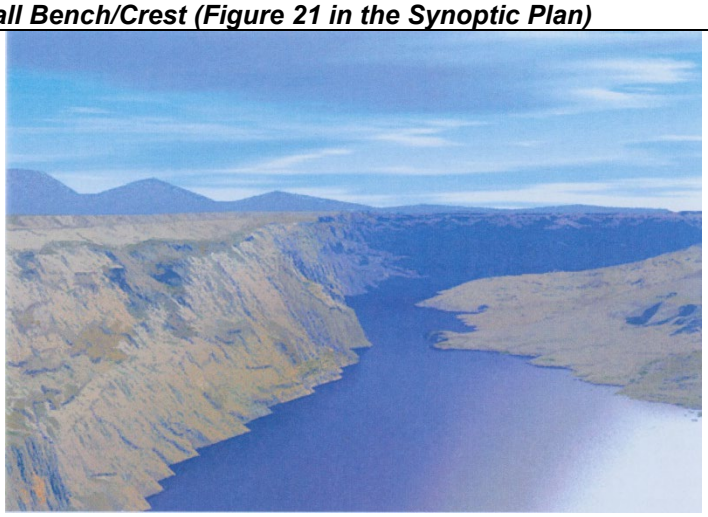
The proposal for a natural landform design approach offers an alternative to the conventional engineered profile design and involves using the key geomorphological characteristics evident in stable landforms within the natural landscape and adapting them to the materials and constraints of the site. Amongst the key principles of the approach include:

- the drainage density of the landform, being the number of drainage lines relative to the overall area, and reflecting the dendritic nature of the drainage;
- steeper slopes located close to the watershed where flows are smallest, with gradients that are typically initially convex in profile becoming concave and flattening out moving downstream;
- drainage lines that have both a channel component and a floodplain, providing stability during frequent and more extreme events; and
- the avoidance of knick points or transitions from sub-critical to super-critical flows other than where located in high erosion resistant material or where gentle transitions are constructed emulating natural transitions that maintain a balance between the scour risk and sediment load.

Specific details of micro-relief design in the rehabilitated landform will be provided in the MOP/Rehabilitation Management Plans prepared and updated through the life of the Project.

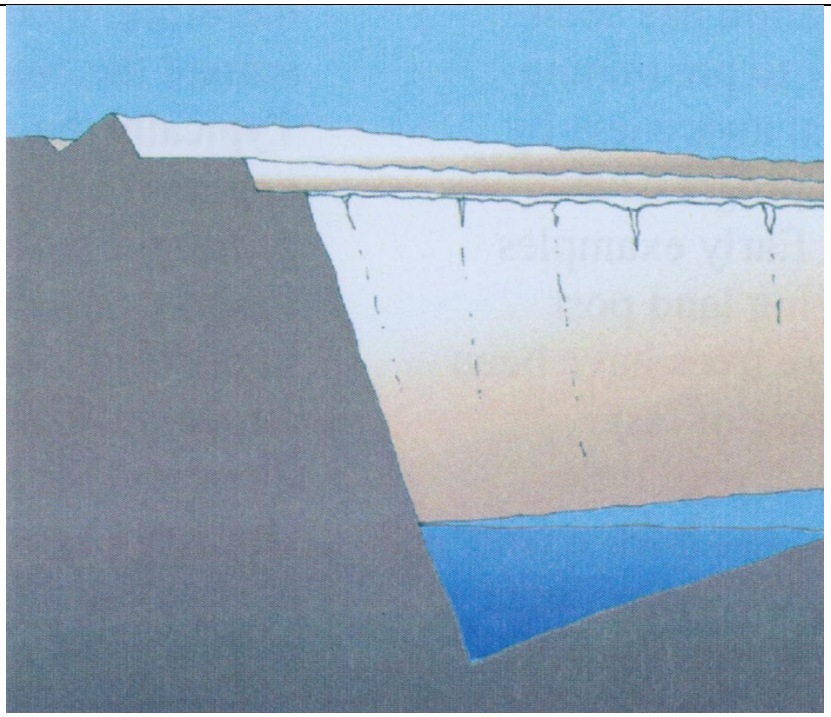
Highwall Bench Prior to Rehabilitation (Figure 20 in the Synoptic Plan)

Blasting of Highwall Bench/Crest (Figure 21 in the Synoptic Plan)

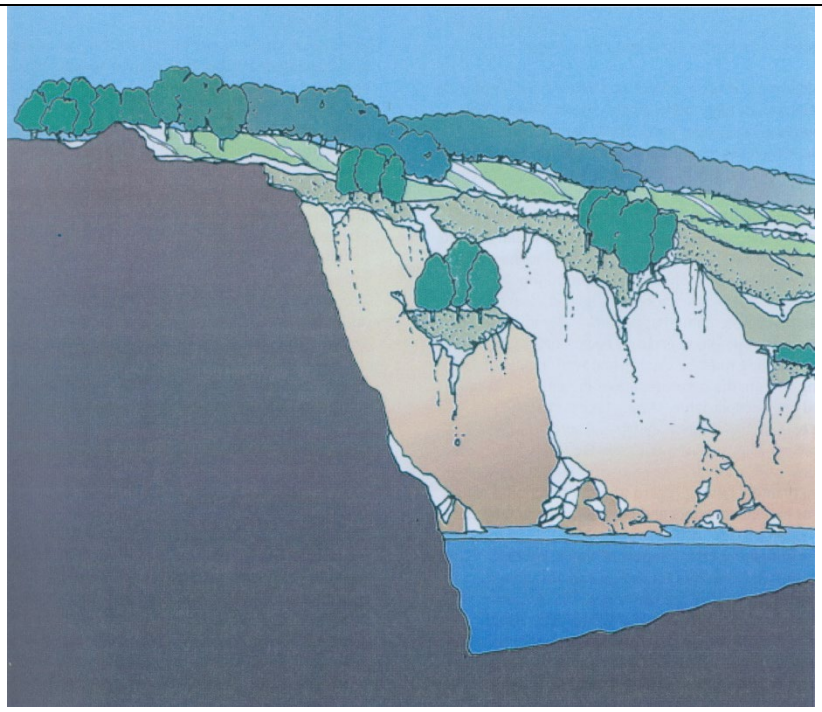


Partially Filled Void From Onsite Drainage (Figure 22 in the Synoptic Plan)

Figure 5.3 Example of highwall treatments demonstrated in the Synoptic Plan © (Andrews, Neil 1999)



Before



After

Figure 5.4 Highwall Rehabilitation Blasting (Figures 28-29 in the Synoptic Plan) © (Andrews, Neil 1999)

5.5 Substrate Preparation

Surface preparation activities for rehabilitated areas will commence as soon as practicable following the completion of mining activities. The general surface preparation activities to be undertaken within the Project Area include:

- prior to the commencement of rehabilitation of the shaped overburden surface, representative samples will be taken to characterise the nature of the spoil material (e.g. sodicity, acid-generating potential, etc.) to determine the potential limitations to rehabilitation and sustainable plant growth. Results from this process will be used to determine specific amelioration techniques (e.g. addition of gypsum, lime, organic matter etc.) that may be required for spoil to overcome potential limitations for landform stability, vegetation establishment and growth;
- soil ameliorants will be applied where appropriate;
- in areas to be returned for future agricultural use, measures such as additional soil amelioration works or further application of topsoil (or suitable alternative) may be required;
- suitable erosion control measures will be implemented to minimise soil loss from areas undergoing rehabilitation;
- where appropriate and practical, structures such as tree hollows, logs and other woody debris will be incorporated into the final landform to augment the habitat value of the proposed vegetated corridors; and
- the installation of appropriate habitat structures (e.g. ponds) will be undertaken where practical.

Biosolids and other organic matter- rich substrate materials/ supplements will be used where these are considered to provide benefits for rehabilitation outcomes.

The use of biosolids will be subject to appropriate approvals being obtained and quality criteria being satisfied.

5.6 Creek Realignments and Final Landform Drainage Lines

5.6.1 Creek Diversions

The following existing creek diversions are approved to divert flows from operational area:

- Bettys Creek Upper Diversion;
- Bettys Creek Middle Diversion;
- Bettys Creek Lower Diversion;
- Swamp Creek Diversion;
- Glendell MIA Diversion; and
- Yorks Creek Diversion.

The location of these diversions is shown in **Figure 1.2.**

All creek diversions have been constructed to contain a 1 in 100 year 72 hour storm event in accordance with development consents and approved creek diversion designs. With the exception of the Yorks Creek Diversion and the Swamp Creek Diversion, all diversions have been designed, constructed and managed with four guiding principles, including:

- Engineered to be hydraulically and geomorphologically stable
- Incorporate erosion control measures based on vegetation and engineering revetments

- Incorporate structures for aquatic habitat
- Revegetate with suitable native species

These principles are designed to ensure the long term stability, sustainability and functionality of the diversion. The design criteria for existing diversions are to:

- produce stable channel, which is unlikely to undergo significant geomorphic change over time;
- reduce the need for ongoing maintenance where possible;
- ensure sufficient capacity to convey the estimated peak flow from the 1% AEP storm event; and
- where practical, incorporate persistent pools to assist in sustaining aquatic habitats.

The key design details for the existing diversions are given in **Table 5.1**below. Refer to the associated detailed design reports for further information.

Table 5.1 Key Diversion Design Details

Diversion	Length (km)	Typical Cross Section		Longitudinal Slope		In-stream structures	Design Report
		Shape	Base Width (m)				
Upper Bettys Creek Diversion	~2	Trapezoidal	6-8	1(V):3(H)	0.25%	Four rock lined Drop structures	Parsons Brinckerhoff, 2007
Middle Bettys Creek Diversion	2.5	Trapezoidal	6	1(V):3(H) - 1(V):5(H)	0.58%-0.94%	Three rock ramp Drop structures	EarthTech, 2006
Lower Bettys Creek Diversion	1.4	Trapezoidal with Benches	10	1(V):3(H)	0.44$	Nil	URS, 2012
Glendell MIA Diversion	0.5	Trapezoidal	3	1(V):3(H)	0.5%	Culverts beneath haul road and rock-lined stilling basin at outlet	Parsons Brinckerhoff, 2008

The existing Yorks Creek Diversion does not have any set detailed design criteria or objectives. This diversion was constructed in the 1980s and is geomorphologically stable. The management and monitoring of existing diversions is set out in the MGO Creek Diversions Plan.

5.6.2 Final Landform Drainage

The overall final landform design, exclusive of final void drainage, have been designed to maximise surface water drainage into the natural environment.

The Upper Bettys Creek Diversion diverted the upper catchment areas of Bettys Creek to Main Creek, reducing the catchment size of Bettys Creek downstream of the Upper Bettys Creek diversion. The final landform will also re-divert parts of the Swamp Creek catchment back towards Bettys Creek.

Drainage lines and constructed confluence points with natural drainage lines in the downstream landscape will have regard to the following principles:

- ACARP hydraulic guidelines;
- the morphologic and hydraulic characteristics of existing creek lines surrounding the locality; and
- designs and treatments of existing creek diversions surrounding the locality.

Confluence points of constructed drainage lines and existing drainage lines/ creeks will have regard to changes in catchment size and the potential for the increased flow volumes to affect the geomorphic stability at the point of confluence and downstream.

Revegetation strategies for constructed drainage lines in the landscape will have regard to the proposed final land use and vegetation in analogous drainage lines in the surrounding landscape.

Where sediment dams are removed or altered as part of the return of rehabilitated catchment areas as clean catchment, the need for temporary sediment control measures to manage potential turbidity risks associated with disturbance from the removal/alteration of the sediment dam will be considered.

Detailed design of drainage lines in the final landform will be contained in the RMP/MOP and Mine Closure Plan.

5.7 Revegetation Program

Rehabilitation of post-mining areas will be completed as soon as practicable after shaped areas become available. The indicative sequence for progressive rehabilitation and final landform design is shown in **Figure 5.1** and **Figure 5.5** to **Figure 5.7**. Whilst it is intended to maximise opportunities for progressive rehabilitation and reduce the disturbance footprint, potential deviations from the indicative schedule may occur due to:

- changes or delays in the mining schedule; and
- postponement of rehabilitation activities to avoid seeding and planting in conditions, which may lead to poor quality rehabilitation or failure.

Where rehabilitation is delayed due to the above scenarios, overburden areas will be shaped to final landform as close as reasonably practicable behind the active mining operation and suitable cover crops applied on exposed areas to minimise dust generation and erosion.

Temporary revegetation will also be undertaken on unshaped overburden dumps and other disturbed areas that are planned to be inactive for one to two years. Temporary revegetation of these areas will improve both visual amenity and the control of dust emissions. Temporary vegetation will typically be fast growing grass species however in some areas, other species, including pioneer species, may be utilised for improved visual amenity.

Revegetation techniques will be continually developed and refined over the life of the Project through a continual process of research, trialling, monitoring and improvement. Current revegetation techniques for the establishment of both native woodland and agricultural areas are discussed below.

The rehabilitation strategy involves the establishment of native vegetation corridors to promote regional fauna movements across the landscape (refer to **Figure 2.1**). In addition, areas of grassland with pockets of native vegetation will also be established for potential future agricultural activities such as grazing (refer to **Section 5.6.2**).

Subject to approved alternative final use requirements, final void slope areas which will eventually be below the high water mark of the pit lake will be revegetated where practical as outlined in the detailed mine closure planning documentation. An appropriate seed mix will be determined to assist in providing stability for the rehabilitation areas. The development of these areas as woodland will increase the availability of woodland communities in the final landform for many decades until final inundation. Once inundated, the trees below the water level will die off but continue to provide habitat for aquatic fauna and birds.

Subject to ultimate final land use constraints, areas identified for grazing will l also be considered for additional woodland development (refer to Section 3). The reduction in any areas of potential grazing land or areas potentially suitable for alternative, post-mining, land uses (refer to Section 3) associated with any increased woodland areas will have regard to any potential socio-economic impacts.

5.7.1 Native Woodland Establishment

Rehabilitated woodland areas will be created to contain flora species assemblage's characteristic of the dominant vegetation communities impacted by the Project. Revegetation of the post-mining landscape, including native woodland areas will focus on establishing vegetation that is consistent with the Central Hunter Ironbark – Spotted Gum - Grey Box Forest vegetation community type with smaller areas of other communities found in the local area (including the Central Hunter Grey Box — Ironbark Woodland) planted in appropriate parts of the terrain. The aim of having species consistent with this EEC is to ensure endemic species are placed on the rehabilitation areas in line with surrounding land and other mine sites proposed final land use objectives. This ensures rehabilitation is complementary of the proposed rehabilitation at the adjacent Glencore operated Ravensworth Operations and Liddell Coal Operations while enhancing regional habitat connectivity. At least 518 hectares of the woodland established in the final landform must meet the listing criteria for the Central Hunter Ironbark – Spotted Gum - Grey Box Forest EEC and species to satisfy the project's biodiversity offset requirements. This specific rehabilitation to meet the EEC requirements is proposed for the Mt Owen North Pit rehabilitation area. Once the minimum 518 hectares meets the requirements, it will be managed in line with Mt Owen's Biodiversity Offset Management Plan (BOMP).

A list of the key species to be utilised in the revegetation mix for target vegetation communities is contained in **Appendix A**. This species list is based on seed availability for species comprising the Central Hunter Ironbark – Spotted Gum Grey Box Forest as previously utilised at Mount Owen. The species list used for other communities is based on planting lists used at other Hunter Valley Operations. Seed mixes used will be derived (where possible) from seed collected from local provenance plants. As additional species from target communities become available for use in seed mixes, the species lists will be expanded. Actual species planted will include a focus on habitat and/or foraging resources for other significant and/or threatened flora and fauna species, including:

- Spotted-tailed Quoll;
- Squirrel Glider;
- Koala;
- Swift Parrot;
- Regent Honeyeater;
- Green and Golden Bell Frog;
- Brush-tailed Phascogale;
- Eastern Bent-wing Bat;
- East-coast Freetail Bat;
- Southern Myotis;
- Speckled Warbler;
- Little Lorikeet;
- Grey-crowned Babbler;
- Diamond Firetail; and
- Masked Owl.

Eucalyptus moluccana (grey-box), *Eucalyptus blakelyi* (Blakely's red gum), *Eucalyptus crebra* (Narrow-leaved Ironbark) and *Corymbia maculata* (Spotted Gum) are examples of selectively planted native species that will address the listing criteria for the Central Hunter Ironbark – Spotted Gum Grey Box Forest, while also providing suitable habitat and foraging resources for a number of the species listed above including the Koala, Swift Parrot and Regent Honeyeater. The establishment of functioning woodland communities (and in the case of the Green and Golden Frog – dams and grassland areas) will provide appropriate foraging habitat (as well as other habitat values) for the above (and other) native species.

Due to seasonal variability, it is not realistic, no appropriate for the direct seeding mix or tube stock composition to include all of the species in the target woodland community. Initial seed mixes used will have regard to natural succession processes (refer to **Figure 5.8**) with the focus on establishing grasses and pioneer species during the establishment phases. The seed mix will contain species found in latter successional phases however further seeding and infill planting of these latter successional phase species will occur as pioneer species naturally begin to thin out. The species composition for revegetation should be selected from the species listed however nurse species may be used during the early succession phases to assist in the early establishment of vegetation. Natural establishment of some species through fauna and other vectors can also be expected in areas close to remnant woodland and previously established woodland areas.

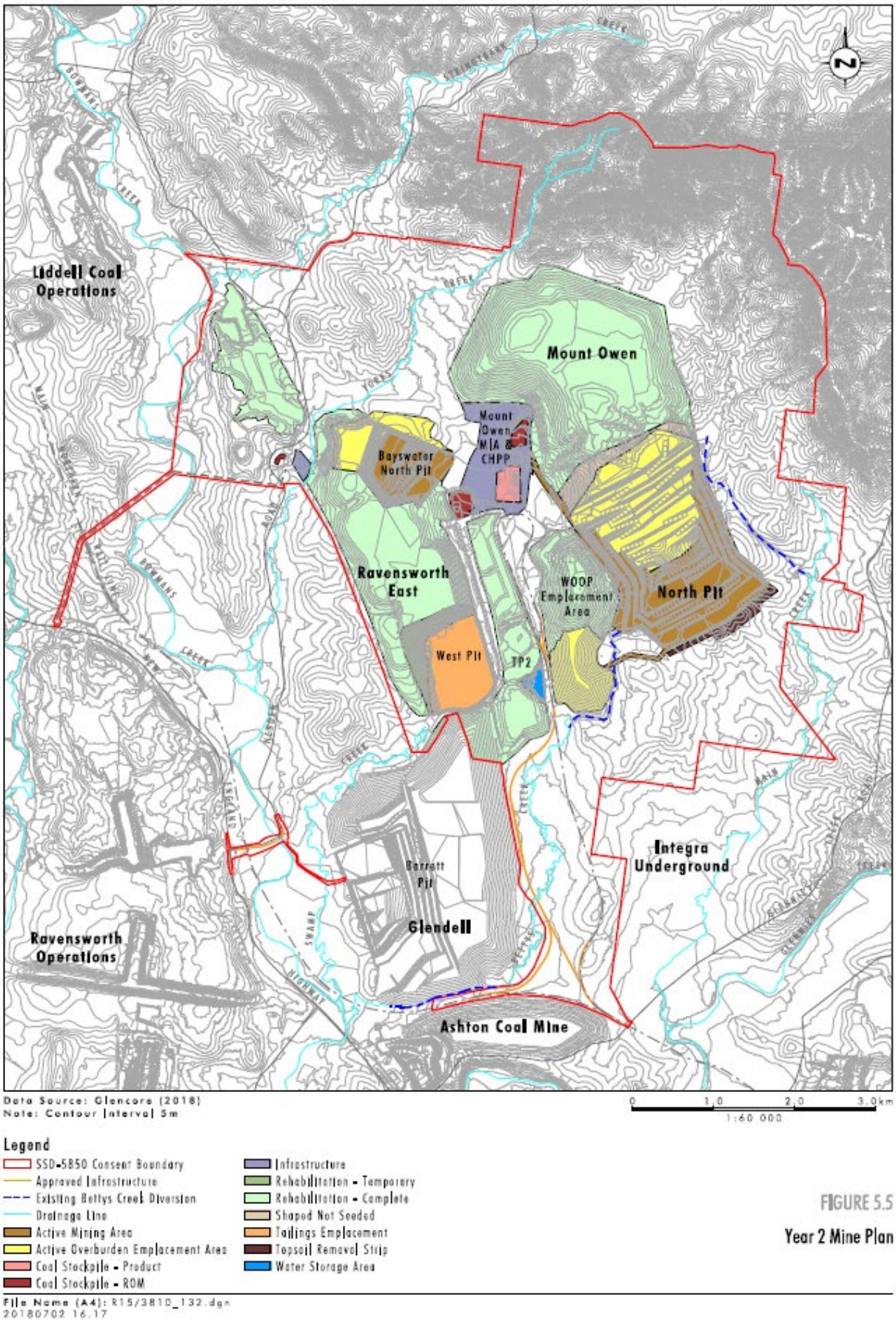


Figure 5.5 Conceptual Mine Plan Year 2

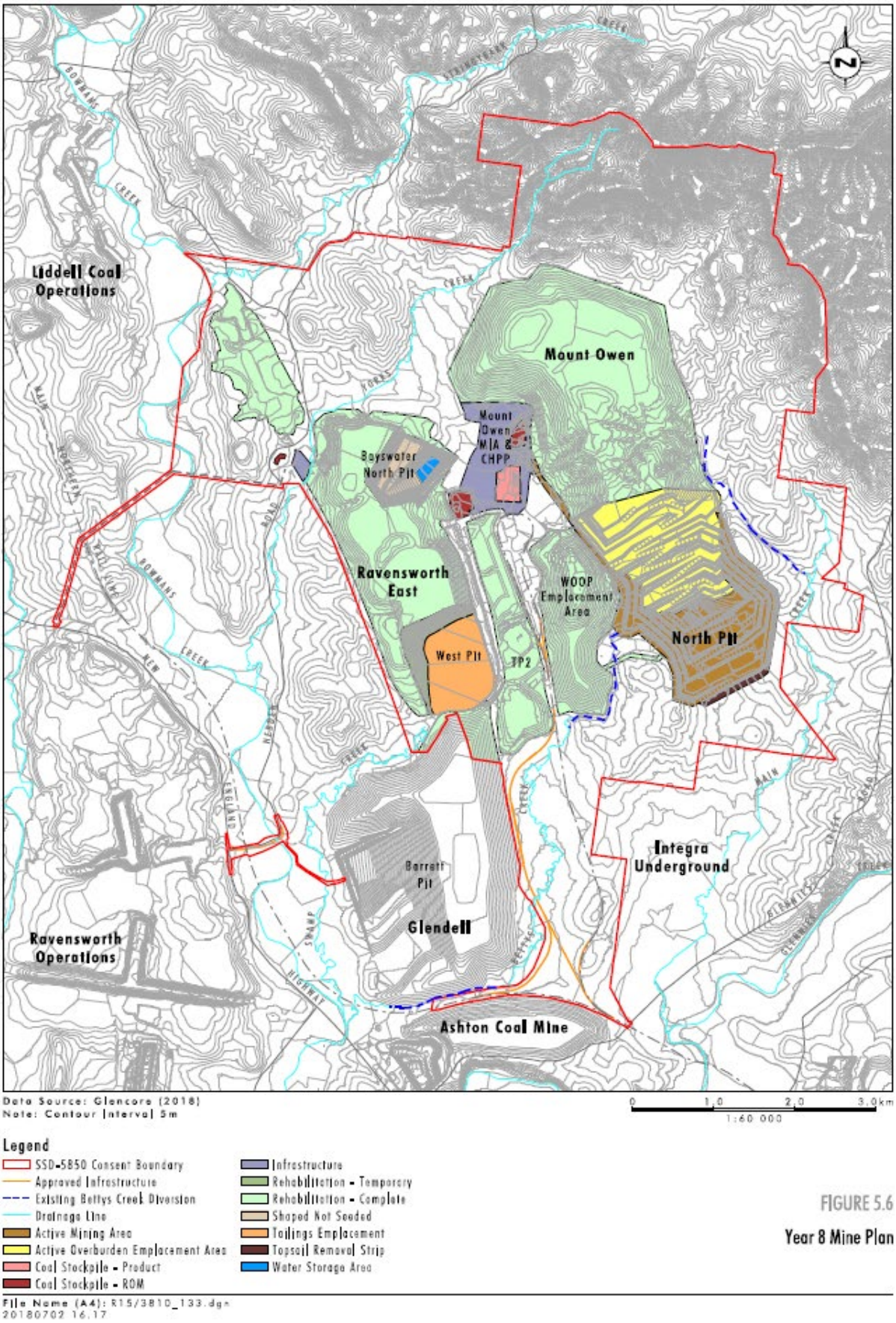


Figure 5.6 Conceptual Mine Plan Year 8

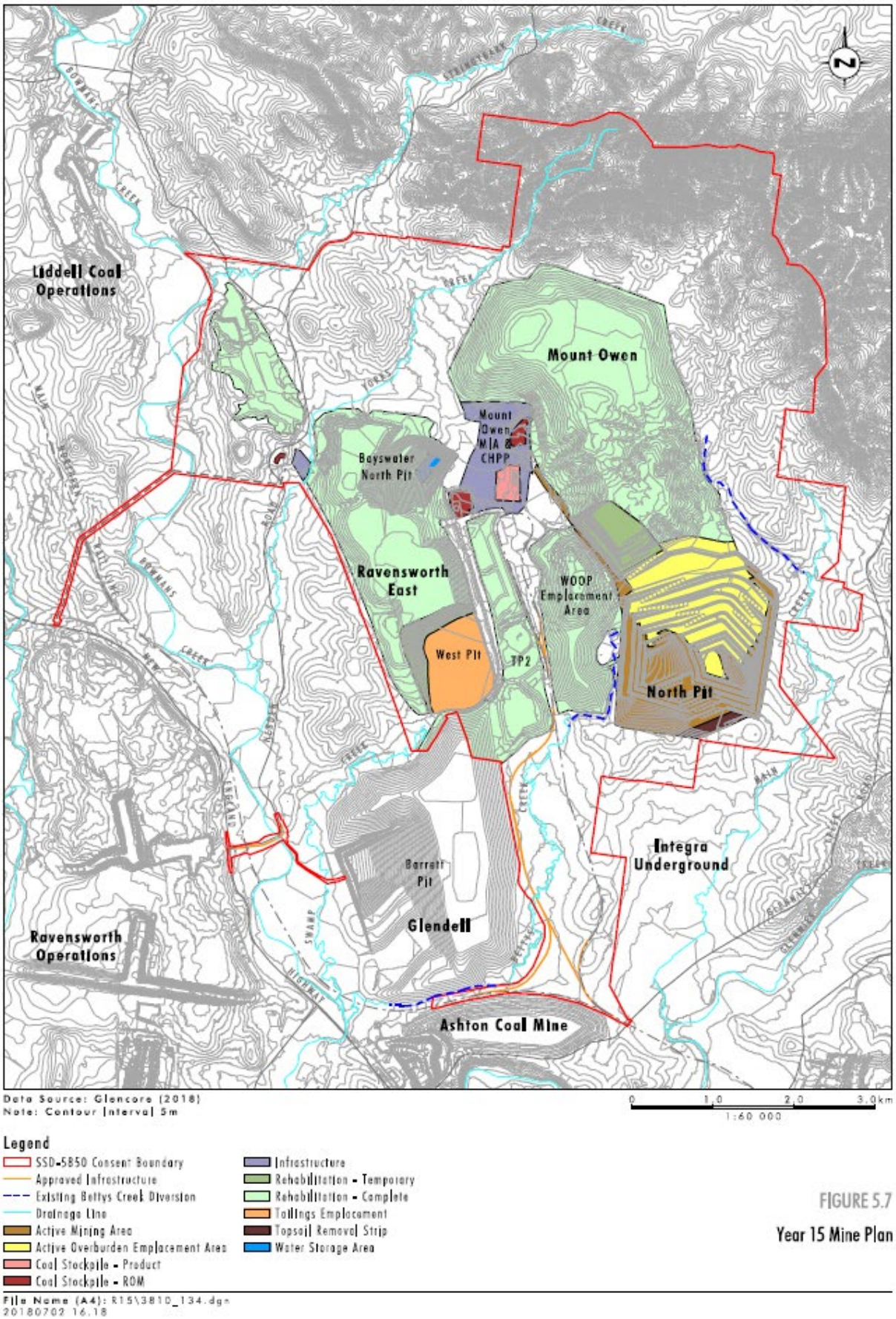


Figure 5.7 Conceptual Mine Plan Year 15

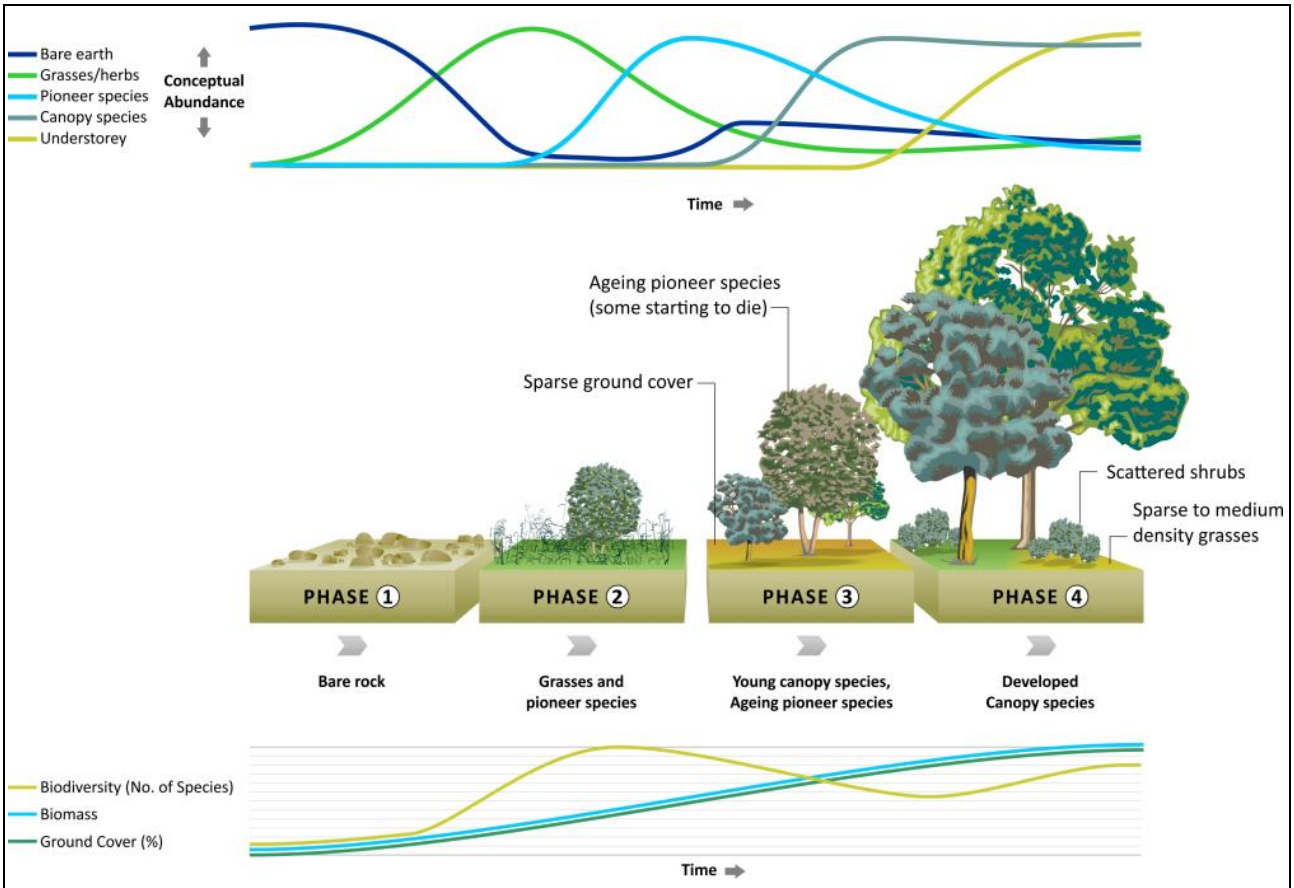


Figure 5.8 Succession Processes in Woodland Communities © Umwelt, 2016

A seed collection and handling program aimed at maximising the viability and diversity of local seed in the revegetation mix will be implemented as part of the rehabilitation program. As a priority, revegetation will involve the use of local provenance seed that will either be utilised for direct seeding or for the propagation of tubestock for planting. However, where adverse seasonal conditions (i.e. drought) or other factors may affect the availability of local provenance seed, supplementation with non-local provenance seed may be required.

Revegetation will primarily involve aerial or direct seeding of native species along with a suitable cover crop or other organic material (e.g. mulch, brush matting or organic growth medium etc.) as required to prevent soil loss and add biomass to the profile. A range of other techniques including the planting of tubestock or aerial seeding may also be utilised where appropriate over isolated areas associated with steep slopes. Infill planting and latter successional phase species establishment will use a combination of direct and aerial seeding and the planting of tubestock.

5.7.2 Establishment of Sustainable Agricultural Areas

The establishment of native vegetation corridor areas does not preclude the ability to re-establish land for sustainable agricultural purposes. As shown in **Figure 1.4**, the Conceptual Post mining land uses includes the establishment of areas in the flatter portion of mine rehabilitation areas for potential future sustainable agricultural purposes such as grazing. However, the ultimate extent and location of these areas will be subject to further detailed closure planning prior to the cessation of mining. Revegetation will involve the use of both native and suitable exotic pasture species for the establishment of grasslands in these areas with pockets of native vegetation, which may ultimately be utilised as shelter for livestock.

Some of the key considerations for the development of these areas will be the suitability of soil, proximity to roads, avoidance of steep areas and access to water resources for stock.

In regards to the establishment of grazing areas, revegetation techniques will be consistent with local agricultural practices and are likely to involve sowing with grasses and legumes appropriate to the district and recognised as suitable for grazing. A similar mix may also be used in areas with steeper slopes to prevent scouring and subsequent soil loss.

Rehabilitate grassland areas to support sustainable grazing activities (minimum land capability of Class VI at Mt Owen, Ravensworth East and areas rehabilitated without topsoil at Glendell, and Class IV or V for topsoiled areas at Glendell). Topsoiled areas at Glendell will have a nominal land capability of class IV or V depending on slope and landscape position. Land capability of Class V will be prioritised, however, this is reliant on factors such as topsoil availability life of mine.

5.7.3 Establishment of Riparian Vegetation

MGO intends to establish areas of self-sustaining riparian habitat within any diverted and/or re-established creek lines and retained water features. Riparian vegetation works will involve the revegetation with native species whilst incorporating structures for aquatic habitat such as persistent pools and woody debris. The establishment of riparian vegetation will be in line with final landform drainage, achieve long term geomorphic stability and minimise erosion. Revegetation of the post-mining landscape, including riparian areas will focus on establishing vegetation that is consistent with the Hunter Valley River Oak Forest vegetation community type.

5.8 Revegetation Care and Maintenance

Based on the outcomes of the rehabilitation monitoring program as outlined in **Section 6.0**, a care and maintenance program will be implemented to facilitate that rehabilitation is sustainable for the long term. The scope of this program will include as a minimum the following:

- weed and feral animal control of rehabilitation;
- erosion and drainage control works;
- re-seeding/planting of rehabilitation areas that may have failed (e.g. lack of germination, high plant mortality rate etc.) or require the establishment of later phase successional species;
- maintenance fertilising; and
- repair of fence lines, access tracks and other general related land management activities.

It is envisaged that this program will be continued as required until it can be demonstrated that the rehabilitation of the MGO has satisfied the closure criteria.

Where areas have been identified as being capable of being returned to sustainable agricultural use, it will be the intention to manage these areas in accordance with their intended use as soon as practical after rehabilitation has become established. For example, following the incorporation of infrastructure such as farm dams and fencing into the rehabilitated landform, cattle grazing at low stocking rates may be introduced intermittently until the soil profile and species diversity has developed sufficiently to support more intensive sustainable grazing.

5.9 Proposed Rehabilitation Sign-Off Process

Based on the outcomes of the rehabilitation monitoring programs and in consultation with the relevant government agencies, MGO intend to seek progressive sign-off of rehabilitated areas once the agreed closure and rehabilitation criteria have been satisfied. The aim will be to achieve consensus on the quality of rehabilitation required as a benchmark for sign-off.

Where ongoing monitoring indicates a high degree of confidence that revegetated areas meeting certain benchmarks will continue to transition towards fully functioning communities (based on experience at other areas of rehabilitation at MGO and/or appropriate analogous sites in the Hunter Valley that have been assessed as being appropriately rehabilitated), rehabilitation sign-off criteria may be revised to enable sign-off at an earlier stage in the succession process.

Any such application of revised criteria would be based on the monitoring of early successional phases and evidence to provide a high degree of confidence that appropriate ecosystem function processes were occurring in the areas to be signed-off.

5.10 Environmental Risk Management

MGO maintains an Environmental Management System (EMS) as a means to facilitate compliance with environmental standards and requirements. The EMS provides a framework for managing all environmental and community aspects, impacts and performance of the mining operations.

MGO EMS has been developed generally in accordance with ISO 14001, and is consistent with the Glencore Coal Assets Australia Environmental Management Framework.

As part of the EMS, management plans, procedures and standards have been developed to meet statutory requirements, manage activities on site to minimise risk to the environment and to continually improve the performance of operations.

In conjunction with the MOP/RMP, MGO has undertaken a Rehabilitation and Closure Risk Assessment. The assessment is undertaken to identify and evaluate potential risks to achieving the Final Land Use and any specific measures to be implemented to mitigate the identified risks.

In brief, MGO identified 28 risks which were assessed, with 13 classified as low, and 15 classified as medium. No high risks were identified.

A summary of the medium risks that were identified related to:

- Spontaneous combustion impedes rehabilitation;
- Failure to achieve the rehabilitation outcome prescribed in the MOP as a result of mine subsidence (Integra Underground);
- Erosion within rehabilitation areas/creek diversions/active mining areas or uncontrolled discharge offsite of sediment laden water;
- Less than adequate topsoil quality/quantity for rehabilitation to be undertaken in accordance with approved MOP;
- Failure to achieve the rehabilitation commitments prescribed in the MOP due to less than adequate land management;
- Failure to achieve the rehabilitation outcome prescribed in the MOP due to less than adequate control of landform design and construction;
- Discharge of dirty water outside of dirty water catchment;
- Contaminated land (existing or occurring on the site at closure);
- Weed infestations and/or damage to rehabilitation by pest species;
- Inadequate volume of suitable materials for capping tailings dams;
- Failure to achieve the rehabilitation outcome prescribed in the MOP due to settlement of tailings dams;
- Tailings crust does not consolidate sufficiently to allow capping to progress as planned;

- Failed/poor rehabilitation due to less than adequate methodology/ maintenance/ environmental conditions;
- Integra surface disturbance (gas drainage infrastructure) compromises rehabilitation; and
- ROM stockpile exceeds capacity.

A copy of the Risk Register developed for the Rehabilitation and Closure Risk Assessment is attached as **Appendix B**. This risk register provides the controls (and additional controls where necessary) to manage the associated risks and also reduce those further where possible. The controls can vary as per the 'hierarchy of control' model, from elimination such as not selecting incorrect rehabilitation material, to administrative such as materials being placed in accordance with site procedures.

6 Proposed Rehabilitation Monitoring

MGO will continue to undertake a rehabilitation monitoring program in accordance with Glencore standards. The objectives of the program will be to:

- assess the long term stability and functioning of re-established ecosystems on mine affected land;
- assess rehabilitation performance against the closure criteria; and
- facilitate continuous improvement in rehabilitation practices.

The monitoring program will be continued within rehabilitated as well as non-mined areas until it can be demonstrated that rehabilitation has satisfied the closure criteria or is there is a high degree of confidence that the vegetation in the rehabilitated area is on a successional pathway that will achieve closure criteria. Information from the monitoring program will also be used to refine closure and sign-off criteria as required. Further details on the proposed rehabilitation monitoring are outlined below.

6.1 Active Mining Records

During active mining operations, MGO will maintain active records as to mining activities and processes that may impact upon the rehabilitation and closure of the site. These records will provide the basis for developing rehabilitation strategies and interpretation of later rehabilitation monitoring outcomes. The types of records to be maintained include, but are not necessarily limited to the following:

- detailed rehabilitation procedures;
- register of contaminated sites including bioremediation areas;
- records of production wastes and other waste streams and where they are located, including where adverse overburden material layers are buried;
- environmental monitoring records, including surface and groundwater quality and results of past remediation programs;
- a register of topsoil and or soil substitute stockpiles (e.g. biosolids), which includes information such as the date in which they were formed and maintenance works undertaken (e.g. weed control, planting with native legumes to maintain microbes etc.); and
- environmental incident records.

6.2 Rehabilitation Methodology Records

MGO will record the details of each rehabilitation campaign so that they are available for later interpretation of rehabilitation monitoring results with the aim of continually improving rehabilitation standards. Amongst the key monitoring parameters to be included in the program relate to the following:

- landform design details;
- drainage design details;
- substrate characterisation;
- site preparation techniques (e.g. topsoil and source, time of sowing, soil ameliorants used etc.);
- revegetation methodologies (e.g. rate and type of fertiliser, cover crop and rate, seed viability including watering and weed management);
- weather conditions;
- photographic records; and
- initial follow-up care and maintenance works (including watering and weed management).

6.3 Rehabilitation Inspections

At the completion of each rehabilitation campaign, an initial establishment inspection will be conducted within 6 months to determine whether issues have occurred or are emerging that have the potential to delay revegetation establishment. Issues may include erosion that has occurred due to storm events, failure of drainage structures and a lack of germination or establishment of vegetation. This process aims to identify potential issues early in order to minimise the extent of areas affected as well as develop mitigation strategies in a timely and cost effective manner.

Inspections of rehabilitated areas will be undertaken over the life of the Project to assess a range of criteria. Inspections will include assessment of

- soil conditions;
- erosion;
- drainage and sediment control structures;
- runoff water quality;
- germination rates;
- species abundance and diversity
- plant health; and
- weed infestation.

The inspection frequency will be refined within the RMP/MOP and have regard to the natural succession pathways of the communities being established. A Rehabilitation Trigger Action Response Plan (TARP) will also be implemented at MGO and ensure rehabilitation standards are maintained and continuously improved. This TARP will have regard to successional processes expected in the communities being re-established and will supplement the rehabilitation care and maintenance program (refer to **Section 5.8**) and will be reviewed and revised as conditions at Mt Owen change or new threats are identified.

6.4 Monitoring Rehabilitation Performances against Objectives and Criteria

To complement the annual inspections, a rehabilitation monitoring program will be continued. The objective of this monitoring program is to evaluate the progress of rehabilitation towards fulfilling long term land use objectives. The monitoring program will also include non-mined areas for reference (analogue) sites. The monitoring results will provide the basis to measure the success of the rehabilitation against the closure criteria having regard to expected successional processes. Information from this monitoring program will also be used to refine closure criteria as required.

To ensure these design principles for creek diversions are adhered to, MGO will employ a monitoring and management program aimed to identify any water quality, ecological, hydrological or geomorphological deficiencies during the construction, establishment, and development and relinquishment phases of the diversion. Where the success of the program has been impacted by other factors such as the physical and chemical constraints of the site soils, the continued stability and establishment of vegetation for the diversions will be ensured through the ongoing creek diversion monitoring program in which any remediation requirements will be identified and implemented.

The monitoring program for areas being rehabilitated back to native ecosystems may not commence until revegetation has demonstrated satisfactory growth, which may take a number of years (i.e. >3 years). The exact scope of the long term rehabilitation monitoring program and creek diversion monitoring will be refined through the RMP/MOP and Creek Diversion Management Plan, respectively.

Broadly, the long term rehabilitation monitoring program will include vegetation monitoring, habitat assessment and fauna monitoring. Whilst the program will be designed to be comparable between

monitoring periods, the program will also be flexible to enable the incorporation of a range of industry accepted techniques that will enable sites to be tracked against meeting the closure criteria.

For areas to be returned to agricultural use, a rehabilitation monitoring program will be developed to assess performance against appropriate objectives and criteria. This criteria includes comparisons with analogue sites such as ground cover is in the range of analogue sites at year 10, presence of weeds and management required to maintain vegetation health (such as fertiliser) is similar. Other criteria includes no significant erosion present, at least 75% of species a suitable for grazing, grazing areas assessed to have a Rural Land Capability Class 6 or better and pasture production is comparable to similarly managed analogue site yields within 5 years. Such rehabilitation monitoring programs may include surveys to assess the quality and health of soils and pasture species. The exact scope of the rehabilitation monitoring program for agricultural land will be refined through the RMP/MOP.

7 Accountabilities and Implementation of the Strategy

Specific responsibilities and appropriate resources for the implementation of the mine closure and rehabilitation strategy for the Project will be detailed within the Rehabilitation Management Plan/ MOP.

The allocation of responsibilities will be designed to promote the integration of rehabilitation and mine closure within the day to day mine planning process.

8 References

Reference	Title
ACARP 2005	Development of Rehabilitation Completion Criteria for Native Ecosystem Establishment on the Coal Mines in the Hunter Valley.
Andrews, Neil 1999.	Synoptic Plan Integrated Landscapes for Coal Mine Rehabilitation in the Hunter Valley of NSW.
Coakes Consulting Pty Ltd 2013	Mount Owen Continued Operations Social Impact & Opportunities Assessment.
Department of Planning and Infrastructure 2012.	Strategic Regional Land Use Plan: Upper Hunter.
Environmental Geochemistry International Pty Ltd (EGi) 2013.	Geochemical Assessment of the Mount Owen Optimisation Project
Environmental Geochemistry International Pty Ltd (EGi) 2018.	Geochemical Assessment of the Mount Owen Continued Operations Project Modification 2
Pells Sullivan Meynink Consult Pty Limited 2013.	Geotechnical Stability Assessment, Life Of Mine, Mount Owen Continued Operations
Singleton Council 2013.	Local Environmental Plan.
Umwelt (Australia) Pty Limited 2014a.	Mount Owen Continued Operations Environmental Impact Statement.
Umwelt (Australia) Pty Limited 2014b.	Assessment of the Ecological Outcomes of Mine Rehabilitation, Regeneration and Revegetation at Mount Owen Mine.
Umwelt (Australia) Pty Limited 2014c	Mount Owen Agricultural Impact Assessment
Umwelt (Australia) Pty Limited 2014d.	Mount Owen Continued Operations Ecological Assessment.
URS Australia Pty Ltd February 2014.	Bayswater Geotechnical Constraints and Observations
Umwelt (Australia) Pty Limited 2016.	Response to PAC Review Report, March 2016
Umwelt (Australia) Pty Limited 2019.	Mount Owen Continued Operations Project Modification 2 – Statement of Environmental Effects.

8.1 Change Information

Full details of the document history are recorded in the document control register, by version. A summary of the current change is provided in *Table 5-3* below.

Version	Date	Change Summary
1.0	22.05.2019	Initial Issue
2.0	November 2019	MOCO MOD 2 Revision

Table 10.1 – Change information summary

8.2 Document Control

Reference	Status	Date	Prepared	Checked	Authorised
3109/R10/V2	EIS Version	October 2014	Jane Chung	Tim Brown	Barbara Crossley
3109/R26/V1	Final for submission	August 2017	David Rankin	David Holmes	Ned Stephenson
3109/R26/V2	Revised Final for Agency review	November 2017	David Holmes	David Holmes	Ned Stephenson
3109/R26/V3	Final for submission incorporating Council and DRE comments	March 2018	David Holmes	David Holmes	Ned Stephenson
3109/R26/V4	Revised Final	February 2019	David Holmes	David Holmes	Ned Stephenson
MOC Rehab Strategy_Mar2019	March Amended Final	March 2019	David Holmes	David Holmes	Ned Stephenson
MOC Rehab Strategy_Mar2019	May Amended Final	May 2019	Jason Desmond	Jason Desmond	Ned Stephenson
MGO Rehabilitation Strategy MOD 2	November Amended Final	November 2019	Jason Desmond	Catherine Fenton	Jason Desmond

Appendix A - Revegetation Species List

A.1 Species List for Central Hunter Ironbark – Spotted Gum – Grey Box Forest

Species	Common Name	Type
Eucalyptus blakelyi	Blakely's red gum	tree
Eucalyptus crebra	Narrow-leaved iron bark	tree
Eucalyptus moluccana	Grey box	tree
Corymbia maculata	Spotted gum	tree
Cassinia quinquefaria	Sifton bush	shrub
Olearia elliptica	Sticky daisy bush	shrub
Ozothamnus diosmifolius	White dogwood	shrub
Daviesia ulicifolia	Gorse bitter pea	shrub
Pultenaea spinosa	Spiny bush-pea	shrub
Acacia falcata	Sickle wattle	shrub
Acacia parvipinnula	Silver-stemmed wattle	shrub
Sida corrugata/subspicata	Sida	shrub
Bursaria spinosa subsp. spinosa	Blackthorn	shrub
Dodonaea viscosa	Sticky hop-bush	shrub
Hardenbergia violacea	False sarsaparilla	climber
Calotis cuneifolia	Purple burr-daisy	ground cover
Chrysocephalum apiculatum/semipapposum	Yellow buttons	ground cover
Vernonia cinerea	-	ground cover
Vittadinia cervicularis/cuneata/sulcata	Fuzzweed	ground cover
Wahlenbergia communis/gracilis	Bluebell	ground cover
Einadia hastata/nutans	Saltbush	ground cover
Dichondra repens	Kidney weed	ground cover
Lepidosperma laterale	Variable saw- sedge	ground cover
Desmodium varians	Slender tick-trefoil	ground cover
Hardenbergia violacea	False sarsaparilla	ground cover
Lomandra filiformis subsp. filiformis	Wattle matt-rush	ground cover
Lomandra multiflora subsp. multiflora	Many-flowered mat-rush	ground cover
Eremophila debilis	Amulla	ground cover
Dianella caerulea var. caerulea	Blue-flax-lily	ground cover
Aristida ramosa/vagans	Wiregrass	ground cover
Austrostipa scabra var. scabra	Speargrass	ground cover
Austrodanthonia fulva/richardsonii	Wallaby grass	ground cover
Bothriochloa decipiens/macra	Redgrass	ground cover
Chloris ventricosa/truncata	Chloris	ground cover
Cymbopogon refractus	Barbed wire grass	ground cover
Cynodon dactylon	Common couch	ground cover

Dichanthium sericeum	Queensland bluegrass	ground cover
Digitaria diffusa	Open summer-Grass	ground cover
Echinopogon caespitosus	Bushy hedgehog- grass	ground cover
Entolasia stricta	Wiry panic	ground cover
Eragrostis brownii/leptostachya	Lovegrass	ground cover
Sporobolus creber	Slender rats tail grass	ground cover
Themeda australis	Kangaroo grass	ground cover

The seeding list is a combination of species form this list that are known to germinate successfully from seed. Not all species listed are a part of the seeding list.

A.2 Central Hunter Grey Box – Ironbark Woodland

Species	Common Name	Type
Angophora floribunda	Rough-barked apple	tree
Brachychiton populneus	Kurrajong	tree
Corymbia maculata	Spotted gum	tree
Eucalyptus blakelyi	Blakely's red gum	tree
Eucalyptus crebra	Narrow-leaved ironbark	tree
Eucalyptus moluccana	Grey box	tree
Eucalyptus tereticornis	Forest red gum	tree
Acacia implexa	Hickory wattle	low tree
Acacia salicina	Sally wattle	low tree
Allocasuarina littoralis	Black she-oak	low tree
Allocasuarina luehmannii	Bulloak	low tree
Acacia amblygona	Fan Wattle	shrub
Acacia decora	Western silver wattle	shrub
Acacia decurrens	Green wattle	shrub
Acacia falcata	Sickle wattle	shrub
Acacia paradoxa	Kangaroo thorn	shrub
Bursaria spinosa	Blackthorn	shrub
Dodonaea viscosa	Sticky hop-bush	shrub
Hardenbergia violacea	False sarsaparilla	ground cover/ climber
Bothriochloa decipiens	Red grass	ground cover
Chloris ventricosa	Windmill grass	ground cover
Eremophila debilis	Amulla	ground cover
Lomandra filiformis or multiflora	Many-flowered mat rush	ground cover
Microlaena stipoides	Weeping grass	ground cover

The seeding list is a combination of species form this list that are known to germinate successfully from seed. Not all species listed are a part of the seeding list.

A.3 Riparian Vegetation Seeding List

Species	Common Name	Type
Angophora floribunda	Rough-barked apple	Tree
Casuarina glauca	Swamp oak	Tree
Eucalyptus tereticornis	Forest red gum	Tree
Acacia implexa	Hickory wattle	low tree
Acacia parvipinnula	Silver-stemmed wattle	Shrub
Acacia salicina	Cooba	Shrub
Breynia oblongifolia	Coffee bush	Shrub
Austrostipa verticillata	Slender bamboo grass	ground cover
Centella asiatica		ground cover
Cynodon dactylon	Common couch	ground cover
Dichondra repens	Kidney weed	ground cover
Juncus continuus / filicaulis / usitatus		ground cover
Microlaena stipoides	Weeping grass	ground cover
Oplismenus aemulus	Australian basket grass	ground cover
Pratia purpurascens	Whiteroot	ground cover

The seeding list is a combination of species form this list that are known to germinate successfully from seed. Not all species listed are a part of the seeding list.

Appendix B - Rehabilitation Risk Register

Environmental Risk Assessment: Mount Owen Complex - August 2019											
Key Element	**Issue**	**Caused By**	**Consequence**	**Current Controls** *(are in place)*	**Expected Risk Consequence**	**Risk Likelihood**	**Current Risk Rating**	**Proposed Additional Controls/Actions**	**Task Owner**	**Due Date**	**% Complete**
1. Geology and Geochemistry	Failure to achieve the rehabilitation outcome prescribed in the MOP due to geochemical composition of materials	LTA knowledge of material and its geochemistry Inappropriate placement of materials	Inability to reach closure and relinquishment of the lease.	1. Geochemical analysis of materials. Geochemical Assessment did not identify any significant issues. Operating history suggests no significant issues 2. Coarse rejects managed in accordance with site procedures 3. Existing management plans in place (e.g. water management plan) in which surface and groundwater water quality is analysed. 4. Groundwater sampling for heavy metal content .	2	D	L				
2. Material prone to Spontaneous Combustion	Spontaneous combustion impedes rehabilitation	Poor management of materials with propensity for spontaneous combustion	Inability to complete rehabilitation Impact on established rehabilitation Cost of managing spontaneous combustion outbreak	1. Spontaneous Combustion Management Plan (document has objective, action and responsibility for Preventative measures). 2. Bayswater North Mining will remove legacy site issues 3. Geotech validation of suitable material.	2	C	M	1. Add validation of final landform material to Spon Com management Plan	JD	25-10-2019	
3. Material prone to Generating Acid Mine Drainage	Failure to achieve the rehabilitation outcome prescribed in the MOP due to AMD Potential for pollution of waters	LTA knowledge of material that may result in AMD.	Inability to reach closure and relinquishment of the lease. Requirement to treat water long term. Impact on environment.	1. Identification and classification of PAF materials 2. Water Quality Monitoring 3.Geochemical Assessment did not identify any significant issues as part of the MOCO Project 4. Material has high buffering capacity 5. Operating history suggests no significant issues 5. Coarse rejects and tailings managed in accordance with site procedures 6. Existing management plans in place (e.g. water management plan).	2	E	L				
4. Mine Subsidence	Failure to achieve the rehabilitation outcome prescribed in the MOP	Mine subsidence (Integra UG)	Interactions with Integra UG mine (cracking/deformations to landform following mining). Additional costs. Repair of water management structures	1. Mine design considers Integra UG interactions 2. Integra Extraction Plan subsidence assessment 3. Information sharing (both GCAA operations) 4. Protocol for inspection and repair (between Integra and Mount Owen) 5. Monitoring.	2	C	M				
5. Erosion and Sediment Control	Erosion within rehabilitation areas/creek diversions/active mining areas. Uncontrolled discharge offsite of sediment laden water.	LTA progressive rehab during operations. LTA water management system and/or design. LTA final landform Large rainfall events LTA maintenance of the water management structures	Impact on rehabilitation. Pollution event offsite. Decrease in water quality. Additional rework required Failed rehab Reputation damage Section 240 Notice	1. Water Management Plan 2. Erosion and Sediment Control Plan 3. Visual inspections 4. Water quality monitoring 5. Annual creek stability monitoring 6. Diversions & dams designed and constructed to engineering standard (Blue Book) 7. Rehabilitation monitoring 8. Maintenance of ESC Structures 9 Quarterly ESC & Rehab Audits 10. GDPs and ESCPs 11. LIDAR Surveys.	2	C	M				

Environmental Risk Assessment: Mount Owen Complex - August 2019										
Key Element	Issue	Caused By	Consequence	Current Controls *(are in place)*	Expected Risk Consequence	Risk Likelihood	Current Risk Rating	Proposed Additional Controls/Actions	Task Owner	Due Date	% Complete
6. Soil Type(s) and Suitability	LTA topsoil quality/quantity for rehabilitation to be undertaken in accordance with approved MOP	Time required to stockpile soil, weed infested topsoil, poor management, site conditions, LTA additional stripping opportunities available. Poor recovery of topsoil.	Inability to reach closure and relinquishment of the lease. Cost of sourcing ameliorants and alternates.	1. Topsoil balance and surveyed stockpile locations 2. Soil management activities outlined in MOP 3. Weed management activities. 4. Inspections (6 monthly) 5. Topsoil quality assessments (GDP process) 6. Topsoil coring & testing in rehab contract 7. Ameliorants (e.g. biosolids).	2	B	M				
7. Flora and Fauna	Failure to achieve the rehabilitation commitments prescribed in the MOP	Erosion, weed and pests, LTA land management	Inability to reach closure and relinquish lease. Impacts to habitat/species	1. Biodiversity Management Plan Rehabilitation Strategy 2. MOP 3. Inspections 4. Weed and pest management procedures 5. Endemic species used in rehabilitation 6. Rehabilitation Monitoring Program 7. Research and development on rehabilitation outcomes 8. CAA HSEC PCL 0007 11.16 Rehabilitation Management. 9. CAA HSEC PCL 0028 11.18 Biodiversity Management.	2	C	M				
8. Slopes and Slope Management	Failure to achieve the rehabilitation outcome prescribed in the MOP	LTA control of landform design and construction Constraints due to LTA design during approval process	Inability to reach closure and relinquishment of the lease. Reworking areas Safety aspects of constructing geofluv landforms	1. Design of final landform and associated drainage 2. Progressive rehab 3. Adequate stakeholder engagement during EIS process 4. ITP (Inspection and Test Plans) 5. Survey inspections and drone pickups 6. Mine transport rules/ fit for purpose equipment/working within parameters	2	C	M	1. Review ITP to ensure consistency with MOP	LL/HM	20-09-2019	
9. Air Quality	Air quality impacts during rehab works resulting in non- compliance or complaints	Dust created from earthworks during rehabilitation Exposed areas Delays in being able to commence rehabilitation Rehabilitation failure Drought	Complaints Prosecution and fines.	1. Air Quality Management Plan which states proactive and reactive air quality controls 2. Site specific Air quality TARPs 3. Air quality & rehabilitation monitoring	2	D	L				
10. Surface Water	Discharge of dirty water outside of dirty water catchment	Leaking/spilt hydrocarbon LTA water management on site Leaking of tailings or return water line	Impact to water quality Non- compliance with consents	1. Water Management Plan (Surface and Groundwater Response Plan TARP status) 2. Water Monitoring Program 3. Engineering design for final landform 3. Clean water diversions 4. Sediment dams 5. Flow pressure monitoring 6. Inspections 7. Site and GCAA protocols 8. Tailings pipes scour dams	2	C	M	1. ERP Tailings HRA	SH	20-12-2019	
11. Groundwater	Groundwater pollution	Contamination due to spill or leakage from onsite containment structure	Impacts to groundwater quality. Non compliance	1. Water MP in which surface and groundwater water quality is analysed. 2. Groundwater monitoring results and triggers in EMD 3. Fuel/chemical storage systems 4. Bioremediation process 5. NDTs on storage tanks	2	D	L				

Environmental Risk Assessment: Mount Owen Complex - August 2019											
Key Element	Issue	Caused By	Consequence	Current Controls *(are in place)*	Expected Risk Consequence	Risk Likelihood	Current Risk Rating	Proposed Additional Controls/Actions	Task Owner	Due Date	% Complete
12. Contaminated Lands	Contaminated land (existing or occurring on the site at closure)	Fuel use at the site Long site history Spills, leaks etc. LTA management of hydrocarbons	Impact on environment Constraint for future land use	1. Fuel storage systems 2. Incident reporting system & PIRMP 3. Spill kits and spill response procedure 4. Contaminated Sites Register 5. Bioremediation area (Glendell & Mt Owen) 5. Hydrocarbon Management Plan	2	B	M	1. Phase 1 Hydrocarbon Audit for MGO complex.	MD	20-12-2019	
13. Hazardous materials	Hazardous materials and dangerous goods remaining on the site at closure.	Failure to identify HAZMAT at closure	Breach of licence Health and safety hazard Financial cost to remedy	1. Chemalert system 2. Procurement/stock management 3. Waste management plan 4. Use of licenced waste disposal contractor and facility 5. Asbestos assessments 6. Hazardous Substances Register 7. Radiation licence & dangerous goods licence	2	D	L	1. Decommissioning of Rav East facilities (inc Phase 2 contamination assessments & HAZMAT assessments) related to GCOP.	MD	20-12-2019	
14. Greenhouse gases, methane drainage / venting	Not applicable - open cut mine										
15. Blasting	Blast impacts associated with rehabilitation works resulting in non-compliance with consents	Blasting required during closure to achieve final landform Blasting during mining operations	Complaints Prosecution and fines	1. Blast Management Plan 2. Drill and blast design procedures/training 3. Monitoring Program and data validation 4. Internal approval forms and checklists 5. Minimal blasting during rehabilitation works	2	D	L				
16. Noise	Noise impacts during rehabilitation resulting in non-compliance with consents or complaints	Earthworks/machinery during rehabilitation LTA controls	Complaints Prosecution and fines	1. Noise Management Plan has proactive and reactive controls arond noise 2. Rehab works only undertaken during daytime 3. Progressive rehab schedule 4. Monitoring program 5. SPL testing 6. GCAA Noise Management Protocol 7. Maintenance Schedule 8. Noise Attenuation	2	D	L				
17. Visual and lighting	Visual/lighting impacts associated with rehabilitation works resulting in non-compliance with consents or complaints	Lighting plant visible during bulk earthworks. Exposed areas visible and identifiable change to the landscape	Complaints	1. Aust std for lighting 2. Lighting impacts reduced during closure (daytime ops) 3. Current visual/lighting procedures	1	E	L				
18. Heritage (Aboriginal and European)	Disturbance of known/unknown Aboriginal/European sites during rehabilitation	Unintended interaction with heritage site due to lack of awareness/fencing/signage/training	Prosecution Loss of culturally/historically significant site Loss of reputation with stakeholders	1. ACHMP and HHMP 2. Ground Disturbance permit 3. Training/awareness 4. Heritage surveys 5. Geographical Information System/ AHIMS/ Site cards 6. Fencing and signage	2	D	L				
19. Bushfire	Damage to rehab or offset areas from bushfire	Bushfire from external (regional fire/ lighting) or internal source (e.g. LTA fuel management, fire caused by site activities/equipment failure)	Loss of established rehabilitation Additional costs for rework of rehab Exposed areas (erosion, sediment, dust) Damage to offset areas.	1. Bushfire Management Plan/Poster 2. Bushfire emergency response procedure 3. Fire fighting equipment/ procedures 4. Hot work permit process 5. Lightning warning system 6. Firetrail maintenance 7. Grazing of bufferlands	2	D	L				

Environmental Risk Assessment: Mount Owen Complex - August 2019											
Key Element	Issue	Caused By	Consequence	Current Controls *(are in place)*	Expected Risk Consequence	Risk Likelihood	Current Risk Rating	Proposed Additional Controls/Actions	Task Owner	Due Date	% Complete
20. Weed and Pest Management	Weed infestations and/or damage to rehab by pest species	LTA weed management/inspections Lack of resources/budget LTA pest management/fencing LTA management of buffer lands	Poor quality rehabilitation Rehabilitation bond not returned Environmental impacts Impacts to neighbouring landholders	1. Existing MOP and TARPs 2. Biodiversity Management Plan 3. Commitment to undertake rehab monitoring/weed/pest inspections 4. Ongoing weed/pest management program 5. CAA HSEC PCL 0007 11.16 Rehabilitation Management. 6. CAA HSEC PCL 0028 11.18 Biodiversity Management	2	C	M				
21. Public Safety	Public access to the site during closure/rehab operations	LTA fencing/gates/signage	Personal injury, impact to rehab, vandalism, safety concerns	1. Controlled access during rehab/closure 2. Signs	2	D	L				
22. Tailings	Inadequate volume of suitable materials for capping tailings dams	Availability of quality/usable resources	Increased costs to source offsite materials Rehabilitation bond is not returned.	1. Materials balance 2. Engineering design for tailings dam capping 3. Provisions in RCE 4. Progressive capping strategy 5. Waste dumps in close proximity to tailings dams	3	C	M				
22. Tailings	Failure to achieve the rehabilitation outcome prescribed in the MOP	Settlement of tailings dams	Settlement of rehabilitation landform resulting in ponding on tailings capped surfaces	Capping design considers potential settlement Inspection and maintenance	2	B	M				
22. Tailings	Tailings crust does not consolidate sufficiently to allow capping to progress as planned	Poor water management with respect to recovering water from the tailings surface LTA management of rise during tailings deposition LTA understanding of material properties with respect to GRAWTS	Inability to reach closure and relinquishment of the lease Delayed capping	1. Surface water management 2. GRAWTS Management Strategy including pipehead floc and Stage 2 of strategy to utilise additional voids	3	C	M				
23. Rehabilitation Methodology	Failed/poor rehabilitation	LTA methodology/ maintenance/ environmental conditions	Additional financial cost to rework Reputation damage	1. RCE (including annual updates) 2. Progressive rehabilitation 3. Ongoing rehab monitoring 4. CAA HSEC PCL 0007 11.16 Rehabilitation Management. 5. MOP/Rehab Strategy	2	C	M				
24. Geotechnical	Failure of highwall or slumping of dumps around final void	Geotechnical failure	Inability to reach closure and relinquishment of the lease Additional costs for rework Safety concerns	1. Slope Stability Management Plan which stipulates maximum dump lift heights 2. Geotechnical engineering input into design	2	D	L				
25. Final Landform Design	Steep slopes and dump heights above approved final landform design criteria	LTA slope design or constraints to working room to achieve <14 degrees for conventional rehab Dump heights not within approved limits	Inability to reach closure and relinquishment of the lease	1. Rehabilitation drainage designed to consider shorter interval on contour banks 2. Rehabilitation monitoring 3. Slope and rehabilitation design (micro relief)	2	D	L				
26. Integra UG Infrastructure interactions	Integra surface disturbance compromises rehab	Gas drainage infrastructure disturbing established rehab	Liability to Mount Owen not offset in Integra MOP	1. Integra MOP and RCE	1	B	M	1. Cross check between MTO and Integra RCE/ MOP/ Annual Reviews	JD	13-09-2019	
27. Overflow ROM stockpile	ROM stockpile exceeds capacity	CHPP capacity constraints in relation to mining coal flow	In pit ROM stockpile Potential spon com and dust issues Compliance issue	1. Production coal flow scheduling	1	B	M	1. Include in pit stockpiles in MOP text	JD/SLR	30-09-2019	

Appendix C - Rehabilitation Strategy Approval

NSW GOVERNMENT | Planning, Industry & Environment

Jason Desmond
Environment and Community Manager

Mt Owen Pty Limited
158 Hebden Road
RAVENSWORTH NSW 2330

13/05/2020

Dear Mr Desmond

Mt Owen Continued Operations Project (SSD 5850)
Approval of Rehabilitation Strategy

I refer to the revised Mt Owen Rehabilitation Strategy, version 2.0 (Strategy), required under condition 43 of Schedule 3 of the Mt Owen Continued Operations Project development consent (SSD 5850).

The Department has carefully reviewed the Strategy and finds that it meets the requirements of the development consent.

Consequently, the Planning Secretary has approved the Strategy (version 2.0, dated May 2020). Please place a final untracked PDF version of the approved Strategy on the project website at your earliest convenience.

If you have any enquiries in relation to this matter, please contact Melissa Anderson on 8275 1392.

Yours sincerely

Matthew Sprott
Director
Resource Assessments (Coal & Quarries)

As nominee of the Planning Secretary