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Ms Chloe Annandale
Environmental Advisor
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MACH Energy Australia Pty Ltd
1100 Wybong Road
MUSWELLBROOK NSW 2333

By email: Chloe.Annandale@machenergyaustralia.com.au

Dear Ms Annandale

Mount Pleasant Operation (DA 92/97)
Rehabilitation Strategy

I refer to your emails dated 12 April 2019 and 14 May 2019, seeking the Secretary's approval of the Mount Pleasant Operation Rehabilitation Strategy, prepared in accordance with condition 54 of Schedule 3 of the above development consent.

The Department has reviewed the updated strategy, provided on 14 May 2019, and considers that it satisfies the relevant conditions of the consent. Therefore, the Secretary has approved the plan.

Please ensure that the strategy is made available on the company's website as soon as possible.

Should you have any enquiries in relation to this matter, please contact Andrew Rode on the details above.

Yours sincerely,

Howard Reed 16-5-19
Director
Resource Assessments
as nominee of the Secretary

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MOUNT PLEASANT OPERATION

REHABILITATION STRATEGY

Document ID:	MP001-0000-H&S-PLN-0023		
Company:	MACH Energy Australia Pty Ltd		
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Endorsed By:	Richard Bailey	**Revision Number:**	01

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1 INTRODUCTION

The Mount Pleasant Operation (MPO) is located in the Upper Hunter Valley of New South Wales (NSW), approximately 3 kilometres (km) north-west of Muswellbrook and approximately 50 km north-west of Singleton (Figure 1). The village of Aberdeen and locality of Kayuga are also located approximately 5 km north-northeast and 1 km north of the MPO boundary, respectively (Figure 1). The proponent of the MPO is MACH Energy Australia Pty Ltd (MACH Energy), which purchased the MPO from Coal & Allied Operations Pty Ltd (Coal & Allied) in 2016.

The initial development application for the MPO was made in 1997. This was supported by an Environmental Impact Statement (EIS) prepared by Environmental Resources Management (ERM) Mitchell McCotter (ERM Mitchell McCotter, 1997). On 22 December 1999, the then Minister for Urban Affairs and Planning granted Development Consent DA 92/97 to Coal & Allied. This allowed for the "Construction and operation of an open cut coal mine, coal preparation plant, transport and rail loading facilities and associated facilities" at the MPO. The consent allowed for operations 24 hours per day seven days per week and the extraction of 197 million tonnes (Mt) of run-of-mine (ROM) coal over a 21 year period, at a rate of up to 10.5 Mt of ROM coal per year.

The Mount Pleasant Project Modification (MOD 1) was submitted on 19 May 2010 with a supporting Environmental Assessment (EA) prepared by EMGA Mitchell McLennan (EMGA Mitchell McLennan, 2010). MOD 1 included the provision of an infrastructure envelope for siting the mine infrastructure, the provision of an optional conveyor/service corridor linking the MPO facilities with the Muswellbrook-Ulan Rail Line and modification of the existing Development Consent DA 92/97 boundaries to accommodate the optional conveyor/service corridor and minor administrative changes. MOD 1 was approved on 19 September 2011.

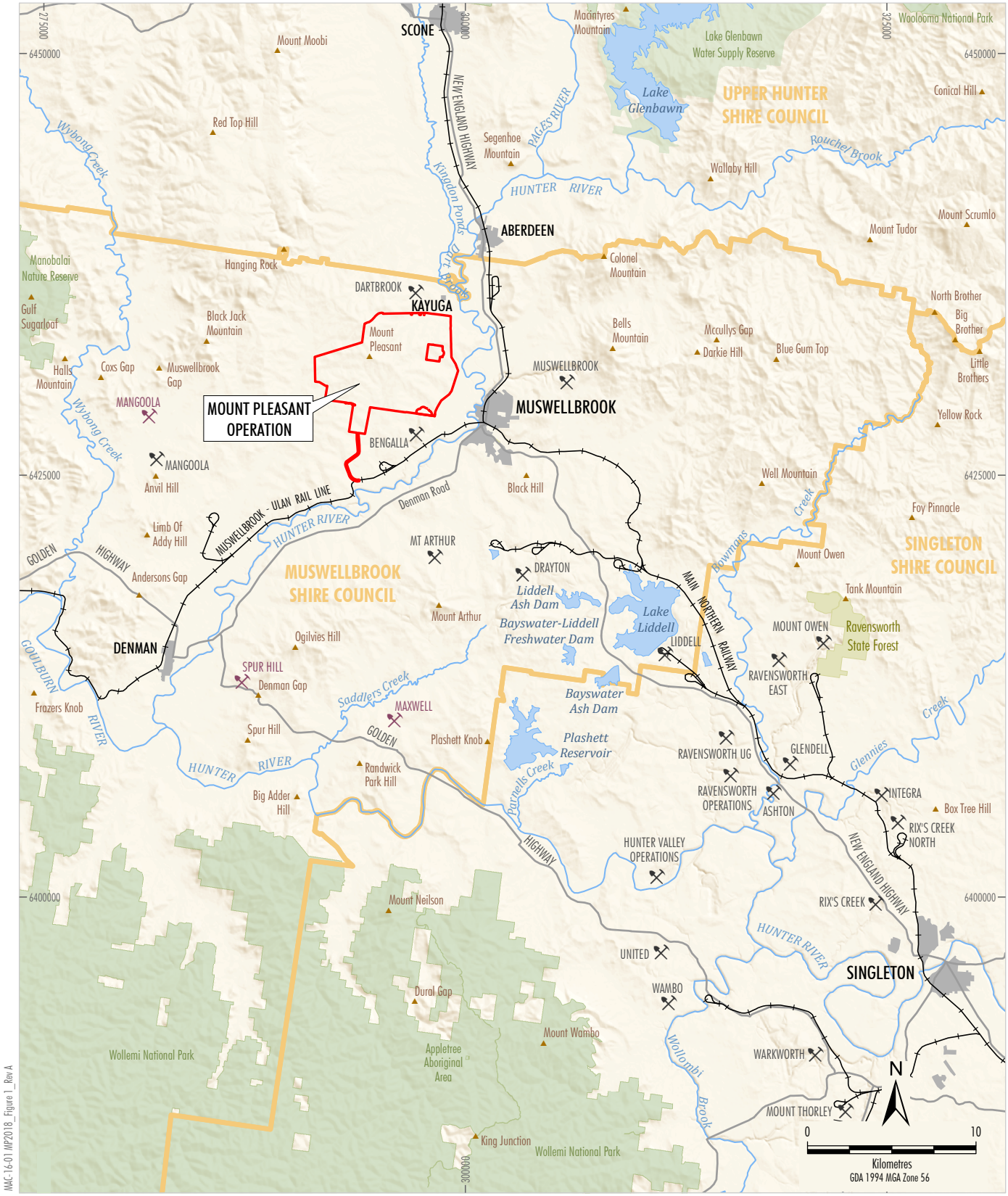
The MPO South Pit Haul Road Modification (MOD 2) was submitted on 30 January 2017 with a supporting EA prepared by MACH Energy (MACH Energy, 2017a). MOD 2 proposed to realign an internal haul road to enable more efficient access to the South Pit open cut, with no other material changes to the approved MPO. MOD 2 was approved on 29 March 2017.

The MPO Mine Optimisation Modification (MOD 3) was submitted on 31 May 2017 with a supporting EA prepared by MACH Energy (MACH Energy, 2017b). MOD 3 comprised an extension to the time limit on mining operations (to 22 December 2026) and extensions to the South Pit Eastern Out of Pit Emplacement to facilitate development of an improved final landform. MOD 3 was approved on 24 August 2018.

The MPO Rail Modification (MOD 4) was submitted on 18 December 2017 with a supporting EA prepared by MACH Energy (MACH Energy, 2017c). MOD 4 proposed the following changes:

- duplication of the approved rail spur, rail loop, conveyor and rail load-out facility and associated services;
- duplication of the Hunter River water supply pump station, water pipeline and associated electricity supply that followed the original rail spur alignment; and
- demolition and removal of the redundant approved infrastructure within the extent of the Bengalla Mine, once the new rail, product loading and water supply infrastructure has been commissioned and is fully operational.

MOD 4 was approved on 16 November 2018 by the Secretary of the Department of Planning and Environment (DPE) (under Delegation). Appendix 2 of the modified Development Consent DA 92/97 illustrates the Conceptual Project Layout Plan of the approved MPO at 2021 and 2025, Approved Surface Disturbance Plan and Conceptual Final Landform (Attachment 1) incorporating the MOD 4 infrastructure relocations.



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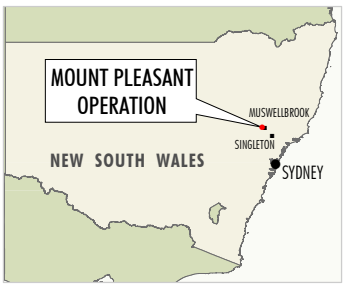

LEGEND

- Mining Operation
- Proposed Mining Operations (Application Lodged)
- Mining Lease Boundary (Mount Pleasant)
- Railway
- Local Government Boundary
- State Forest
- National Parks and Wildlife Estate

Source: Geoscience Australia (2006); NSW Division of Resources & Geoscience (2017); Office of Environment and Heritage NSW (2017); Land and Property Information (2017)

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MOUNT PLEASANT OPERATION

Project Location

Figure 1

1.1 PURPOSE AND SCOPE

This Rehabilitation Strategy has been prepared by MACH Energy to satisfy the requirements under Development Consent DA 92/97 and specifically Schedule 3, Condition 54. In addition, specific reference has been made to the requirements of the *ESG3: Mining Operations Plan (MOP) Guidelines* (Department of Trade and Investment, Regional Infrastructure and Services - Division of Resources and Energy [DRE], 2013) to avoid duplication between the content of this Rehabilitation Strategy and the content that is required to be presented in the Mining Operations Plan/Rehabilitation Management Plan (MOP/RMP). The role of this Rehabilitation Strategy, as well as the key components of the rehabilitation implementation and improvement methodology at the MPO, are shown on Figure 2.

The Rehabilitation Strategy applies to all employees and contractors at the MPO and covers all areas within the MPO boundary. The Rehabilitation Strategy applies to the life of the MPO, including (but not limited to) the period of mining operations specified in Development Consent DA 92/97, which currently permits mining until 22 December 2026. As required by Condition 5, Schedule 2 of Development Consent DA 92/97, the Rehabilitation Strategy will continue to apply (excluding mining operations) beyond 22 December 2026, as required, until the rehabilitation and any additional undertakings (required by the Secretary of the DPE, or the Division of Resources and Geoscience [DRG] within the DPE) have been carried out satisfactorily.

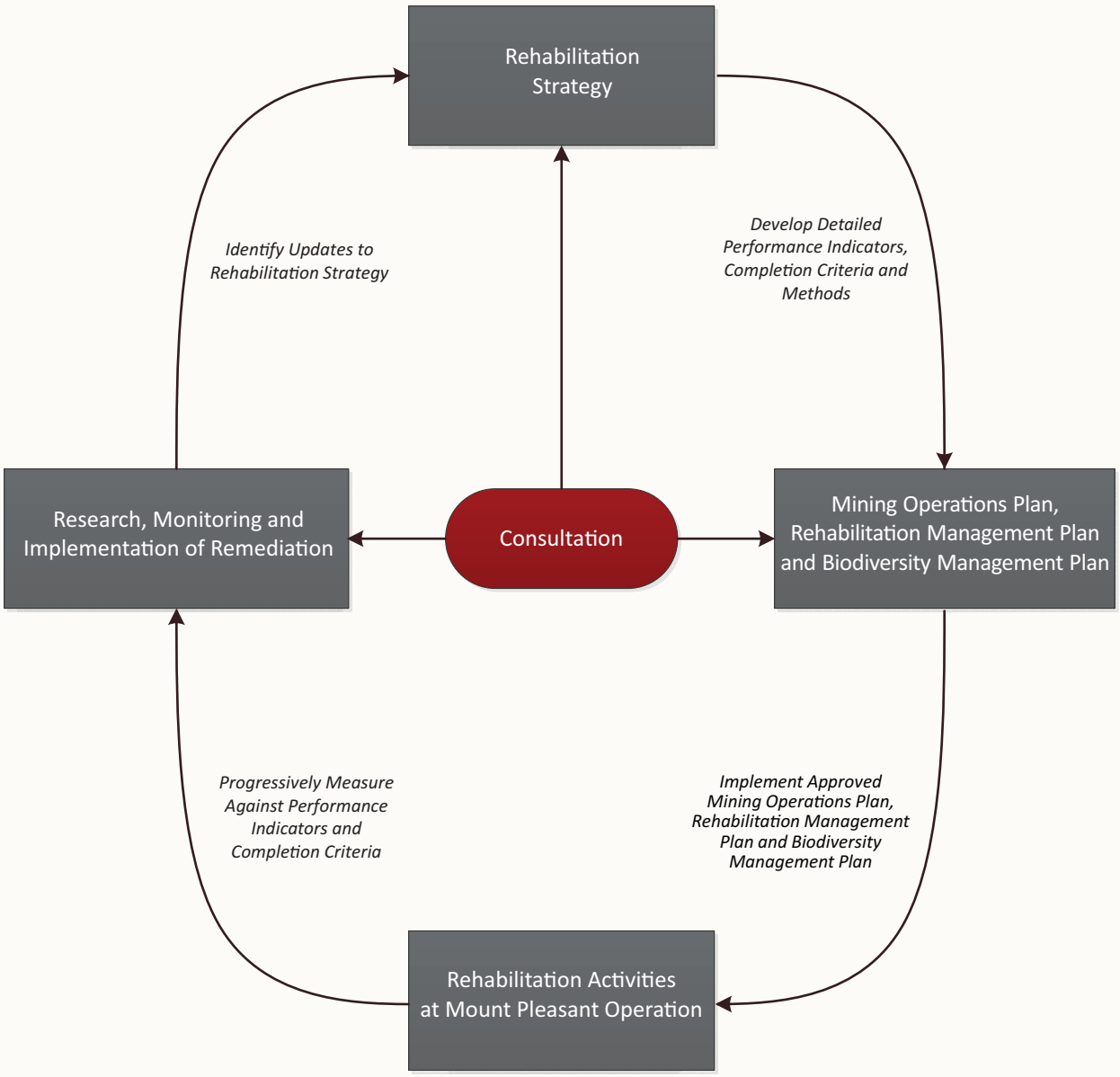
Under Condition 37, Schedule 3 of Development Consent DA 92/97, MACH Energy is required to remove the existing rail loop and infrastructure corridor, prior to 31 October 2022:

> *37. The Applicant must, by no later than 31 October 2022:*
>
> *(a) remove all infrastructure associated with the development within Mining Lease No. 1645 (ML 1645) south of Wybong Road (other than infrastructure which the operator of the Bengalla mine agrees with the Applicant, in writing, can remain in situ);*
>
> *(b) do all things available to transfer or cause the grant of a mining lease over that part of ML 1645 south of Wybong Road to the operator of Bengalla mine or its nominee;*
>
> *(c) transfer the freehold land owned by the Applicant within ML 1645 south of Wybong Road to the operator of Bengalla mine (or its nominee) at rural market value;*
>
> *(d) release any easements for pipeline and rail spur within or in the vicinity of ML 1645 south of Wybong Road which benefit land owned by the Applicant; and*
>
> *(e) demolish the Bengalla Link Road bridge required under condition 38 (a) below and, unless otherwise agreed by the Secretary, reinstate the road reserve to the satisfaction of Council.*
>
> *Note: The rail loop and infrastructure corridor is shown in Figure 3 of Appendix 2.*

On this basis, this Rehabilitation Strategy focuses on disturbance areas north of Wybong Road (e.g. the vegetation mapping shown on Figure 7 is limited to areas north of Wybong Road). Notwithstanding, this Rehabilitation Strategy has addressed interim rehabilitation of the existing rail loop and infrastructure corridor in Section 4.2.

1.1.1 PREVIOUS VERSIONS

A previous version of the Rehabilitation Strategy was submitted by Coal & Allied and was approved on 23 July 2012. MACH Energy prepared a 'Preliminary Rehabilitation Strategy' as part of the *Mount Pleasant Operation - Mine Optimisation Modification Response to Submissions* (MACH Energy, 2017d) for which this Rehabilitation Strategy has built upon to address Condition 54, Schedule 3 of Development Consent DA 92/97.



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Key Components of Rehabilitation Implementation and Improvement Methodology

Figure 2

1.1.2 CURRENT VERSION

This version of the Rehabilitation Strategy has been prepared to replace the previous version prepared by Coal & Allied described in Section 1.1.1 and to provide a contemporary outline of MACH Energy's proposed objectives and measures to implement rehabilitation at the MPO, following the approval of MOD 3/MOD 4.

As required by Condition 54, Schedule 3 of Development Consent DA 92/97, a draft version of this Rehabilitation Strategy has been submitted to DRG and the Muswellbrook Shire Council (MSC) for the purpose of consultation.

This Rehabilitation Strategy has been prepared on behalf of MACH Energy by Dr David Freudenberger (whose appointment has been approved by DPE [letter dated 18 September 2018] as a 'suitably qualified and experienced person'), to satisfy the requirements under Condition 54, Schedule 3 of Development Consent DA 92/97.

1.2 STRUCTURE OF THE REHABILITATION STRATEGY

The remainder of the Rehabilitation Strategy is structured as follows:

- Section 2: Outlines the statutory obligations relevant to this Rehabilitation Strategy.
- Section 3: Outlines the key rehabilitation strategies proposed at the MPO.
- Section 4: Provides an indicative schedule for rehabilitation and describes progressive rehabilitation at the MPO.
- Section 5: Describes the annual review and continuous improvement process.
- Section 6: Summarises the rehabilitation monitoring and research programme at the MPO.
- Section 7: Provides references used in this Rehabilitation Strategy.

2 STATUTORY OBLIGATIONS

MACH Energy's statutory obligations relevant to the development of this Rehabilitation Strategy are contained in the conditions of Development Consent DA 92/97 (as modified), as outlined in Section 2.1 below.

2.1 REHABILITATION STRATEGY REQUIREMENTS

Conditions 53 to 56, Schedule 3 of Development Consent DA 92/97, (in addition to the Statement of Commitments) outline the rehabilitation management required at the MPO, including the preparation of a Rehabilitation Strategy (refer Table 1).

Table 1
Rehabilitation Management Development Consent DA 92/97 Conditions

<table>
<tr><th>MPO Development Consent
DA 92/97</th><th>Section where addressed in this Rehabilitation Strategy document</th></tr>
<tr><td colspan="2">Schedule 3</td></tr>
<tr><td>Rehabilitation Objectives
53. The Applicant must rehabilitate the site to the satisfaction of DRG. This rehabilitation must be generally consistent with the conceptual final landform depicted in Figure 4 in Appendix 2, and comply with the objectives in Table 11.
Table 11: Rehabilitation Objectives
<table>
<tr><th>Feature</th><th>Objective</th></tr>
<tr><td>All areas of the site affected by the development</td><td>• Safe, stable and non-polluting
• Fit for the intended post-mining land use/s</td></tr>
<tr><td>Areas proposed for native ecosystem re-establishment</td><td>• Restore self-sustaining native woodland ecosystems characteristic of vegetation communities found in the local area, as shown conceptually in Figure 4 in Appendix 2.
• Establish areas of self-sustaining:
– riparian habitat, within any diverted and/or re-established creek lines and retained water features;
– potential habitat for threatened flora and fauna species; and
– wildlife corridors, as far as is reasonable and feasible, and as shown conceptually in Figure 4 in Appendix 2.</td></tr>
<tr><td>Areas proposed for agricultural land</td><td>• Establish/restore grassland areas to support sustainable agricultural activities
• Achieve the nominated land capability classification</td></tr>
</table></td><td>Section 3.1.3, 3.2, 3.3, 3.4 and 3.5

Section 3.2

Section 3.3</td></tr>
</table>

Table 1 (Continued)
Rehabilitation Management Development Consent DA 92/97 Conditions

MPO Development Consent DA 92/97		Section where addressed in this Rehabilitation Strategy document
Other land affected by the development	• *Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of local native plant species (unless DRG agrees otherwise)*	Section 3.2
Final Landform	• *Stable and sustainable for the intended post-mining land use/s* • *Integrated with surrounding natural landforms* • *Incorporate micro-relief and drainage lines that are consistent with surrounding topography, to the greatest extent practicable* • *Maximise surface water drainage to the natural environment (excluding final void catchment)*	Section 3.1.3
Final voids	• *Designed as long term groundwater sinks to maximise ground water flows across back filled pits to the final void* • *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*	Section 3.1.3 and 3.4
Surface infrastructure of the development	• *To be decommissioned and removed, unless DRG agrees otherwise*	Section 3.1.1 and Section 3.5
Rehabilitation materials	• *Materials from areas disturbed under this consent (including topsoils, substrates and seeds) are to be recovered, managed and used as rehabilitation resources, to the greatest extent practicable*	Section 3.1.4
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 fit for aquatic ecology and riparian vegetation*	Section 3.5
Community	• *Ensure public safety* • *Minimise adverse socio-economic effects associated with mine closure*	Section 3.6

Table 1 (Continued)
Rehabilitation Management Development Consent DA 92/97 Conditions

MPO Development Consent DA 92/97	Section where addressed in this Rehabilitation Strategy document
54. By the end of January 2019, unless otherwise agreed by the Secretary, the Applicant must prepare a Rehabilitation Strategy for the development to the satisfaction of the Secretary. This strategy must:	
(a) be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Secretary;	Section 1.1.2
(b) be prepared in consultation with DRG and Council;	Section 1.1.2
(c) build upon the Rehabilitation Objectives in Table 11 and the conceptual final landform depicted in Figure 4 in Appendix 2, including identification of opportunities for increasing the areas of woodland and habitat connectivity within the rehabilitated landscape;	Section 3
(d) 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; and	Section 3.2
(e) include an indicative schedule for the staged rehabilitation of the development.	Section 4.3
The Applicant must implement the approved strategy as approved from time to time by the Secretary.	
Progressive Rehabilitation	
55. The Applicant must rehabilitate the site progressively, that is, as soon as reasonably practicable following disturbance. All reasonable steps must be taken to minimise the total area exposed at any time. Interim stabilisation and temporary vegetation strategies must be employed when areas prone to dust generation, soil erosion and weed incursion cannot be permanently rehabilitated.	Section 4
Note: It is accepted that some parts of the site that are progressively rehabilitated may be subject to further disturbance at some later stage of the development.	
55A. The Applicant must implement all reasonable and feasible measures to provide for the interim stabilisation and temporary vegetation of the existing rail loop and infrastructure corridor, as soon as reasonably practicable following the removal of infrastructure as required under condition 37.	Section 4.2
Note: The Applicant's obligations under this condition will cease following the transfer or grant of a mining lease over that part of ML 1645 south of Wybong Road to the operator of Bengalla mine (or its nominee).	
Statement of Commitments	
Redundant Infrastructure Removal in Bengalla Mine Footprint	
• *MACH Energy will stabilise redundant rail infrastructure areas within the footprint of the Bengalla Mine such that they do not pose an ongoing material source of dust emissions (i.e. seeding to establish a cover crop and/or application of a dust suppressant) prior to management of these areas being transferred to Bengalla Mine.*	Section 4.2
• *Existing Mount Pleasant Operation rail spur erosion and sediment control water management structures (e.g. sediment fences) within the footprint of Bengalla Mine will also be left in place, subject to agreement of Bengalla Mine.*	

3 REHABILITATION STRATEGY

Sections 3.1 to 3.6 provide a description of rehabilitation strategies to address the objectives in Condition 53, Schedule 3 of Development Consent DA 92/97.

3.1 GENERAL REHABILITATION PRINCIPLES

This section describes the post-mining land use and rehabilitation domains, and general principles that will be applied to all rehabilitated landforms at the MPO.

The general principles are based on the principles provided in the *National Standards for the Practice of Ecological Restoration in Australia, 2nd Edition* (Society for Ecological Restoration Australasia [SERA], 2018) as follows:

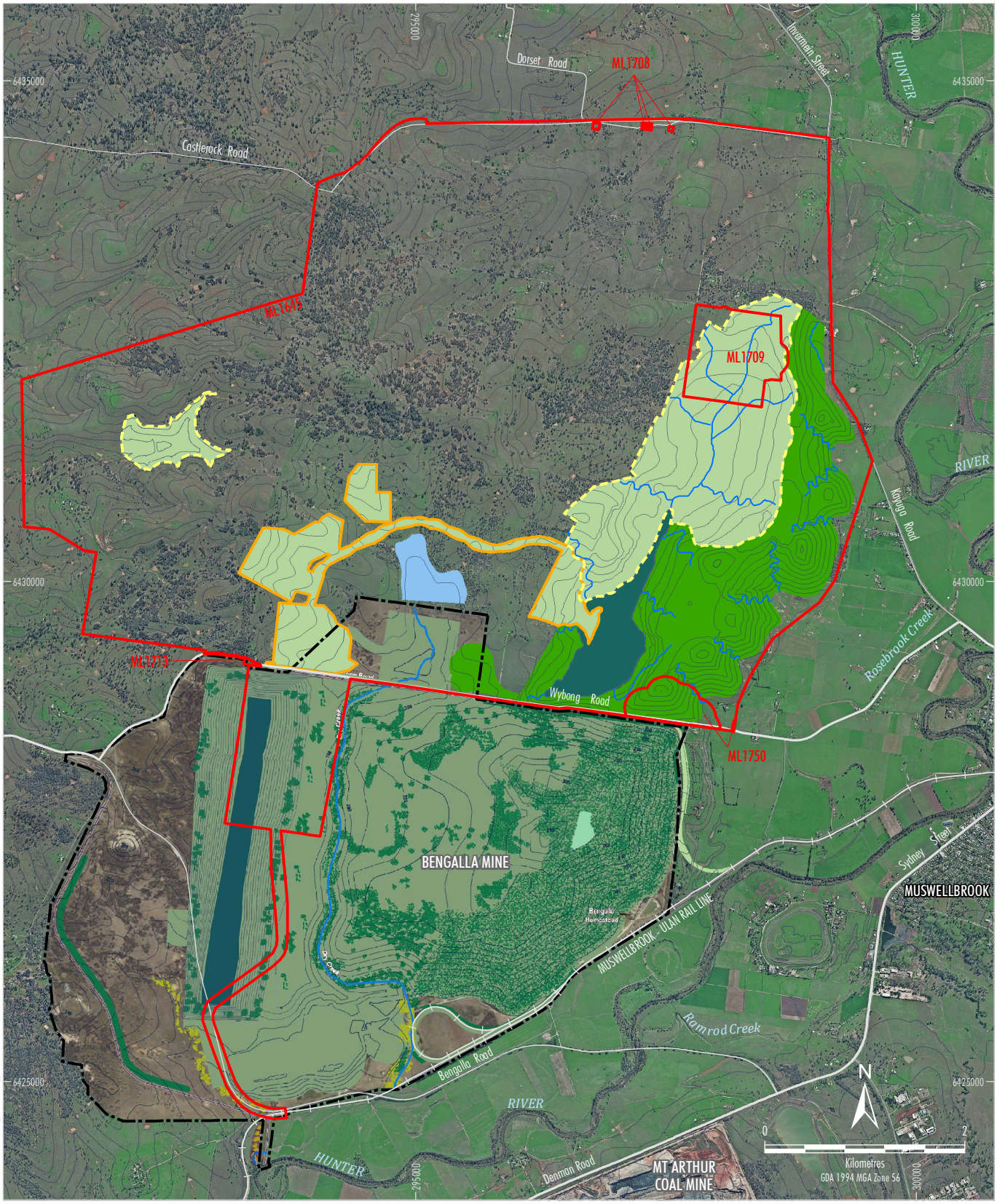
1. *Ecological restoration practice is based on an appropriate local indigenous reference ecosystem.*
2. *Restoration inputs will be dictated by level of resilience and degradation.*
3. *Recovery of ecosystem attributes is facilitated by identifying clear targets, goals and objectives.*
4. *The goal of ecological restoration is full recovery, insofar as possible, even if outcomes take long timeframes or involve high inputs.*
5. *Restoration science and practice are synergistic.*
6. *Social aspects are critical to successful ecological restoration.*

3.1.1 POST-MINING LAND USE AND REHABILITATION DOMAINS

MACH Energy has undertaken a preliminary assessment of potential post-mining land uses (e.g. nature conservation, agriculture) taking into account relevant strategic land use objectives of the area in the vicinity of the MPO and the potential benefits of the post-mining land use to the environment, future landholders and the community. This has included consultation with MSC who has indicated a preference for the inclusion of some intensive agricultural/industrial post-mining land uses that provide employment for the local community.

Provisional Post-Mining Land Use Domains are shown on Figure 3 and described in Table 2. Table 2 has been prepared in accordance with the *Mining Operations Plan (MOP) Guidelines* (DRE, 2013), where each of the Secondary Domains are characterised by a similar post-mining land use objective.

The Post-Mining Land Use Domains will be reviewed in consultation with key stakeholders (including the MSC, relevant regulatory agencies [including the DPE, Resources Regulator, and DPI Agriculture], and the MPO's CCC) during the life of the MPO as part of the MOP/RMP and Rehabilitation Strategy revision process (Section 5). As rehabilitation progresses, an independent Land Capability Assessment will be undertaken using the *Land and soil capability assessment scheme: second approximation - a general rural land evaluation system for New South Wales* (NSW Office of Environment and Heritage [OEH], 2012) to identify specific locations suitable for low intensity agricultural activities.



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LEGEND

Mount Pleasant Mining Lease Boundary

Post-mining Land Use Domains

- Domain A - Final Void
- Domain B - Water Infrastructure and Storage
- Domain C - Agricultural Land
- Domain D - Native Woodland/Grassland
- Potential Low Intensity Agriculture Area
- Potential High Intensity Agriculture Area

Note: Upslope diversions associated with minimising the catchment of the final void are not shown.

Bengalla Mine Conceptual Final Landform *

- Project Boundary (Appendix 2 of Development Consent SSD-5170) (Dated 23 December 2016)
- Dry Creek
- Final Void Lake
- Rehabilitation
- Rehabilitation Class III
- Indicative Tree Screens (or equivalent)
- Treed Rehabilitation
- Indicative Restorative Area

** Digitised from Appendix 9 of Development Consent (SSD-5170) and amended in the Mount Pleasant Operation CHPP area.*

Source: NSW Land & Property Information (2017); NSW Division of Resources & Energy (2017); Department of Planning and Environment (2016); MACH Energy (2018)
Orthophoto: MACH Energy (Aug 2016)

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Provisional Post-mining Land Use Domains

Figure 3

Table 2
Provisional Post-Mining Land Use Domains

Code	Secondary Domain	Description
A	Final Void	• Infrastructure will be decommissioned and removed (unless DRG agrees otherwise). • Residual final void waterbody. • Final void (and associated drainage network) will be shaped to reflect a less engineered profile that is more consistent with the surrounding natural environment. • Final void designed as long-term groundwater sink to maximise groundwater flows across back filled pits to the final void. • Could provide long-term use for recreational or industrial activities.
B	Water Infrastructure and Storage	• Water management infrastructure that will remain post-mining (e.g. upslope diversions). • The Mine Water Dam has been identified as a potential long-term source of water for nearby intensive land uses (subject to obtaining relevant regulatory approvals).
C	Rehabilitation Area – Agricultural Land	• Infrastructure will be decommissioned and removed (unless DRG agrees otherwise). • Areas that will be rehabilitated to a standard suitable for agricultural (or industrial) post-mining land use (including potential intensive land use areas). • Potential intensive land use areas have been identified based on proximity to nearby supporting infrastructure and/or water storage facilities.
D	Rehabilitation Area – Native Woodland/ Grassland	• Infrastructure will be decommissioned and removed (unless DRG agrees otherwise). • Areas that will be rehabilitated to native woodland/grassland. • Consistent with MSC's recommendations, the eastern face of the MPO final landform will be revegetated with native tree and shrub species. • Other Domain D areas have been selected based on slope (i.e. areas that will be of reduced agricultural use). • Provisional Plant Community Types (PCTs) are discussed in Section 3.2.

3.1.2 REHABILITATION PHASES

The rehabilitation phases for the MPO are summarised below:

- Decommissioning Phase – removal of hard stand areas, buildings, contaminated materials, hazardous materials.
- Landform Establishment Phase – incorporates gradient, slope, aspect, drainage, substrate material characterisation and morphology.
- Growing Media Development Phase – incorporates physical, chemical and biological components of the growing media and ameliorants that are used to optimise the potential of the media in terms of the preferred vegetative cover.
- Ecosystem and Land Use Establishment Phase – incorporates revegetated lands and habitat augmentation; species selection, species presence and growth together with weed and pest animal control/management; and establishment of flora.
- Ecosystem and Land Use Sustainability Phase – Incorporates components of floristic structure, nutrient cycling recruitment and recovery, community structure and function, which are the key elements of a sustainable landscape.

As described in Section 4.1, temporary rehabilitation, including hydromulching and seeding of temporary landforms (e.g. mine access roads etc.), will be undertaken across the site to minimise the total area exposed at any time. This temporary rehabilitation will be undertaken where areas prone to dust generation, soil erosion and weed incursion cannot be permanently rehabilitated, in accordance with Condition 55, Schedule 3 of Development Consent DA 92/97. Temporary rehabilitation will be undertaken within 6 months of these areas becoming available.

3.1.3 FINAL LANDFORM

MACH Energy is aware of the level of local interest with respect to the shape and form of MPO final mine landforms. MACH Energy has therefore developed the following design principles for the MPO final landform:

- The emplacement landform will be designed to look less “engineered” when viewed from Muswellbrook (i.e. incorporation of macro-relief to avoid simple blocky forms).
- Surface water drainage from the waste emplacement landform will incorporate micro-relief to increase drainage stability and avoid major engineered drop structures where practical.
- The final void (and associated drainage network) will be shaped to reflect a less engineered profile that is more consistent with the surrounding natural environment.

The following subsections provide further discussion of how these principles will be applied.

Design Integration of Macro and Micro Relief

The emplacement extension and other proposed changes to the final landform that were approved as part of MOD 3 were intended to improve the overall appearance of the MPO landform by incorporating the following concepts:

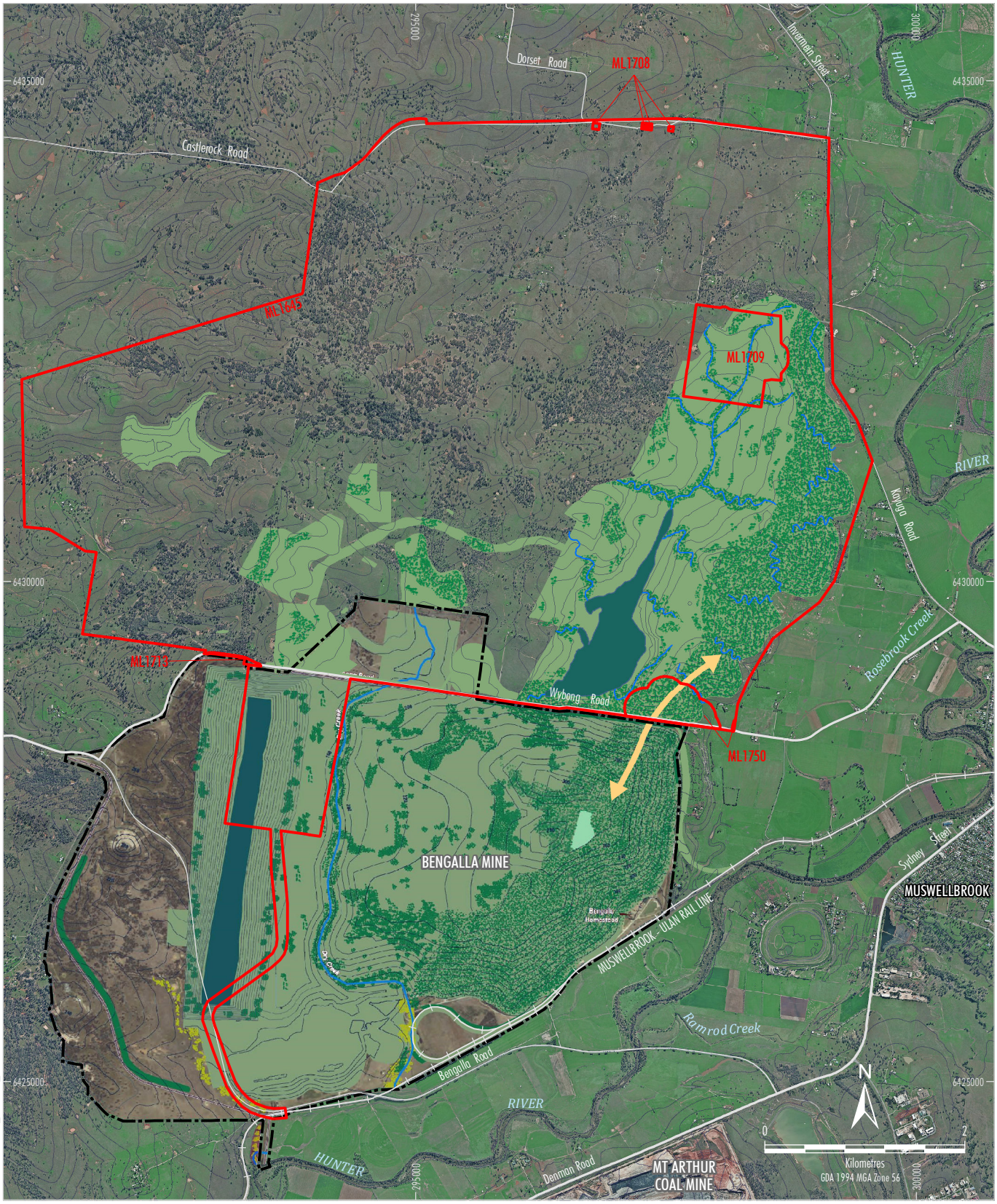
- The final landform surface of the upper lifts on the eastern side of the emplacement will be varied to break up the horizon line when viewed from the east.
- The toe of the emplacement will be extended in plan to form a more complex shape that better aligns with the underlying topography.

These elements of macro-relief on the eastern face of the final landform create a number of spurs and valleys, with the high points on the landform aligning with the spurs to further improve the more natural appearance of the landform from viewpoints to the north-east and south-east. The objective of the final landform is to develop drainage features in the post-mine landform that mitigate erosion potential. This will be achieved by incorporating micro-relief into the drainage design.

The NSW Mineral Council’s *Rehabilitation by Design Practice Notes* (2007) and Department of Environment & Climate Change’s *Managing Urban Stormwater Soils and Construction Volume 2E Mines and Quarries* (2008) provide principles for the construction of stable batter slopes. These principles include:

- Use of a combination of convex and concave outer batters to convey runoff (i.e. as opposed to fixed slope batters).
- Appropriately spaced benches to reduce the velocity of runoff.
- Gentler slope gradients.

MACH Energy has considered these principles in developing the conceptual final landform shown on Figure 4.



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LEGEND

- Mount Pleasant Mining Lease Boundary
- Final Void
- Final Rehabilitation
- Wildlife Corridor

Bengalla Mine Conceptual Final Landform *

- Project Boundary (Appendix 2 of Development Consent SSD-5170) (Dated 23 December 2016)
- Dry Creek
- Final Void Lake
- Rehabilitation
- Rehabilitation Class III
- Indicative Tree Screens (or equivalent)
- Treed Rehabilitation
- Indicative Restorative Area

** Digitised from Appendix 9 of Development Consent (SSD-5170) and amended in the Mount Pleasant Operation CHPP area.*

Source: NSW Land & Property Information (2017); NSW Division of Resources & Energy (2017); Department of Planning and Environment (2016); MACH Energy (2017)
Orthophoto: MACH Energy (Aug 2016)

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MOUNT PLEASANT OPERATION

Conceptual Final Landform

Figure 4

In particular, MACH Energy will implement the following measures to increase the stability of the final landform:

- Establish bench drains where necessary to convey runoff from batter slopes to sub-catchment drainage lines and investigate opportunities to develop small ephemeral wetlands.
- Maximise the number of sub-catchments to reduce the catchment area of individual constructed drainage lines.
- Establish meandering drainage lines that increase the total drainage length and therefore result in gentler stream bed gradients.
- Where practical, design drainage lines to generally produce a complex and concave stream bed profile.
- Establish diverse and variable density native tree cover on the outer face of the Eastern Out of Pit Emplacement and in final landform drainage features to promote stability of the final landform.

The final landform drainage lines will be designed to accommodate natural erosive processes. This will be achieved through consideration of key erosional and geomorphic characteristics such as nature of bed material (e.g. particle size), presence of rock outcrops, bed features (such as cascades, pool and riffle zones) as well as bed and bank vegetation.

Geomorphic features will be incorporated into the design of the relevant final landform drainages. This will also be informed by investigation into the physical characteristics of waste rock and soil materials at the MPO for provision of appropriate rock, sub-soil and topsoil material for use on outer batters and in drainage features.

The conceptual landforms currently proposed will be further refined over the life of the MPO. This will include further review using GeoFluv™ or similar catchment/drainage review and landform design software to examine whether the development of further micro-relief could reasonably be incorporated to limit the need for bench drains on the outer batters of the Eastern Out of Pit Emplacement.

Throughout the life of the MPO, the conceptual final landform may be revised to reflect the outcomes of the above investigations, in consultation with MSC and relevant NSW Government agencies. Progressive updates to the final landform that are consistent with the design intent concepts outlined above will be documented in the relevant MOP/RMP.

General Design Concepts – Outer Batters of Eastern Out of Pit Emplacement

The design improvement work conducted by MACH Energy to date for the outer batters of the Eastern Out of Pit Emplacement has maintained an average outer emplacement slope of approximately 10 degrees, to be generally consistent with the approved final landform of the MPO.

In order to develop a more natural looking landform, MACH Energy has incorporated significant areas of the outer emplacement batters at slopes of less than 10 degrees (lower slopes), and more limited areas of slopes up to approximately 14 degrees (upper slopes), to provide visually important slope variation, while also maintaining waste rock emplacement capacity.

Figures 5 and 6 provide visual simulations that illustrate how the implementation of the concepts described in this section result in a significantly improved final landform for the MPO.

In practice, significantly steeper slopes than 14 degrees in post-mining landforms can be sufficiently stable in the long term (as in the natural Hunter Valley environment), provided that they are utilised in positions in the final landform that have minimal upslope catchment (e.g. upper slopes) and are part of an integrated geomorphologically robust landform design that reflects the composition of the waste rock material.

LEGEND
Established Rehabilitation

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MOUNT PLEASANT OPERATION

Final Landform Simulation -
Floodplain Properties
(Kayuga Road)

Figure 5

MAC-16-01 MP 2018_RehabStrat_002A

LEGEND
Established Rehabilitation

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MOUNT PLEASANT OPERATION

Final Landform Simulation -
Muswellbrook (Hill Street)

Figure 6

MAC-16-01 MP 2018_RehabStrat_003A

MACH Energy will continue to refine the design of the proposed final landform, and where relevant, will justify areas to be constructed at steep grades (including slopes greater than 14 degrees) on the basis of maintaining waste emplacement capacity and how this is acceptable due to its hydrological/drainage position and/or geomorphically robust design in the final landform in the relevant MOP/RMP.

External Drainage

It is noted that the final landform is representative of the final landform that will remain if the MPO does not obtain suitable future authorisations to continue mining beyond 2026. In the event that mining did not proceed past 2026, the final landform will involve a range of earthworks to push down areas of the final highwalls and low-walls; the outcome being a single void remaining in the south with a relatively natural looking shape (Figure 4).

In the final landform (Figure 4) MACH Energy has sought to minimise the catchment area that reports to the eastern face of the Eastern Out of Pit Emplacement, to minimise the volume of water reporting to drainage features on the outer batters, and therefore minimise the need for highly visible traditional engineered linear drop structures.

The southern and eastern batters of the rehabilitated emplacement final landforms will drain externally to local tributary streams and ultimately to the Hunter River.

Internal Drainage

To minimise the area of steep slopes and the land sterilised by the final void, MACH Energy has designed the final landform to provide for gently sloping areas to the west of the Eastern Out of Pit Emplacement. These areas can potentially be utilised for productive agricultural industries (Section 3.3).

This includes a central area where incident rainfall will report to the final void, in part because there is a natural ridgeline to the immediate west of the open cut that remains as a topographic constraint to potential off-site site drainage of the central area if mining were to cease in 2026. It is noted that this ridgeline will be mined through in the originally approved 21 year mine life.

The design of the final void will be refined as required to ensure that the final void will not spill to the environment and will provide a groundwater sink (MACH Energy, 2017b). Final void modelling will be re-evaluated when revised groundwater inflow estimates are available from the MPO contemporary groundwater model (in preparation by HydroSimulations).

Out of Pit Emplacement – Outer Batters Construction Methodology

To facilitate the more rapid establishment of the final landform profiles, MACH Energy will generally construct the outer batters of the eastern face of the waste emplacement in 10 metre (m) lifts that also facilitate the construction of more variable compound final landform slopes.

To maximise the topographic shielding of the evening and night-time mining operations, daytime only construction and final shaping of the outer parts of the Eastern Out of Pit Emplacement will be prioritised. This approach has the advantage of providing a visual and noise attenuation barrier between the open cut operations and the town of Muswellbrook, as well as facilitating the rapid establishment of initial rehabilitation on the lower portions of the emplacement (Section 4.1).

3.1.4 REHABILITATION MATERIALS

MACH Energy will undertake measures to retain as much material as practicable from the pre-mining landform and surrounds to use during rehabilitation. Such measures include:

- Implementing a Vegetation Clearance Protocol which will identify and retain material for rehabilitation including habitat material (e.g. tree hollows, stag trees, coarse woody debris and rocks) and seeding vegetation for seed collection prior to clearing.
- Seed collection and propagation using the on-site Seed Harvesting Facility.
- Rehabilitation material characterisation in order to:
  - identify any physical or chemical deficiencies or limiting factors;
  - develop selective placement strategies or develop soil amelioration techniques;
  - identify material for use in the root zone, which is capable of supporting sustainable vegetation establishment;
  - identify materials that limit plant growth or which may contaminate surface or groundwater (e.g. salinity), and hence may require special handling, treatment or disposal; and
  - identify any propensity for spontaneous combustion.
- Topsoil stripping (guided by soil mapping) and management in designated stockpiles.

Where possible, topsoil will be directly transported to rehabilitation areas. Where this is not possible, topsoil stockpiles will be established separate to subsoil stockpiles and away from active transport corridors.

Subsoils would also be stockpiled for use in the MPO rehabilitation program. Soil testing would be undertaken to inform whether any amelioration of the soils (i.e. gypsum or lime treatment) is required prior to or during reapplication on MPO rehabilitation areas.

Some externally sourced materials (i.e. select rock for rock armouring drainage lines) may also be required throughout the mine life.

These measures are described further in the Biodiversity Management Plan and/or MOP/RMP.

A detailed description of how salvaged habitat materials (e.g. stag trees, coarse wood debris) and collected native seed from vegetation clearance areas will be stored at the on-site Seed Harvesting Facility and used in the rehabilitation program is provided in the MPO Biodiversity Management Plan.

3.2 AREAS PROPOSED FOR NATIVE ECOSYSTEM RE-ESTABLISHMENT

In accordance with the rehabilitation objectives in Condition 53, Schedule 3 of Development Consent DA 92/97, the proposed native ecosystem areas will aim to restore self-sustaining native woodland ecosystems characteristic of vegetation communities found in the local area. Highly competitive exotic grasses (e.g. Rhodes Grass) and non-local Australian species (e.g. *Acacia saligna*) will not be used anywhere on-site. In addition, MACH Energy is required to include development of:

- potential habitat for threatened flora and fauna species;
- riparian habitat, within any diverted and/or re-established creek lines and retained water features; and
- wildlife corridors, as far as is reasonable and feasible.

The following subsections provide a description of measures to be implemented to meet these objectives.

3.2.1 NATIVE WOODLAND ECOSYSTEMS AND HABITAT FOR THREATENED FLORA AND FAUNA

Updated vegetation mapping of the MPO area was undertaken in 2018, following approval of MOD 3 by Hunter Eco. This mapping was undertaken in order to align vegetation communities with contemporary Plant Community Type (PCT) definitions, as well as to inform target woodland ecosystems and species selection for rehabilitation (Figure 7). The updated vegetation mapping has been supplemented in areas by earlier vegetation mapping, undertaken by Cumberland Ecology in 2011.

The vegetation communities presented on Figure 7 have been reconciled against contemporary PCT definitions in Table 3.

Table 3
Vegetation Community Plant Community Type Reconciliation

Vegetation Community Name (Figure 7)	PCT	PCT Name
White Box – Narrow-leaved Ironbark – Blakely's Red Gum[1]	1606	White Box – Narrow leaved Ironbark – Blakely's Red Gum shrubby open forest of the central and upper Hunter.
Spotted Gum – Narrow-leaved Ironbark Woodland[1]	1602	Spotted Gum – Narrow-leaved Ironbark shrub – grass open forest of the central and lower Hunter.
Spotted Gum – Grey Box x White Box Woodland/Forest[1]	1604	Narrow-leaved Ironbark – Grey Box – Spotted Gum shrub – grass woodland of the central and lower Hunter.
Slaty Box Woodland (DNG)	1655	Grey Box – Slaty Box shrub – grass woodland on sandstone slopes of the upper Hunter and Sydney Basin.
Narrow-leaved Ironbark – Grey Box Grassy Woodland[1]	1691	Narrow-leaved Ironbark – Grey Box grassy woodland of the central and upper Hunter.
Narrow-leaved Ironbark Shrubby Forest[1]	1605	Narrow-leaved Ironbark – Native Olive shrubby open forest of the central and upper Hunter.
Grey Box x White Box Grassy Woodland[1]	483	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley.
Forest Red Gum Grassy Open Forest[1]	618	White Box x Grey Box – Red Gum – Rough-barked Apple grassy woodland on rich soils on hills in the upper Hunter Valley.

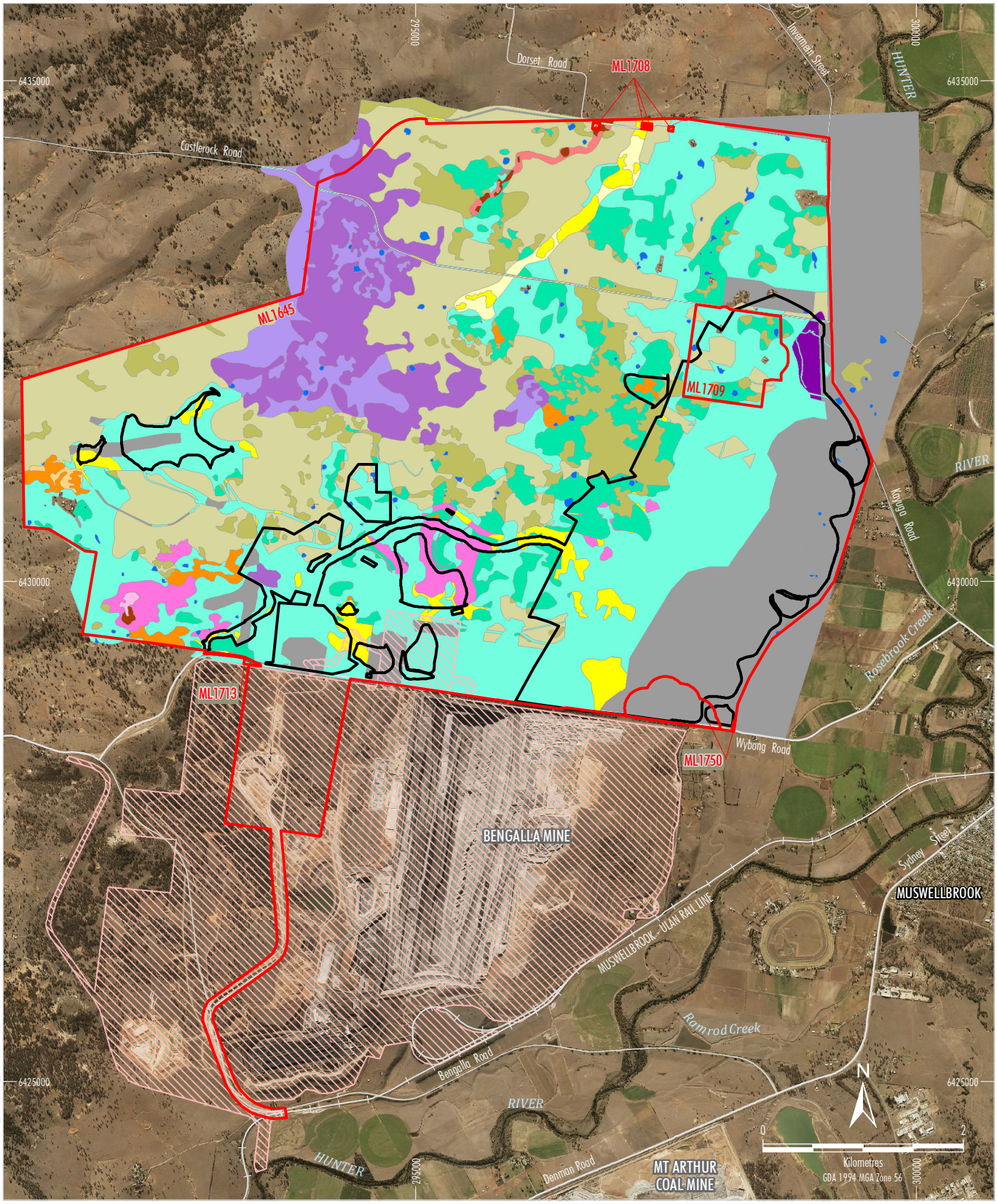
Source: OEH (2018) *Bionet Vegetation Classification*. Accessed 31 October 2018. https://www.environment.nsw.gov.au/NSWVCA20PRapp/search/pctsearch.aspx

Note: DNG = Derived Native Grassland.

[1] Including the DNG component of the vegetation community.

Analysis of this vegetation mapping indicates that the most widespread PCTs being disturbed by the MPO are the following:

- Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley (represent White Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological Community).
- Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter.
- Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter.



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LEGEND

- Mining Lease Boundary (Mount Pleasant)
- Conceptual Project Layout Plan at 2025*
- Bengalla Mine (SSD-5170)

Vegetation Mapping

- White Box - Narrow-leaved Ironbark - Blakely's Red Gum [DNG] [1]
- White Box - Narrow-leaved Ironbark - Blakely's Red Gum [1]
- Spotted Gum - Narrow-leaved Ironbark Woodland [DNG]
- Spotted Gum - Narrow-leaved Ironbark Woodland [2]
- Spotted Gum - Grey Box x White Box Woodland/Forest [DNG]
- Spotted Gum - Grey Box x White Box Woodland/Forest [2]
- Slaty Box Woodland [DNG]
- Narrow-leaved Ironbark - Grey Box Grassy Woodland [DNG]
- Narrow-leaved Ironbark - Grey Box Grassy Woodland [3]
- Narrow-leaved Ironbark Shrubby Forest [DNG]
- Narrow-leaved Ironbark Shrubby Forest [3]
- Grey Box x White Box Grassy Woodland [DNG] [1]
- Grey Box x White Box Grassy Woodland [1]
- Forest Red Gum Grassy Open Forest [DNG] [1]
- Forest Red Gum Grassy Open Forest [1]
- Non-native
- Dam

[1] TEC Listed BC Act: White Box Yellow Box Blakely's Red Gum Woodland

[2] TEC Listed BC Act: Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions

[3] TEC Listed BC Act: Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions

* Excludes minor ancillary works (e.g. access roads and water diversions)

Source: Hunter Eco (2018); Cumberland Ecology (2011); NSW Land & Property Information (2017); NSW Division Resources & Energy (2017); Department of Planning and Environment (2016)
Orthophoto: MACH Energy (Jul 2018)

MACHEnergy

MOUNT PLEASANT OPERATION

Pre-Mining Vegetation Communities

Figure 7

The eastern face of the final landform will be targeted for revegetation using the species characteristic of these PCTs as conceptually shown on Figure 3 (i.e. Domain D – Native Woodland/Grassland) and Figure 4. These PCTs are proposed to provide potential habitat (in the long-term) for threatened flora and fauna that have been previously recorded in the area, including:

- Woodland birds:
  - Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*).
  - Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*).
  - Speckled Warbler (*Chthonicola sagittata*).
  - Black-chinned Honeyeater (eastern subspecies) (*Melithreptus gularis gularis*).
  - Diamond Firetail (*Stagonopleura guttata*).
  - Varied Sittella (*Daphoenositta chrysoptera*).
- Mammals:
  - Squirrel Glider (*Petaurus norfolcensis*).
  - Spotted-tailed Quoll (*Dasyurus maculatus*).
  - Eastern Freetail-bat (*Mormopterus norfolkensis*).
  - Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*).
  - Eastern Bentwing-Bat (*Miniopterus schreibersii oceanensis*).
  - Grey-headed Flying-fox (*Pteropus poliocephalus*).
  - Eastern False Pipistrelle (*Falsistrellus tasmaniensis*).
  - Southern Myotis (*Myotis macropus*).
  - Greater Broad-nosed Bat (*Scoteanax rueppellii*).
  - Eastern Cave Bat (*Vespadelus troughtoni*).
- Flora:
  - Tiger Orchid (*Cymbidium canaliculatum*) – Endangered Population in the Hunter Catchment.

A summary of the PCT communities targeted for revegetation and associated upper, middle and ground stratum species is provided in Table 4. It is anticipated that the list of PCTs will be further augmented and refined over the life of the MPO based on the results of on-site investigations, on-site rehabilitation trials and consultation with key stakeholders. The specific areas that will be targeted for each PCT and the area to be targeted in rehabilitation works will be determined through a detailed design process and included in the relevant MOP/RMP.

Table 4
Plant Community Types Proposed for Native Ecosystem Rehabilitation

PCT	PCT Name	Formation	Class	Applicable TEC	Typical Upper Stratum	Typical Middle Stratum	Typical Ground Stratum
483	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Grassy Woodlands	Western Slopes Grassy Woodland	BC Act, E: White Box Yellow Box Blakely's Red Gum Woodland. EPBC Act, CE: White Box Yellow Box Blakely's Red Gum Woodland.	• *Eucalyptus moluccana* • *Eucalyptus albens* • *Brachychiton populneus* subsp. *populneus* • *Angophora floribunda*	• *Notelaea microcarpa* • *Maireana microphylla* • *Sclerolaena muricata*	• *Bothriochloa macra* • *Boerhavia dominii* • *Oxalis perennans* • *Elymus scaber var. scaber* • *Cynodon dactylon* • *Chamaesyce drummondii* • *Einadia nutans* subsp. *nutans* • *Austrostipa verticillata* • *Aristida personata* • *Aristida ramosa* • *Asperula conferta* • *Rumex brownii* • *Mentha diemenica* • *Lomandra confertifolia subsp. rubiginosa* • *Cyperus gracilis* • *Geranium solanderi var. solanderi* • *Austrostipa scabra* • *Calotis lappulacea* • *Glycine clandestina* • *Chloris truncata*

Table 4 (Continued)
Plant Community Types Proposed for Native Ecosystem Rehabilitation

PCT	PCT Name	Formation	Class	Applicable TEC	Typical Upper Stratum	Typical Middle Stratum	Typical Ground Stratum
1605	Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter	Dry Sclerophyll Forests (Shrub/grass sub-formation)	North-west Slopes Dry Sclerophyll Woodlands	BC Act, E: Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions. EPBC Act, CE: Central Hunter eucalypt forest and woodland.	• *Eucalyptus crebra* • *Notelaea microcarpa*	• *Maireana microphylla* • *Myoporum montanum* • *Olearia elliptica* • *Pittosporum undulatum* • *Breynia oblongifolia* • *Acacia paradoxa*	• *Microlaena stipoides* • *Aristida ramosa* • *Rytidosperma racemosum* • *Rytidosperma bipartitum* • *Dichelachne micrantha* • *Dichondra repens* • *Daucus glochidiatus* • *Cheilanthes sieberi*
1604	Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter	Grassy Woodlands	Coastal Valley Grassy Woodlands	BC Act, E: Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions. EPBC Act, CE: Central Hunter eucalypt forest and woodland; EPBC Act, CE: White Box Yellow Box Blakely's Red Gum Woodland.	• *Eucalyptus crebra* • *Eucalyptus moluccana* • *Corymbia maculata*	• *Bursaria spinosa* • *Olearia elliptica*	• *Eremophila debilis* • *Cymbopogon refractus* • *Aristida ramosa* • *Aristida vagans* • *Microlaena stipoides* • *Rytidosperma fulvum* • *Cheilanthes sieberi* • *Lomandra multiflora* • *Brunoniella australis*

Source: OEH (2018) *Bionet Vegetation Classification*. Accessed 31 October 2018. https://www.environment.nsw.gov.au/NSWVCA20PRapp/search/pctsearch.aspx

BC Act = *Biodiversity Conservation Act, 2016*, EPBC Act = *Environment Protection and Biodiversity Conservation Act, 1999*, TEC = Threatened Ecological Community, E = Endangered Ecological Community & CE = Critically Endangered Ecological Community.

3.2.2 RIPARIAN HABITAT

The main drainage feature within the vicinity of the MPO is the Hunter River which flows in a southerly direction approximately 1 km to the east of the MPO area. The pre-mining environment of the MPO consists of a number of ephemeral drainage lines that drain to the Hunter River, however no perennial streams/creeks exist on-site.

The final landform design will contain similarly ephemeral drainage lines as conceptually shown by blue lines on Figures 3 and 4. These drainage lines will be targeted for the creation of riparian habitat. Design of riparian habitats will include consideration of key erosional and geomorphic characteristics such as nature of bed material (e.g. particle size), presence of rock outcrops, bed features (such as cascades, pool and riffle zones) as well as bed and bank vegetation, as described in Section 3.1.3. Revegetation of drainage lines will consider the upper, middle and lower stratum species that are suited to ephemeral drainage lines in the area.

The main retained water features in the final landform will be the final void and potentially the Mine Water Dam on the southern Mining Lease (ML) boundary (Figure 3).

Revegetation of the void walls/batters will use species that are appropriate for its steepness and aspect, however this is not envisaged to create a riparian ecosystem, rather, this vegetation will be used for stabilisation and aesthetic purposes.

The Mine Water Dam at the southern ML boundary (Figure 3) will potentially be retained to support agriculture and provide conditions for establishment of riparian habitat. If the water storage is retained, vegetation species occurring in riparian areas of the surrounds will be used for revegetation. Species which may be targeted for revegetation of this area will include:

- Upper stratum – River Red Gum (*Eucalyptus camaldulensis*), River Sheoak (*Casuarina cunninghamiana* subsp*. cunninghamiana*), Rough-barked Apple (*Angophora floribunda*).
- Middle stratum - Tree Violet (*Melicytus dentatus*), Willow Bottlebrush (*Callistemon salignus*).
- Lower stratum - Slender Bamboo Grass (*Austrostipa verticillata),* Wallaby Grasses (*Rytidosperma* spp.), Couch Grass (*Cynodon dactylon*), Weeping Grass (*Microlaena stipoides*), Red Grass (*Bothriochloa macra*), Tall Spike-rush (*Eleocharis sphacelata*), Spiny-headed Mat-rush (*Lomandra longifolia*), Tall Sedge (*Carex appressa*).

Figures 3 and 4 indicate the locations of proposed drainage lines and permanent water features. A detailed design process will be undertaken to determine specific locations and design features of riparian habitat areas, which will be developed in the mine closure planning phase and described in the MOP/RMP.

3.2.3 WILDLIFE CORRIDORS

Consistent with MSC's recommendations for the Bengalla Mine final landform, the eastern face of the MPO final landform will be revegetated with native tree and shrub species as shown in Figure 3 (i.e. Domain D – Native Woodland/Grassland) and Figure 4. This will allow the landform to assimilate with the woodland communities in the surrounding environment and develop a contiguous wildlife corridor with the Bengalla Mine rehabilitation and surrounding remnant woodland (as shown conceptually on Figure 4).

MACH Energy will consult with the Bengalla Mining Company regarding integration of rehabilitation across the MPO and the Bengalla Mine. MACH Energy proposes to facilitate this process by (for example) undertaking joint rehabilitation workshops with the Bengalla Mine to discuss rehabilitation strategies, revegetation species and implementation measures. MACH Energy is committed to information sharing to facilitate integration of rehabilitation across the MPO and the Bengalla Mine.

3.3 AREAS PROPOSED FOR AGRICULTURAL LAND

During consultation, MSC indicated a preference for the option of intensive agricultural/industrial post-mining land uses that provide potential employment for the local community. Consequently, rehabilitation of the MPO will consider both low and high intensity agricultural land uses subject to OEH Land Capability Assessments. Low intensity agriculture will consist of reinstating grazing capability. High intensity agriculture will be targeted on former infrastructure sites with low slopes and internal drainage, and may include, for example, feedlots, poultries, and glasshouses.

Low Intensity Agriculture

Following landform reconstruction using the strategies described in Section 3.1.3, areas proposed for low intensity agriculture (Figure 3) will be prepared to accommodate sustainable/managed livestock grazing. The objective will be to establish areas to be classified as Land Capability Class 4, Class 5 or Class 6 lands. The definitions of Land Capability Classes 4, 5 and 6 are provided in Table 5. It should be noted that although the definitions of Land Capability Class 5 and 6 lands include land uses such as forestry and nature conservation (in addition to grazing), MACH Energy does not propose to establish forestry on the rehabilitation areas proposed for low intensity or high intensity agriculture.

Table 5
Land Capability Classes Proposed for Low Intensity Agriculture

Class	Definition
4	**Moderate capability land**: Land has moderate to high limitations for high-impact land uses. Will restrict land management options for regular high-impact land uses such as cropping, high-intensity grazing and horticulture. These limitations can only be managed by specialised management practices with a high level of knowledge, expertise, inputs, investment and technology.
5	**Moderate–low capability land**: Land has high limitations for high-impact land uses. Will largely restrict land use to grazing, some horticulture (orchards), forestry and nature conservation. The limitations need to be carefully managed to prevent long-term degradation.
6	**Low capability land**: Land has very high limitations for high-impact land uses. Land use restricted to low-impact land uses such as grazing, forestry and nature conservation. Careful management of limitations is required to prevent severe land and environmental degradation.

Source: OEH (2012) *The land and soil capability assessment scheme: second approximation - a general rural land evaluation system for New South Wales.*

Low intensity agricultural rehabilitation areas will be cultivated and broadcast sown with pasture species. The species mix will be developed in consultation with an Agronomist, and depend on the growth media available and environmental conditions at the time of rehabilitation. Species selection will also take into consideration potential encroachment on rehabilitation areas proposed for native ecosystem re-establishment.

Improved pasture species commonly present in the surrounding grazing areas that will be considered for low intensity agricultural rehabilitation include:

- Subterranean Clover (*Trifolium subterranean*).
- White Clover (*Trifolium repens*).
- Lucerne (*Medicago sativa*).
- Green Panic (*Panicum maximum var. trichoglume*).
- Kikuyu Grass (*Pennisetum clandestinum*).
- Perennial Ryegrass (*Lolium perenne*).
- Phalaris (*Phalaris aquatica*).
- Oat (*Avena sativa*).

Native grass species will also be considered in pasture species mixes such as Couch Grass Wallaby grasses and *Austrostipa* spp. (Spear grasses) which have been shown to develop well in post-mining landscapes of the Hunter Valley (Huxtable, Koen and Waterhouse, 2005).

Areas on the final landform likely to be lower in soil moisture (e.g. steeper terrain) will be targeted for establishment of native grasses due to their ability to withstand such conditions in comparison to introduced pasture species.

High Intensity Agriculture

Activities that may be classed as high intensity agriculture include, for example, feedlots, poultries, and glasshouses. Areas proposed for high intensity agriculture have been identified on Figure 3, and have been nominally located at this stage based on proximity to the Mine Water Dam proposed to be retained post-mine closure.

In order to stabilise and minimise erosion from the proposed high intensity agriculture areas, the following will be undertaken:

- reconstruction of the landform as described in Section 3.1.3;
- installation of drainage, erosion and sediment control features; and
- sowing of pasture species similar to areas of low intensity agriculture to stabilise the surface.

High intensity agriculture areas will be refined in consultation with MSC throughout the life of the MPO, and will depend on such factors as commercial interest. Subject to further consultation, the MOD 4 rail loop and corridor may be maintained in the final landform as a valuable facility to support the potential high intensity agricultural activities (MACH Energy, 2017c). Any development of high intensity agriculture (and the possible retainment of the MOD 4 rail loop/corridor) will be subject to development approval, as necessary, with the relevant consent authority. If the MOD 4 rail loop/spur is not to be retained, the conveyors and rail infrastructure would be removed, the rail corridor cut and fill areas regraded and the rail corridor and rail loop will be rehabilitated.

3.4 FINAL VOIDS

The final void, lowwalls and ramps cannot be rehabilitated progressively over the mine life as they are active until the end of production and waste rock emplacement/final landform establishment. The final void will be designed to minimise its size and depth by infilling some components where mine planning allows.

The final void landform will be rehabilitated with vegetation species appropriate for the complex landform. The highwall will be rehabilitated using the best reasonable and feasible rehabilitation technologies available and revegetated with species that are appropriate for its steepness and aspect.

Design alternatives for the final void will be continually evaluated and prepared as part of the closure planning process at the MPO and will be subject to ongoing regulatory consultation. Relevant geotechnical studies will be undertaken to assess the stability and provide guidance on measures to minimise instability. Appropriate measures will be used to limit access to steep areas around the final void to restrict cattle, pedestrian and vehicle access. These measures may include large rock placement, landform shaping, or fencing, as agreed with relevant government authorities prior to closure.

3.5 WATER QUALITY MANAGEMENT

Water runoff from the post-mining landform will either be retained on-site or will runoff/discharge to the surrounding environment. The quality of water retained on-site will be managed to be suitable for its proposed post-mining land use (e.g. low or high intensity grazing, native ecosystem). Water quality of runoff to the surrounding environment will be managed to be similar to waterways in the immediate catchment area. Measures proposed to manage water retained on-site and discharged off-site will include:

- The final landform will incorporate design features to minimise water runoff velocity and erosion potential such as micro and macro relief, a combination of convex and concave outer batters, and gentler slope gradients.
- Revegetation will be undertaken on all mine landforms in accordance with its proposed final land use.
- Erosion and sediment control structures will remain in place permanently (e.g. rock armour, drains) or until the catchment is rehabilitated and discharge water quality is similar to comparable undisturbed landforms (e.g. silt fencing, sediment dams).
- Mine water dams and sediment dams will be decontaminated prior to removal (or in the case of the Mine Water Dam potentially retained for post-mining land uses).
- Permanent water management structures will be designed and constructed, in accordance with best practice guidelines, including Landcom (2004) *Managing Urban Stormwater: Soils and Construction Volume 1, 4th Edition* and Department of Environment and Climate Change (2008) *Managing Urban Stormwater: Soils and Construction Volume 2.*

Detailed management measures to ensure runoff is suitable for receiving waters and fit for aquatic ecology and riparian vegetation will be developed as part of mine closure planning and described in the MOP/RMP.

Hazardous and Contaminated Materials

Hazardous materials will be stored on site in accordance with the NSW *Work Health and Safety Act 2011* and supporting *Work Health and Safety Regulation 2017* and the *Work Health and Safety (Mines and Petroleum Sites) Act 2013* and the supporting *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*.

Procedures and controls will be used to minimise the potential for land and water contamination from the handling, storage and disposal of hazardous substances. These controls will include storage within properly sealed containers and controlled areas, and bunding areas used for medium to long-term storage requirements. Storage and waste receival areas will be isolated from clean water catchments to minimise the risk of land or water pollution should an unplanned spill occur.

The response to any accidental spills or ground contamination will be assessed on a case-by-case basis, and remediated using biodegradable spill absorbent and in accordance with any requirements of the SDS for the material. Hydrocarbon or chemical spills will be reported in the MPO incident reporting and management system with corrective and preventative measures taken as appropriate, in accordance with the Pollution Incident Response Management Plan.

Hydrocarbon spills will be managed using bioremediation of the contaminated soils within the MPO bioremediation facility located adjacent the open cut pit, or taken offsite for bioremediation at an appropriate facility.

These procedures, in addition to the water quality management measures described above, aim to ensure the site is non-polluting.

3.6 PUBLIC SAFETY AND SOCIAL TRANSITION

During rehabilitation, the MPO will have restricted access to the public similar to that of the operating mine site. Prior to site relinquishment, a risk assessment will be undertaken to determine if there are any further controls that need to be put in place to ensure public safety. Measures may include large rock placement, landform shaping, fencing, or signage to alert the public to a potential hazard.

A socio-economic study will be commissioned five years prior to expected mine closure, which will evaluate and address the following:

- developing a contemporary baseline of the MPO workforce and community profile;
- identifying potential socio-effects (positive and negative) of the mine closure on the MPO workforce, associated workforce (subcontractors, suppliers) and the broader community;
- in consultation with stakeholders, proposing measures to minimise potential negative effects and maximise potential positive effects of mine closure; and
- developing a draft implementation programme for the measures identified to address social effects.

The findings of the socio-economic study may inform the subsequent versions of the Rehabilitation Strategy. For example, consultation undertaken to date with MSC has identified a preference for intensive agricultural/industrial post-mining land uses that provide employment for the local community. This has been taken into consideration in the final landform design and rehabilitation domains with proposed areas nominated for such land uses. If this preference changes over time, the Rehabilitation Strategy will be updated, considering the progress of final landform established and economic factors.

4 REHABILITATION SCHEDULE AND PROGRESSIVE REHABILITATION

Condition 55, Schedule 3 of Development Consent DA 92/97 requires MACH Energy to undertake progressive rehabilitation and to minimise the area of land exposed at any time. Condition 55A, Schedule 3 of Development Consent DA 92/97 requires that MACH Energy implement all reasonable and feasible measures to provide for the interim stabilisation and temporary revegetation of the existing rail loop and infrastructure corridor, as soon as reasonably practicable following its removal. Condition 54 (e), Schedule 3 of Development Consent DA 92/97 requires an indicative schedule for the staged rehabilitation of the MPO.

Section 4.1 provides progressive rehabilitation strategies proposed to be implemented across the site, and Section 4.2 provides interim stabilisation and temporary revegetation of the existing rail loop and infrastructure corridor. Section 4.3 provides an indicative schedule for rehabilitation of the MPO.

4.1 PROGRESSIVE REHABILITATION

MACH Energy will prioritise construction of the lower batters of the waste emplacement to the final landform profile, and the rapid spreading of topsoil and sowing of sterile cover crops to target early revegetation of these batters to progressively minimise visual impacts on Muswellbrook and other locations to the east.

The preferential use of 10 m lifts of the emplacement landform will result in more rapid establishment of the final surface levels. Using this approach, waste rock placement progresses more rapidly than the alternative of construction in 20 m emplacement lifts. Lifts greater than 10 m may however be used on occasion, if the 10 m lifts result in material economic constraints.

MACH Energy anticipates initial rehabilitation within six months of each subsequent dump panel lift being completed (subject to delays associated with climatic extremes). Initial rehabilitation will include targeting reshaping to final surface level and sowing of sterile cover crops of all outer emplacement batter lifts of the Eastern Out of Pit Emplacement.

Initial rehabilitation may also include hydromulching and seeding of temporary landforms (e.g. mine access roads etc.). Initial rehabilitation will be undertaken across the site to minimise the total area exposed at any time, in accordance with Condition 55, Schedule 3 of Development Consent DA 92/97. Initial rehabilitation will be undertaken within six months of areas being available, where areas prone to dust generation, soil erosion and weed incursion cannot be permanently rehabilitated.

4.2 REHABILITATION OF THE RAIL LOOP AND INFRASTRUCTURE CORRIDOR

Under Condition 37, Schedule 3 of Development Consent DA 92/97, MACH Energy is required to remove all infrastructure associated with the development within ML 1645 south of Wybong Road (other than infrastructure which can remain in situ, with the agreement of Bengalla Mine) and transfer ownership to Bengalla Mine. MACH Energy is required to perform interim rehabilitation on this area, prior to transfer of ownership, as specified within the Statement of Commitments. Following the transfer of ownership, it will be the responsibility of Bengalla Mine to operate and rehabilitate the site. For this reason, this Rehabilitation Strategy has focused on disturbance areas north of Wybong Road, except in regard to the interim rehabilitation specified below.

As soon as reasonably practicable following removal of the existing rail loop and associated infrastructure within the footprint of the Bengalla Mine, initial rehabilitation will be undertaken so the area does not pose an ongoing material source of dust emissions.

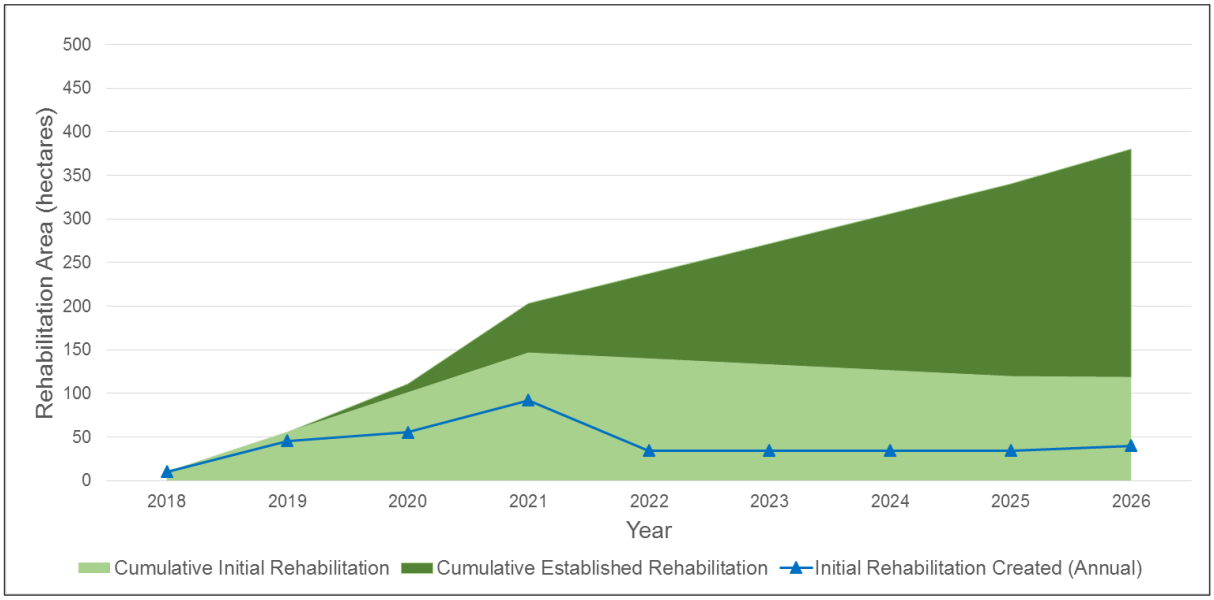
Initial rehabilitation will include levelling/reforming the infrastructure area, followed by sowing of a sterile cover crop and/or application of a dust suppressant. The MPO rail spur erosion and sediment control water management structures (e.g. sediment fences) within the footprint of Bengalla Mine will be left in place, subject to the agreement of Bengalla Mine.

4.3 REHABILITATION PROGRESS

Chart 1 provides a preliminary estimate of the progress of both initial and established rehabilitation at the MPO.

Chart 1 indicates that the progress of initial and established rehabilitation is highly subject to the planned progress of mining activities and the relative waste rock volumes generated. The area of rehabilitation achieved will initially be lower, followed by a period of rapid establishment of larger areas of rehabilitation once significant portions of the out of pit emplacement external batters are available at final surface level. As the MPO progresses, the rate of rehabilitation establishment will stabilise as a more steady state is achieved and mining advances at full scale behind the established South Pit Eastern Out of Pit Emplacement.

Chart 1
Preliminary Estimate of Rehabilitation Progress



Note: Timing subject to confirmation of mining rate and emplacement geometry in the MOP/RMP and may vary due to factors outside of MACH Energy's control (e.g. climatic extremes).

As required by the *ESG3: Mining Operations Plan (MOP) Guidelines* (DRE, 2013), the MOP/RMP will report on and schedule specific rehabilitation activities to be undertaken over subsequent MOP/RMP terms.

To track rehabilitation progress, the MOP/RMP will also include quantitative values of the total disturbance area and total rehabilitation area at the start and at the end of each year of the MOP/RMP term. The MOP/RMP will also include supporting plans showing the progression of rehabilitation over the MOP/RMP term, which will be prepared in accordance with the plan requirements of the MOP Guidelines.

5 REVIEW AND IMPROVEMENT OF ENVIRONMENTAL PERFORMANCE

5.1 ANNUAL REVIEW

In accordance with Condition 3, Schedule 5 of Development Consent DA 92/97, MACH Energy will review and evaluate the environmental performance of the MPO by the end of March each year (for the preceding calendar year), or other such timing as agreed by the Secretary of the DPE.

In relation to rehabilitation, the Annual Review will:

- include a summary of rehabilitation monitoring undertaken in accordance with the MOP/RMP in the past year;
- identify any rehabilitation activities undertaken over the past year;
- identify any rehabilitation related non-compliance over the past year, and describe what actions were (or are being) taken to ensure compliance; and
- describe what rehabilitation activities will be implemented over the next year to improve the environmental performance of the MPO.

The Annual Review will be made publicly available on the MACH Energy website in accordance with Condition 11, Schedule 5 of Development Consent DA 92/97.

5.2 REHABILITATION STRATEGY REVISION

In accordance with Condition 4, Schedule 5 of Development Consent DA 92/97, this Rehabilitation Strategy will be reviewed, and if necessary revised (to the satisfaction of the Secretary of the DPE), within three months of the submission of:

- an Annual Review (Condition 3, Schedule 5);
- an incident report (Condition 7, Schedule 5);
- an Independent Environmental Audit (Condition 9, Schedule 5); and
- any modification to the conditions of Development Consent DA 92/97.

Within four weeks of conducting any such revision, MACH Energy will advise the Secretary of the DPE of the outcomes of the review, and submit any revised documents to the Secretary of the DPE for approval.

In accordance with Condition 4A, Schedule 5 of Development Consent DA 92/97, MACH Energy may submit a revised Rehabilitation Strategy for the approval of the Secretary at any time, and may also submit any revision to this Rehabilitation Strategy required under Development Consent DA 92/97 on a staged basis.

If agreed with the Secretary of the DPE, a revision to this Rehabilitation Strategy required under Development Consent DA 92/97 may be prepared without undertaking consultation with all parties nominated under the relevant Condition of Development Consent DA 92/97.

This Rehabilitation Strategy will be made publicly available on the MACH Energy website, in accordance with Condition 11, Schedule 5 of Development Consent DA 92/97.

6 REHABILITATION MONITORING AND RESEARCH

Monitoring of rehabilitation areas at the MPO is described in detail in the MOP/RMP. Rehabilitation monitoring will utilise the principles of a systems-based approach (e.g. Landscape Function Analysis [Tongway and Ludwig, 2011] or similar) to determine progress towards a self-sustaining ecosystem and compare the conditions of the rehabilitated areas with representative control sites. In the areas designated for native revegetation (Figures 3 and 4), Landscape Function Analysis will be supplemented with floristic monitoring and compared to vegetation benchmark completion criteria for the targeted PCTs.

Detailed performance indicators and completion criteria have been developed to assess rehabilitation success at the MPO and are provided in the MPO MOP/RMP. The performance indicators and completion criteria set have been developed in consideration of the MOP Guidelines; the six principles of the National standards for the practice of ecological restoration in Australia (Society for Ecological Restoration Australasia [SERA], 2018) and include quantitative benchmark values for the relevant plant community types to be established in MPO rehabilitation areas. The benchmark values have been included in the absence of data from analogue/reference sites which are representative of the MPO rehabilitation areas. Once a data set, collected over a number of monitoring campaigns, from the relevant reference sites has been obtained, the benchmark values will be revised to reflect the local reference site data.

Monitoring will inform the need for corrective actions/contingency measures, described in the MOP/RMP. Section 9 of the MOP/RMP includes a Trigger Action Response Plan which includes a description of the contingency measures that would be undertaken should rehabilitation monitoring indicate that a rehabilitation area is not trending towards its relevant completion criteria, and measures that would be undertaken in response to the occurrence of risk event. The status of rehabilitation may be evaluated using recognised frameworks such as the ‘Progress Evaluation Recovery Wheel’ (SERA, 2018).

As part of the rehabilitation program, MACH Energy will undertake research trials at the MPO as described in the MOP/RMP. These research trials will focus on research and management practices which are designed to enhance the woodland communities established across the rehabilitated landscape. MACH Energy proposes to build on industry research results to re-establish woodland in rehabilitated areas. MACH Energy will also conduct investigations (including soil testwork) to assess the characteristics of replaced soil and assess its suitability for rehabilitation of Class 4, 5 and 6 Land Capability agricultural lands, as determined by a Certified Professional Soil Scientist. The outcomes of the rehabilitation trials will be used to refine the rehabilitation program at the MPO described in the MOP/RMP.

7 REFERENCES

Department of Environment and Climate Change (2008*) Managing Urban Stormwater: Soils and Construction Volume 2*.

EMGA Mitchell McLennan (2010) *Mount Pleasant Project Modification Environmental Assessment Report.* Prepared for Coal & Allied Operations Pty Ltd.

Environmental Resources Management Mitchell McCotter (1997) *Mount Pleasant Operation Environmental Impact Statement.*

Huxtable, HCA. Koen, TB. and Waterhouse, D. (2005) 'Establishment of native and exotic grasses in mine overburden and topsoil in the Hunter Valley, New South Wales'. *The Rangeland Journal*. CSIRO Publishing. Vol. 27, p.73-88

Landcom (2004) *Managing Urban Stormwater: Soils and Construction Volume 1, 4th Edition*. New South Wales Government.

MACH Energy Australia Pty Ltd (2017a) *Mount Pleasant Operation (DA 92/97) – South Pit Haul Road Modification*.

MACH Energy Australia Pty Ltd (2017b) *Mount Pleasant Operation – Mine Optimisation Modification Environmental Assessment.*

MACH Energy Australia Pty Ltd (2017c) *Mount Pleasant Operation – Rail Modification.*

MACH Energy Australia Pty Ltd (2017d) *Mount Pleasant Operation – Mine Optimisation Modification Response to Submissions.*

New South Wales Mineral Council (2007) *Rehabilitation by Design Practice Notes*.

New South Wales Trade and Investment Regional Infrastructure and Services – Division of Resources and Energy (2013) *ESG3: Mining Operations Plan (MOP) Guidelines*.

Office of Environment and Heritage (2012) *The land and soil capability assessment scheme: second approximation - a general rural land evaluation system for New South Wales*. Department of Premier and Cabinet. Sydney, NSW. ISBN 978 1 74293 634 5

Office of Environment and Heritage (2018) *Bionet Vegetation Classification*. Accessed 31 October 2018. https://www.environment.nsw.gov.au/NSWVCA20PRapp/search/pctsearch.aspx

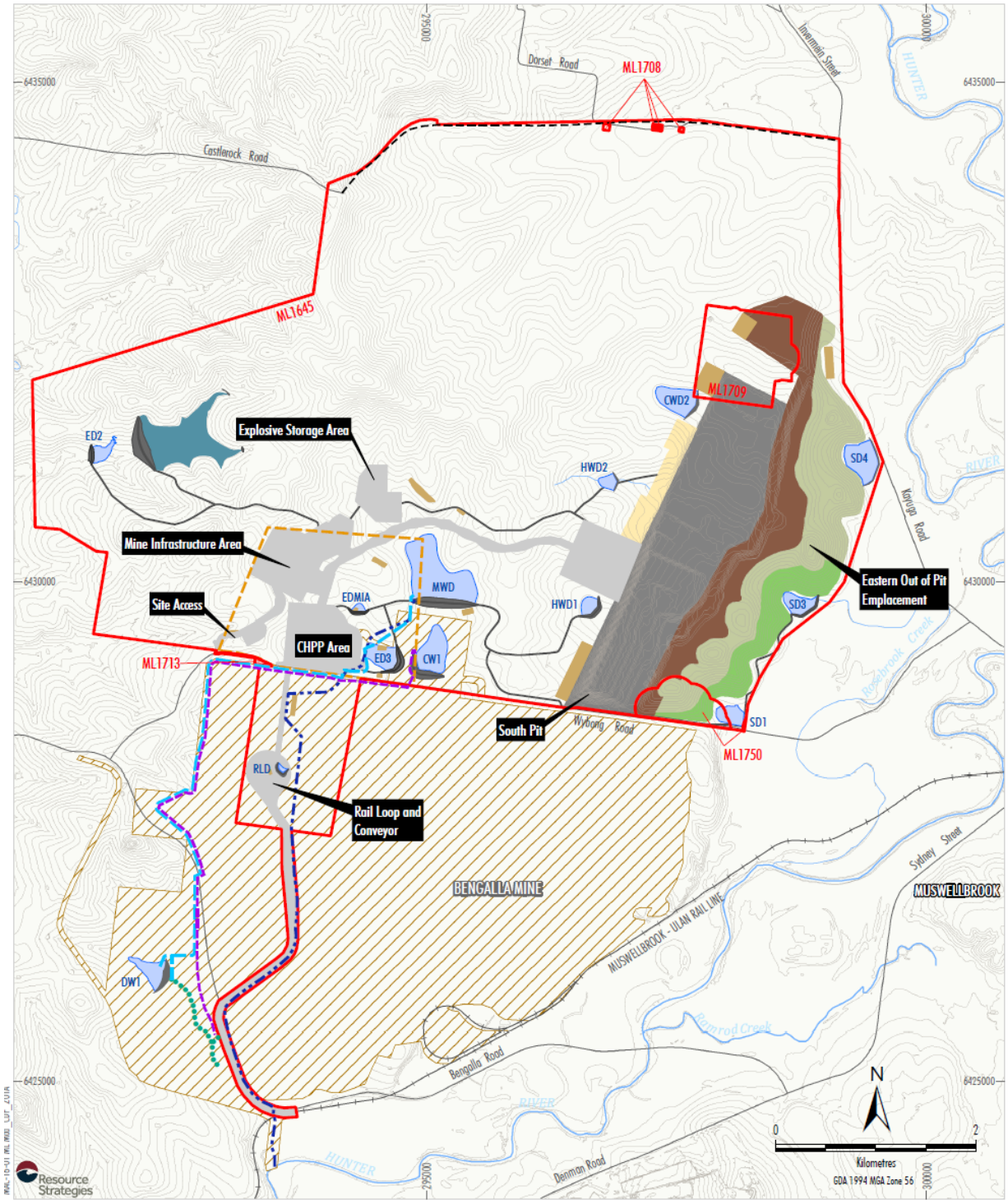
Society for Ecological Restoration Australasia (2018) *National Standards for the Practice of Ecological Restoration in Australia*. Second Edition.

Tongway, D. J. & Ludwig, J. A. (2011) *Restoring disturbed landscapes, putting principles into practice.* Washington: Society for Ecological Restoration International, Island Press.

ATTACHMENT 1

APPENDIX 2 OF DEVELOPMENT CONSENT DA 92/97

APPENDIX 2
FIGURE 1 - CONCEPTUAL PROJECT LAYOUT PLAN AT 2021



LEGEND

- Mining Lease Boundary
- Bengalla Mine Approved Disturbance Boundary (SSD-5170)
- Infrastructure Area Envelope
- Active Stripping Area
- Active Mining Area
- Active Overburden Emplacement Area
- Topsoil Stockpile
- Initial Rehabilitation
- Established Rehabilitation
- Infrastructure and Borrow/Stockpile Area
- Access Road
- Northern Link Road

Indicative Water Pipeline Alignment

- MPO Hunter River Supply Pipeline
- MPO DW1 Pipeline (Bi-directional)
- Bengalla Mine CW1 Pipeline
- Approximate Extent of Scour Protection
- Water Dam
- Fines Emplacement Area

Source: NSW Land & Property Information (2017); NSW Division of Resources & Energy (2017); MACH Energy (2017)

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FIGURE 2 - CONCEPTUAL PROJECT LAYOUT PLAN AT 2025

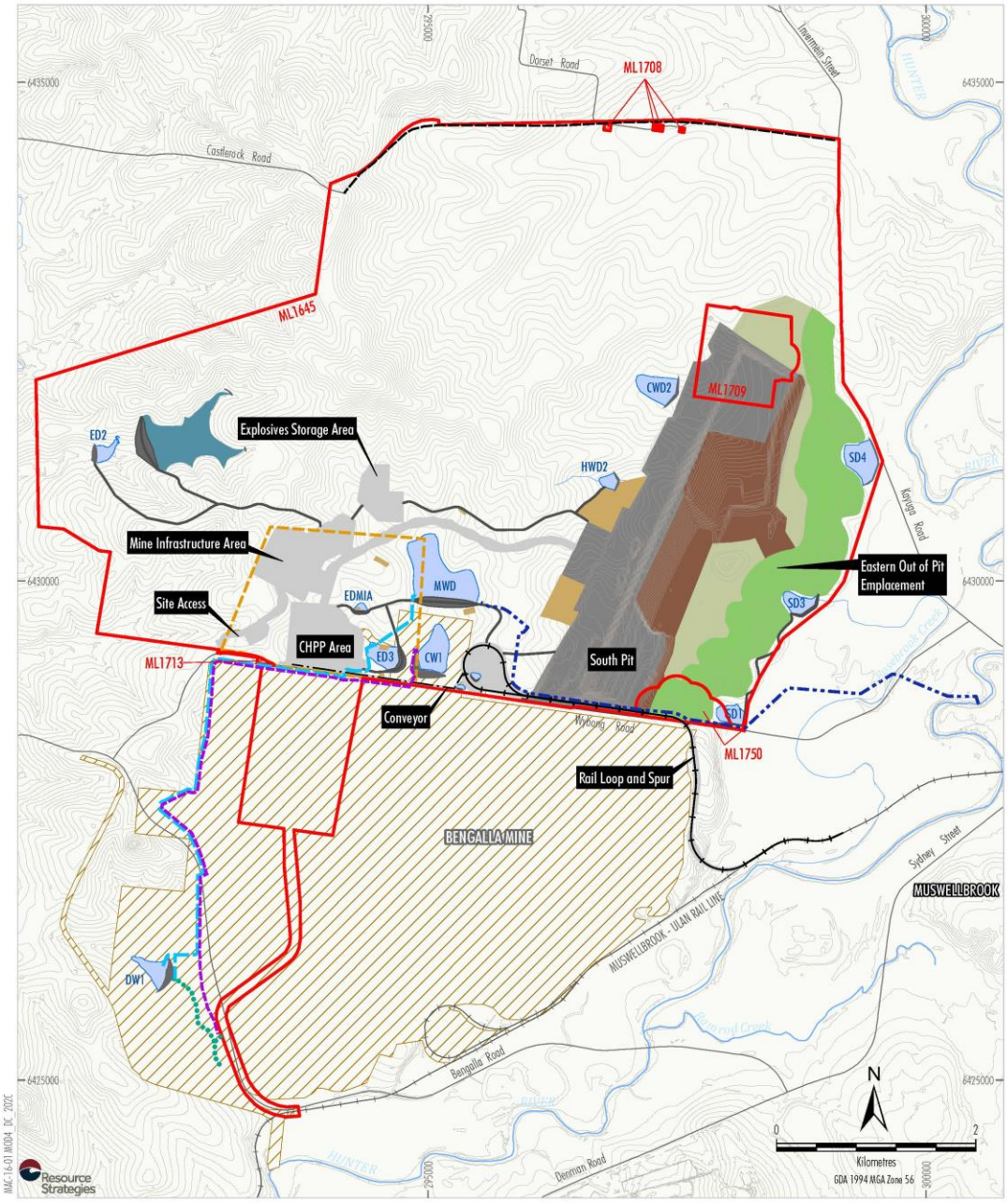
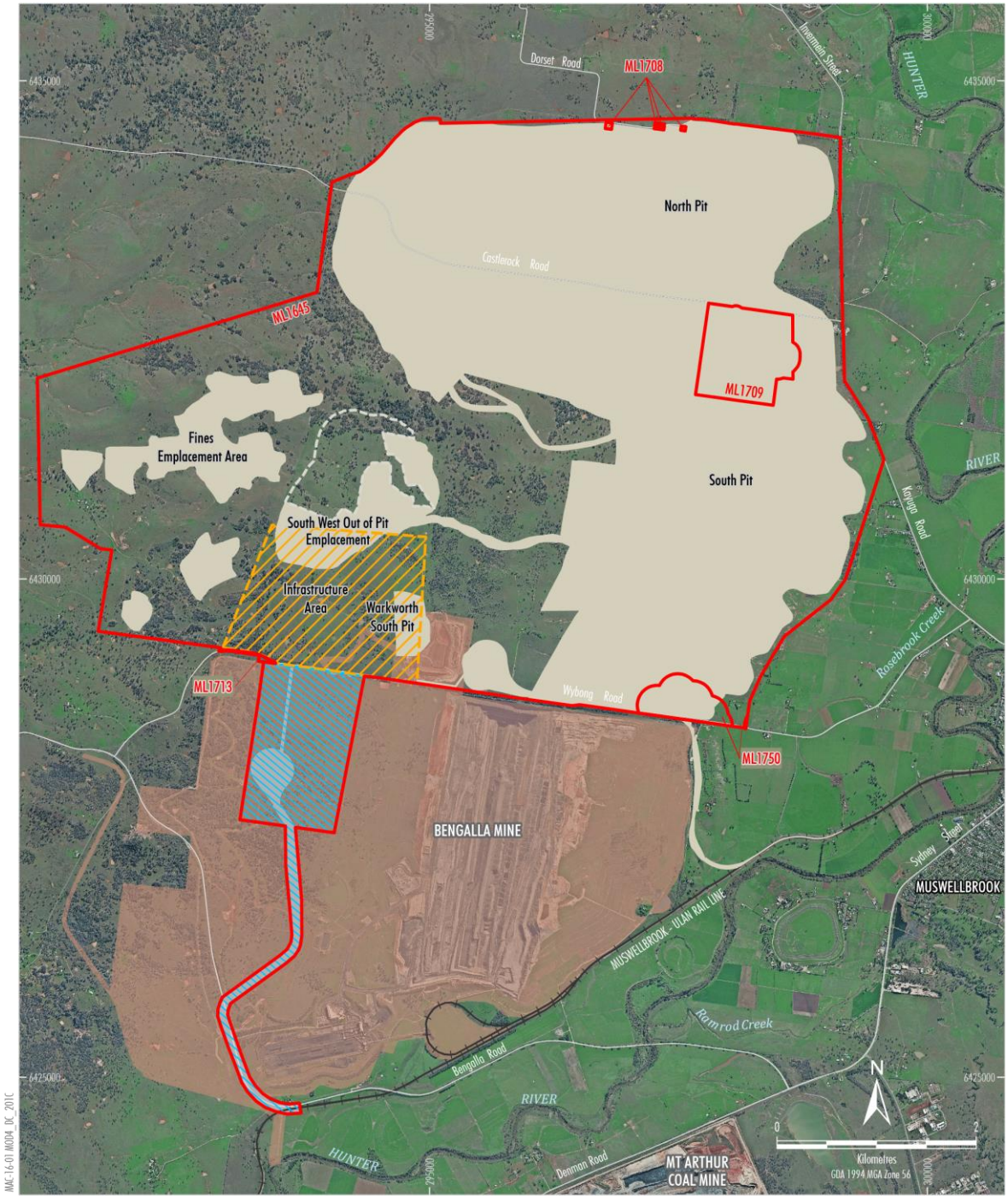


FIGURE 3 - APPROVED SURFACE DISTURBANCE PLAN



LEGEND

- Mining Lease Boundary
- Approximate Extent of Approved Surface Development [1]
- Area Relinquished for Overburden Emplacement and Major Infrastructure
- Infrastructure Area Envelope
- Infrastructure to be removed under the Terms of Condition 37, Schedule 3
- Indicative Existing Coal Transport Infrastructure
- Bengalla Mine Approved Disturbance Boundary (SSD-5170)

NOTE

1. Excludes some project components such as water management infrastructure, infrastructure within the Infrastructure Area Envelope, offsite coal transport infrastructure, road diversions, access tracks, topsoil stockpiles, power supply, temporary offices, signalling, other ancillary works and construction disturbance.

Source: NSW Land & Property Information (2017); NSW Division of Resources & Energy (2018); Department of Planning and Environment (2016); MACH Energy (2017)
Orthophoto: MACH Energy (Aug 2016)

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Approved Surface Disturbance Plan

FIGURE 4 - CONCEPTUAL FINAL LANDFORM