

# MAC-ENC-MTP-047

## REHABILITATION STRATEGY



### Brief description

---

The Rehabilitation Strategy (the Strategy) is the standard for rehabilitation at Hunter Valley Energy Coal Pty Ltd (HVEC). The Strategy provides a framework for landform design and revegetation aligned with Regulator and community expectations.

The goal of the Strategy is to provide a framework to “Create a safe, stable, non-polluting and sustainable landscape that achieves the intended final land uses and is consistent with key stakeholder agreed social and environmental values.” The goal seeks to align with the Project Approval (PA) requirements, rather than disparaging their purpose.

### Key contact

---

Document Writer – Environment Analysis and Improvement (east)

Document Owner – Manager Environment, Analysis and Improvement (east)

Document Approver – Head of Health, Safety and Environment Business Partnership

Document authorisation is located in Appendix 1.

# MAC-ENC-MTP-047

## REHABILITATION STRATEGY



### Content

<b>Intent</b>	<b>4</b>
<b>Application</b>	<b>4</b>
<b>Abbreviations</b>	<b>4</b>
<b>Definitions</b>	<b>5</b>
<b>1 Introduction</b>	<b>6</b>
<b>2 Project area</b>	<b>8</b>
<b>3 Domains</b>	<b>13</b>
3.1 Open Cut Void	13
3.2 Infrastructure Areas	13
3.3 Tailings Storage Facilities	14
3.4 Overburden Emplacement Areas	14
3.5 Water Management Areas	14
3.6 Non Operational Lands and Rehabilitation Areas	14
3.7 Final Void	15
3.8 Rehabilitation Area - Pasture	15
3.9 Rehabilitation Area - Woodland	16
3.10 Offset Areas	17
<b>4 Rehabilitation goal, objectives, completion criteria and performance indicators</b>	<b>18</b>
4.1 Hierarchy of the Mt Arthur Coal rehabilitation process	18
4.2 Goal	19
4.3 Process to achieve rehabilitation success	19
<b>5 Consultation with stakeholders</b>	<b>23</b>
<b>6 Rehabilitation strategy key components</b>	<b>23</b>
6.1 Planning	24
6.2 Final Voids	24
6.3 Overburden Emplacement Areas	25
<b>7 Surface Water Management</b>	<b>39</b>
7.1 Erosion and rock armouring	46
7.2 Peak flow assessment	46
<b>8 Characterisation of soils and overburden</b>	<b>47</b>
<b>9 Clearing and reuse of vegetation</b>	<b>48</b>
<b>10 Revegetation</b>	<b>48</b>
<b>11 Rehabilitation Management Plan</b>	<b>49</b>
<b>12 Management and monitoring</b>	<b>50</b>
<b>13 Review of the strategy</b>	<b>50</b>
<b>14 Bibliography</b>	<b>51</b>

# MAC-ENC-MTP-047

## REHABILITATION STRATEGY



<b>Appendix 1 - Document Control Authorisation .....</b>	<b>52</b>
<b>Appendix 2 – Regulatory conditions .....</b>	<b>53</b>
<b>Appendix 3 – Mt Arthur Coal Rehabilitation Program completion criteria .....</b>	<b>56</b>
<b>Appendix 4 – Topography erosion factors .....</b>	<b>59</b>
<b>Appendix 5 – Correspondence records .....</b>	<b>63</b>

### List of Figures:

---

Figure 1: Rehabilitation process feedback loop for Mt Arthur Coal	7
Figure 2: Mt Arthur Coal Site Location	10
Figure 3: Diagrammatic representation of the post mining landscape	11
Figure 4: Diagrammatic representation of the post mining land use capability	12
Figure 5: Visual assessment locations for landform design montage figures	28
Figure 6: Predicted view of landform from Muswellbrook Racecourse:	30
Figure 7: Predicted view of landform from Denman Rd:	32
Figure 8: Predicted view of landform from Golden HWY:	34
Figure 9: Predicted view of landform from Yammanie Road Muswellbrook:	36
Figure 10: Predicted view of landform from Ironbark Road Muswellbrook:	38
Figure 11: Proposed Final Landform Drainage Plan overview showing geofluv detail	41
Figure 12: Proposed Final Landform Drainage Plan showing inset locations	42
Figure 13: Proposed Final Landform Drainage Plan east inset	43
Figure 14: Proposed Final Landform Drainage Plan north inset	44
Figure 15: Proposed Final Landform Drainage Plan west inset	45

### List of Tables:

---

Table 1: Mt Arthur Coal pasture seed mix	16
Table 2: Mt Arthur Coal Native Woodland Seed Mix	17
Table 3: Mt Arthur Coal Box Gum Woodland Seed Mix	17
Table 4: Rehabilitation objectives, performance indicators and completion criteria	21

### Intent

The Mt Arthur Coal Rehabilitation Strategy (the Strategy) has been developed to address Condition 42 of Schedule 3 of Project Approval 09\_0062 MOD 1 Mt Arthur Coal Mine – Open Cut Modification Project dated 26 September 2014 (the Project Approval) which was issued to Hunter Valley Energy Coal Pty Ltd (HVEC) by the NSW Department of Planning and Environment (DPE).

The Strategy was developed using guidance from state and federal government guidelines and stakeholder consultation. The goal of the Strategy is to provide a framework to “Create a safe, stable, non-polluting and sustainable landscape that achieves the intended final land uses and is consistent with key stakeholder agreed social and environmental values” in accordance with the requirements of the Project Approval. Furthermore

### Application

This Standard applies to the following:

- All Mt Arthur Coal employees and contract staff
- All partnering contractor company representatives
- All subcontractor company representatives.

### Abbreviations

<b>AEMR</b>	Annual Environmental Management Report
<b>ARA</b>	Annual Rapid Assessment
<b>BMP</b>	Biodiversity Management Plan
<b>DPE</b>	NSW Department of Planning and Environment
<b>DRE</b>	Division of Resources and Energy
<b>EA</b>	Ecological Assessment
<b>EMS</b>	Environmental Management System
<b>FLDP</b>	Future Landscape Design Project
<b>HSE</b>	Health, Safety and Environment
<b>HVEC</b>	Hunter Valley Energy Coal Pty Ltd
<b>MAC</b>	Mt Arthur Coal
<b>MOP</b>	Mining Operations Plan
<b>RFFET</b>	Regional Flood Frequency Estimation Tool
<b>RL</b>	Relative Level
<b>RMP</b>	Rehabilitation Management Plan
<b>TARP</b>	Target Action Response Plan
<b>TEC</b>	Threatened Ecological Community

### Definitions

**Hunter Valley Energy Coal Pty Ltd** - operates the Mt Arthur Coal Complex which consists of the approved open cut mining operations, a rail loop and associated rail loading facilities and the Mt Arthur Underground Project (MP 06\_0091).

**Future Landscapes Design Project** - The FLDP was a project undertaken to investigate, develop and deliver a landform that would align with community expectations and improvements in landform design. A report by Landloch Pty Ltd (2014) was written to capture the Phase 1 (research and design options) findings of the project which have now been incorporated into the Applied Geofluv™ landform approach.

**Applied Geofluv™** - The Applied Geofluv™ approach (Geofluv) uses the characteristics of stable natural alluvial landforms in the local environment as an analogue on which to base the design of overburden landforms. Importantly, the approach does not replicate existing landforms, but rather uses the key characteristics that make these landforms stable in the design.

**The Project Approval** - Project Approval 09\_0062 MOD 1 Mt Arthur Coal Mine – Open Cut Modification Project dated 26 September 2014.

**Rehabilitation Management Plan (RMP) / Mining Operations Plan (MOP)** - The Rehabilitation Management Plan meets the requirements of Condition 44 of the Mt Arthur Coal Modification Project PA 09\_0062 MOD 1 under Section 75W of the Environmental Planning and Assessment Act 1979 (EP&A Act). Condition 44 requires the project proponent to prepare and implement a Rehabilitation Management Plan for the Project. The RMP has been integrated into the MOP which is required by the Division of Resources and Energy.

## 1 Introduction

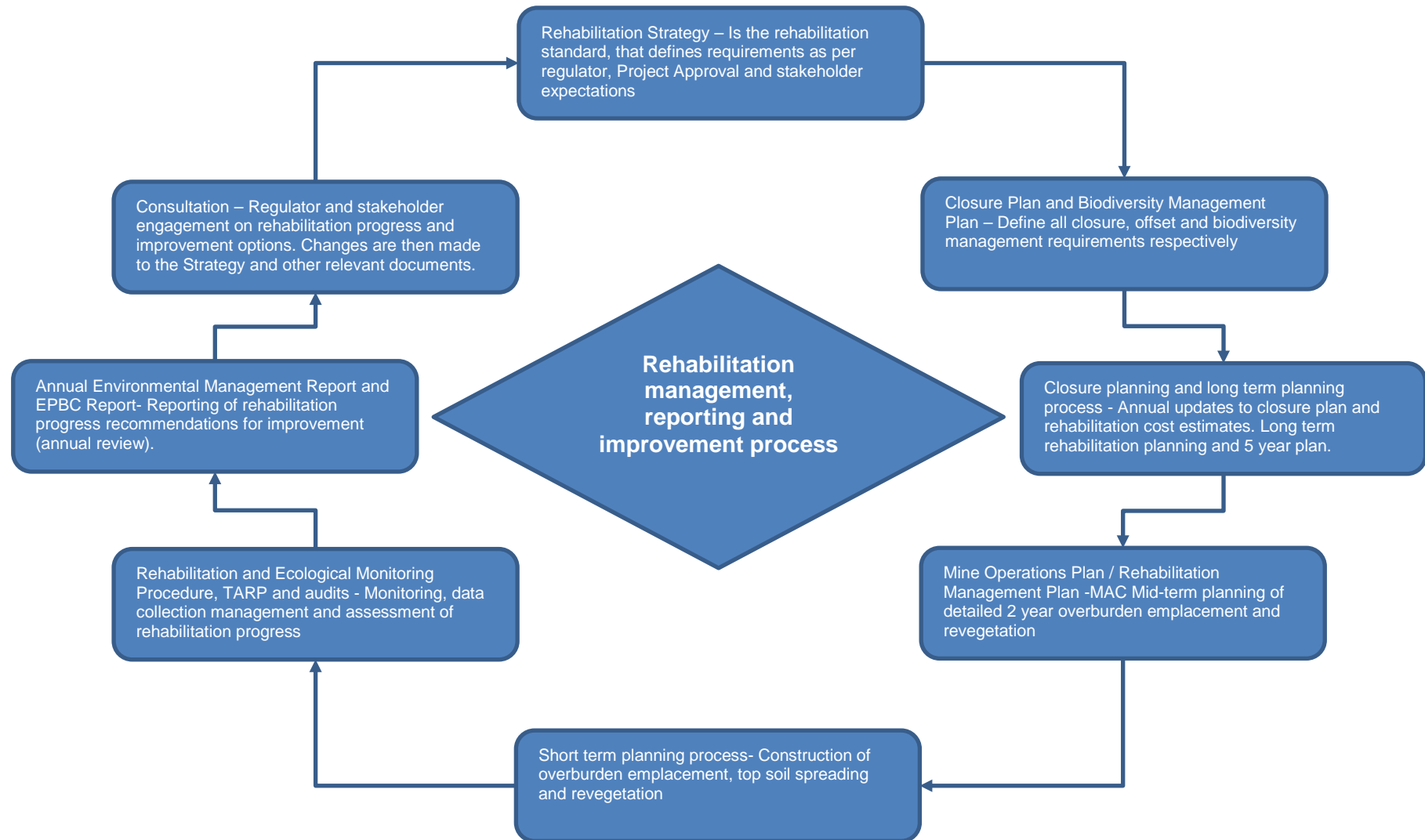
The Strategy has been developed taking into account the Australian Government handbook for Leading Practice Sustainable Development Program for the Mining Industry, Mine Rehabilitation 2016. The Strategy provides the overarching standard for decision making in terms of rehabilitated landscape and complements the Mt Arthur Coal Conceptual Mine Closure Plan. The Rehabilitation Management Plan / Mining Operations Plan (MOP), Biodiversity Management Plan, and other relevant plans provide further specific details for management and monitoring of rehabilitation aspects at Mt Arthur Coal. Appendix 2 provides a guide to the relevant Project Approval conditions that pertain to the Strategy.

The rehabilitation process at Mt Arthur Coal (Figure 1), is as follows:

- the Strategy is a business level document that prescribes the overall rehabilitation approach at Mt Arthur Coal, including the goal, objectives, and criteria for rehabilitation, that the Closure Plan, Rehabilitation Management Plan, Biodiversity Management Plan and Rehabilitation and Ecological Monitoring Procedure are based upon;
- The closure planning process develops life of asset design that incorporates emplacements, voids and rehabilitation.
- the long-term mine planning process updates the mining plan, for the five year planning horizon;
- the mid-term planning process adds the detail for the first two years of the 5 year plan, which is included in the MOP therefore integrating The Strategy with the five year mining plan;
- the short term planning process involves the landform emplacement, shaping, top soiling, seeding and or planting generally on a one to two year timeframe.
- monitoring and management of the rehabilitation is managed through the Rehabilitation and Ecological Monitoring Procedure process. These monitoring and management processes are the primary action to ensure rehabilitation is functioning as stated in the Strategy and the MOP.
- the information from the monitoring and management is then presented in the Annual Environment Management Report (AEMR). Opportunities for improvement identified through the monitoring process are also presented in the AEMR and relevant plans updated as required.

# MAC-ENC-MTP-047

## REHABILITATION STRATEGY



**Figure 1: Rehabilitation process feedback loop for Mt Arthur Coal**

Version 1.1 (26.05.2017)

Revalidation date: Event based or three years from revision date

NSW Energy Coal (printed copies are uncontrolled)

# MAC-ENC-MTP-047

## REHABILITATION STRATEGY



In 2013, Mt Arthur Coal instigated a report into the Future landscapes design project (FLDP). The Landloch Pty Ltd (2014) FLDP report set out to research a rehabilitation landform design that would address stakeholder requirements for both functionality and aesthetics. To do this, the project used material characterisation and runoff/erosion modelling to develop landform "rules" that Mt Arthur Coal could use to develop acceptable designs. Landform evolution modelling was then used to assess and refine the designs. The outcomes of the Landloch Pty Ltd FLDP report were used for the development of a geomorphological design using the Applied Geofluv™ landform approach (Geofluv), as further described in this Strategy.

This Strategy has been developed to ensure that the post mining landform supports the selected agricultural post-mining landuses and enhancing habitat value of the woodland areas integrated into the wider agricultural landscape. Due consideration to visual amenity has been integrated into the Strategy, together with minimisation of visual impact during mining operations, and blending the post-mining landform with surrounding un-mined topography. The post-mining landform will also allow for grazing in selected areas, with the re-establishment of land capability classes generally equivalent to pre-mining.

The Strategy also aims to increase native woodland areas at the end of mine life, and enhance regional habitat linkages between remnant onsite native vegetation communities, offset areas, rehabilitated mined land and offsite vegetation areas. This is consistent with the general vegetation strategies found in the Synoptic Plan, which is currently under review. Following community and stakeholder consultation, the Strategy generally reflects community expectations for the final landform design and rehabilitation.

Land use options are a dynamic aspect of mine rehabilitation due to changing expectations and technology. Landforms need to be designed with future land use in mind but are limited by the information and approvals available at any point in time. Mt Arthur Coal use strategic consultation and engagement to maintain up to date landform design and land use.

The MacLeans emplacement area has been used explicitly through this document to showcase the Geofluv approach and the design has been included in the Strategy. The Geofluv approach shown in the Strategy will be applied to emplacements where the design meets requirements for stability, rehabilitation and approved land uses. Design and construction of emplacement areas following the Project Approval Mod1 will be continued using the same Geofluv approach where appropriate. Pre-Project Approval emplacements will not be retrospectively modified to include Geofluv design or other natural relief. The design is expected to evolve with experience and monitoring of the emplacements and therefore the design shown in the Strategy is indicative only. Updated designs for remaining emplacements will be included in subsequent revision of the Strategy, which will be submitted to DPE in 2018 for review and approval.

Mt Arthur Coal has a firm commitment to minimising the impact of its operations on the environment and community, and has a comprehensive Environmental Management System (EMS) in place to fulfil this commitment. This Strategy is a component of the Mt Arthur Coal EMS. Further detailed procedures relating to rehabilitation to support this Strategy are outlined in the MOP (which satisfies the requirement for a Rehabilitation Management Plan under Schedule 3 Condition 44 of PA09\_0062 MOD1), the Conceptual Mine Closure Plan, the Biodiversity Management Plan and Mt Arthur Coal's Rehabilitation and Ecological Monitoring Procedure (MAC-ENC-PRO-080).



# MAC-ENC-MTP-047

## REHABILITATION STRATEGY

### 2 Project area

The Mt Arthur Coal Complex is located in the Upper Hunter Valley, NSW approximately five kilometres south west of Muswellbrook (Figure 2).

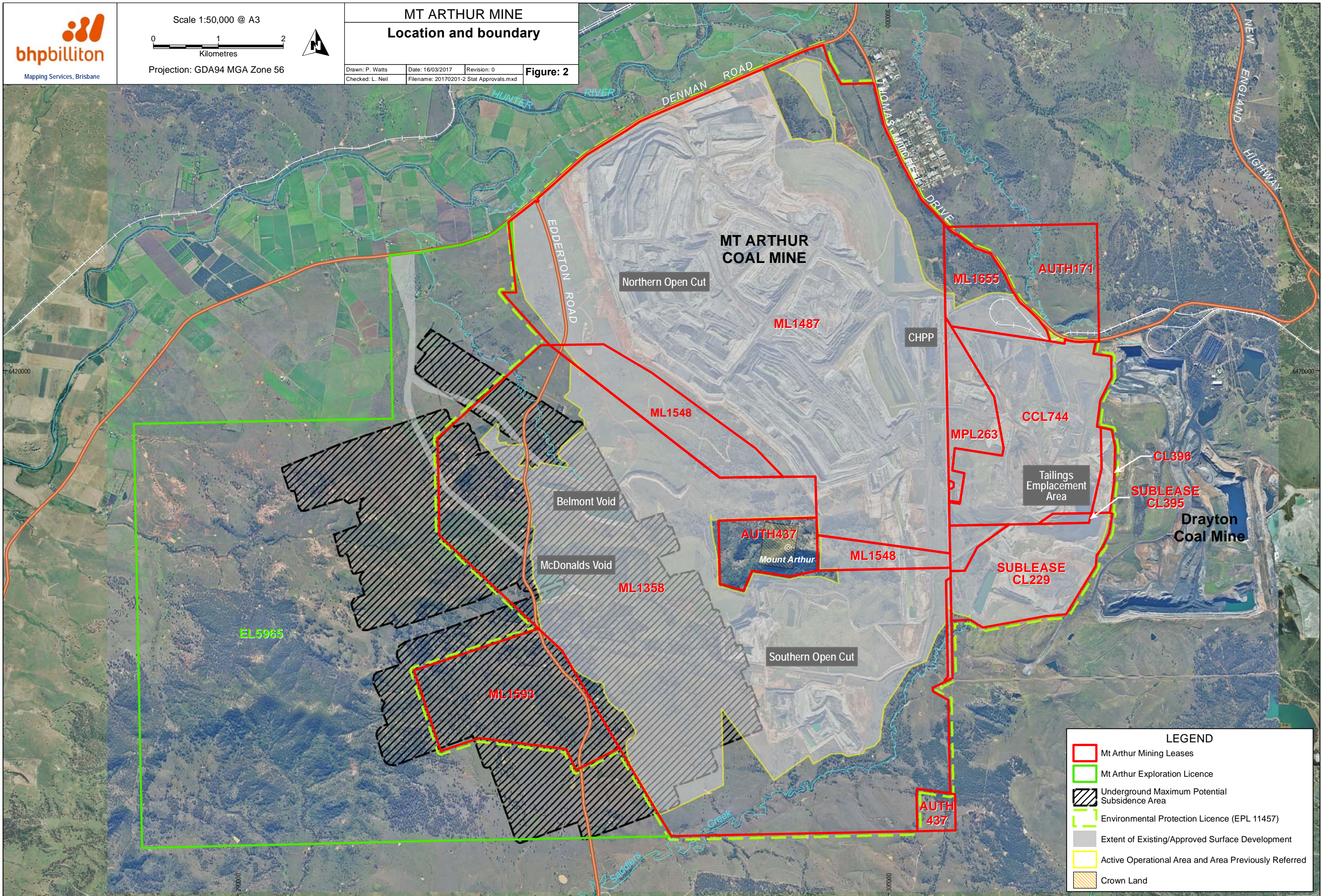
Figure 3 provides a diagrammatic representation of the post mining landscape of the Project Approval area and surrounding lands which remains generally in accordance with the concept strategy depicted in Appendix 7 of the Project Approval.

Figure 4 provides a diagrammatic representation of the post mining land capabilities and land uses of the Project Approval area and surrounding lands which reflects Mt Arthur Coal's commitment to achieve post mining land capabilities that are comparable to pre-mining land capabilities and remains generally in accordance with the requirements of the Project Approval.



**MT ARTHUR MINE**  
**Location and boundary**

Drawn: P. Watts    Date: 16/03/2017    Revision: 0    **Figure: 2**  
Checked: L. Neil    Filename: 20170201-2 Stat Approvals.mxd



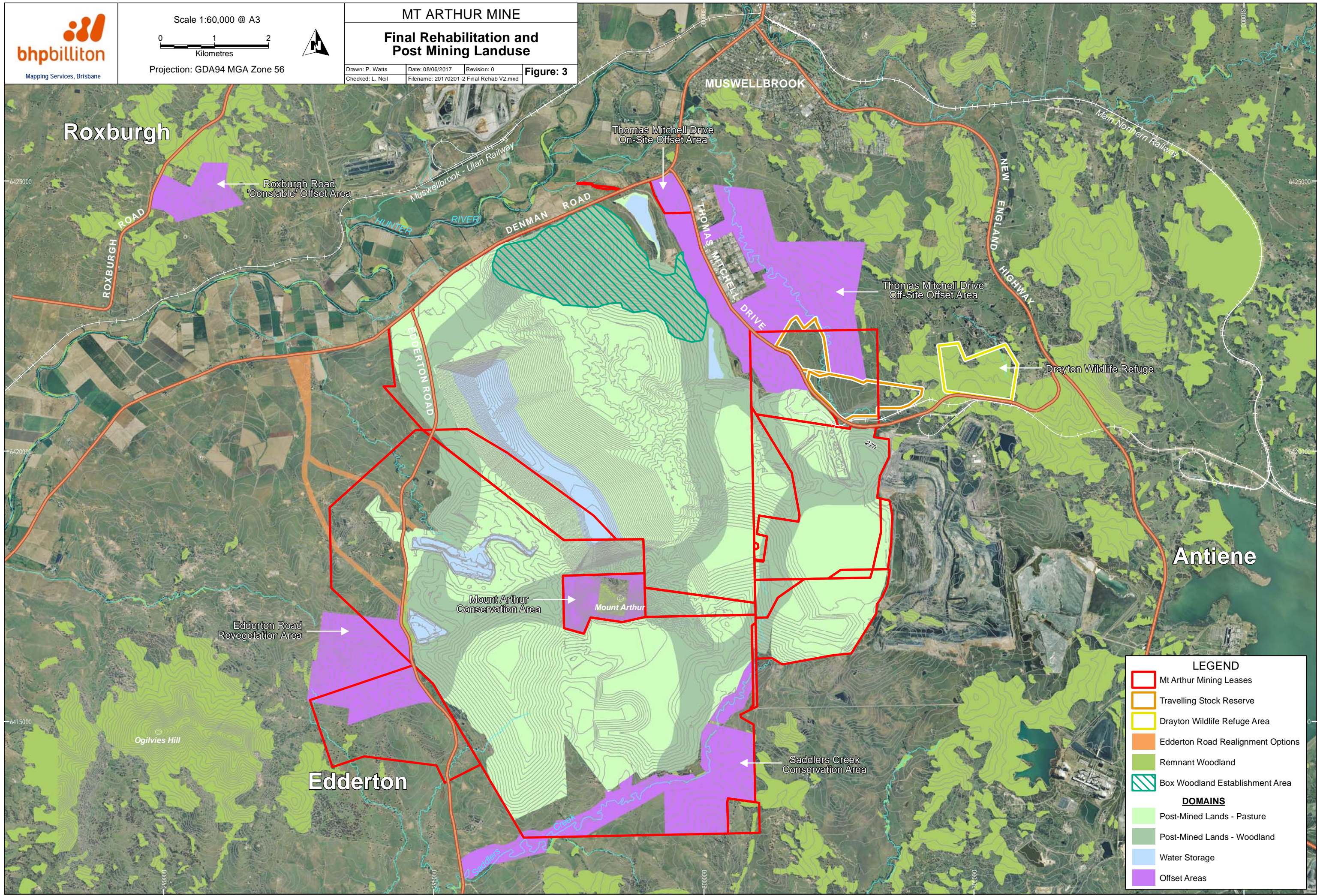
**LEGEND**

- Mt Arthur Mining Leases
- Mt Arthur Exploration Licence
- Underground Maximum Potential Subsidence Area
- Environmental Protection Licence (EPL 11457)
- Extent of Existing/Approved Surface Development
- Active Operational Area and Area Previously Referred
- Crown Land



**MT ARTHUR MINE**  
**Final Rehabilitation and Post Mining Landuse**

Drawn: P. Watts Date: 08/06/2017 Revision: 0  
Checked: L. Neil Filename: 20170201-2 Final Rehab V2.mxd **Figure: 3**

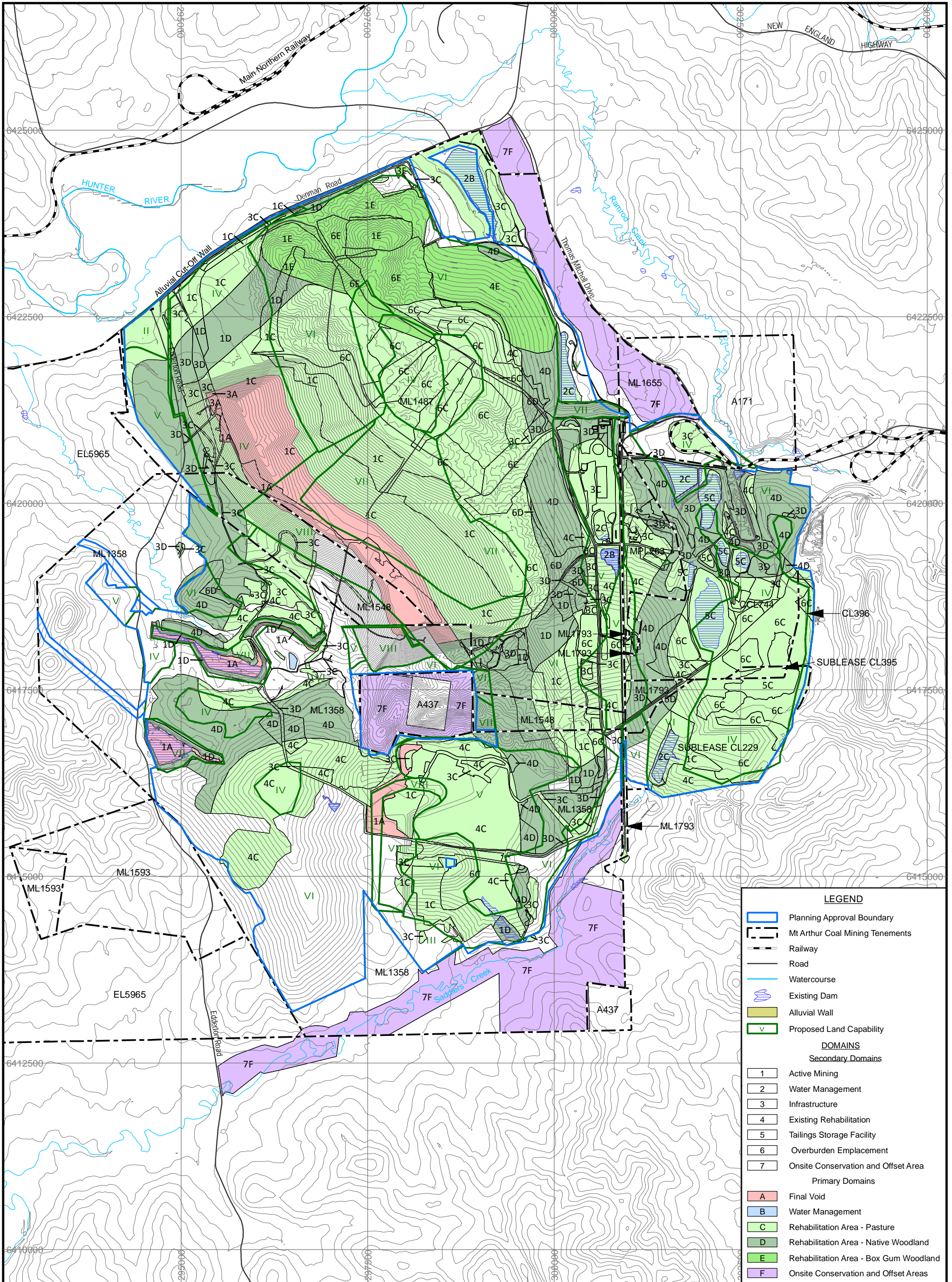


**LEGEND**

- Mt Arthur Mining Leases
- Travelling Stock Reserve
- Drayton Wildlife Refuge Area
- Edderton Road Realignment Options
- Remnant Woodland
- Box Woodland Establishment Area

**DOMAINS**

- Post-Mined Lands - Pasture
- Post-Mined Lands - Woodland
- Water Storage
- Offset Areas



### 3 Domains

To assist in defining the lands requiring rehabilitation under this Strategy, the mine site has been divided into domains based on current (mining) and final landuse. A domain can be defined as a land management unit within a mine site, with similar geophysical characteristics. Domains may require different rehabilitation methods to achieve the intended post-mining land use, for example tailings storage facilities (TSF) may not be suitable for woodland rehabilitation due to roots creating a pathway for water into the capped TSF. A diagrammatic representation of the final landform and landuse is provided in Figure 3. The domains have been taken from the Project Approval and are:

#### Mining and Rehabilitation domains (Secondary)

- Open Cut Void;
- Overburden Emplacement;
- Infrastructure Areas;
- Tailings Storage Facility;
- Water Management;
- Rehabilitated areas; and
- Non-operational lands.

#### Post mining land use domains (Primary)

- Final Void;
- Rehabilitation Area – Pasture;
- Rehabilitation Area – Native Woodland;
- Rehabilitation Area – Box Gum Woodland; and
- Offset Areas.

#### 3.1 Open Cut Void

Areas of open cut void will become overburden emplacement areas as the mine progresses minimising the total void area unless other options are chosen after a void plan is developed. At the end of mine life, open cut void areas will be in either the final void, rehabilitation area – pasture, rehabilitation area – native woodland, rehabilitation area – box gum woodland or water management domains.

#### 3.2 Infrastructure Areas

All surface infrastructure at the Mt Arthur Coal Complex will be removed from the site unless a post-mining land use has been identified and approved by DRE. Disturbed areas associated with existing infrastructure will be managed and revegetated generally in accordance with the techniques discussed in Table 5-1 of the 2013 Environmental Assessment (EA) and aligned with the Strategy.

### 3.3 Tailings Storage Facilities

The rehabilitated TSF will be integrated into the total mine landform and revegetation process. As an example the TSF located in the Bayswater No. 2 and Drayton Sub lease Areas will be integrated with other rehabilitation in the Drayton Sub-lease area to form an elevated landform. Revegetation of TSFs will be completed after final capping is complete. The design of the capping layer will focus on both sealing the underlying material and creating suitable conditions (based on the characterisation of the tailings and capping materials) for sustainable vegetation establishment. TSFs will be protected from incompatible land use activities such as over grazing.

### 3.4 Overburden Emplacement Areas

As noted in Section 5.1.1 of the 2013 EA, the overall objective of the rehabilitation program is to achieve landuse capability following the cessation of mining that is comparable to pre-mining landuse and considers stakeholder's interests. Additionally, it is proposed to increase the percentage of native woodland to improve habitat value with minimum areas defined in the Biodiversity Management Plan, which also aligns with stakeholder interests. Ongoing investigation into final land use including the opportunity of further woodland planting will be updated to the strategy as investigations are completed.

The key components of the final proposed landform as defined in the EA pertaining to the areas of active mining and overburden emplacement include:

- Mt Arthur North overburden emplacement height to an average of RL 360m (maximum height of RL 375m AHD to create visual relief on the overburden emplacement area);
- Bayswater No 3 (Saddlers Pit) overburden emplacement height up to RL 250 m AHD;
- Drayton sub-lease emplacement area up to RL 290m AHD (part of South Pit extension);
- Development of out-of-pit overburden emplacement areas up to RL 360m AHD.

The MacLeans emplacement area has been used explicitly through this document to showcase the Geofluc approach. The Geofluc approach shown in the Strategy will be applied to emplacements where the design is shown to meet requirements for stability, rehabilitation, economic and approved land uses. Further detailed design of emplacement areas, to be established following the Project Approval Mod1, will be developed using the same Geofluc approach where appropriate. Updated designs for these remaining emplacements will be included in a subsequent revision of the Strategy, which will be submitted to DPE in 2018 for review and approval. Pre-Project Approval Mod1 emplacements will not be retrospectively modified to include Geofluc design or natural relief.

### 3.5 Water Management Areas

Water management areas include final water storages and drainage lines from the landforms. The final landform drainage pattern will be designed and revegetated to achieve long-term stability and erosion control, and integrate with surrounding catchments. Reconstructed creek design will include significant areas of rehabilitated overburden and other mine areas to ensure that the reconstructed channels are stable in a wide range of flows (Section 8.9.3 EA). A flood protection bund has been constructed between Denman Road and the active mining area where the topography is lower in elevation than the 1955 peak flood level in the Hunter River. The bund options will be assessed to understand if it is required post mining.

### 3.6 Non Operational Lands and Rehabilitation Areas

Non operational lands have been integrated into the offset and rehabilitation areas. The Rehabilitation Area comprises vegetation to be established over 2642 hectares of the disturbance area for open cut operations, encompassing habitat corridors and rehabilitated woodlands. These domains are to be managed to enhance habitat and corridor values during and at completion of mining.

The short to long term management and revegetation of these lands requires:

- Fencing and access control;
- Weed and vertebrate pest species management and control;
- Regeneration and revegetation works;
- Corridor establishment and management;
- Habitat augmentation;
- Track construction and maintenance;
- Strategic grazing and stock control; and
- Bushfire management.

The final adopted rehabilitation and management option for these areas will largely depend on the requirements of the Project Approval, the prevailing condition of these areas and, particularly, whether they have been cleared or contain remnant vegetation.

### 3.7 Final Void

The final voids are currently proposed to be used for water storage post-mining. Void locations and respective catchment boundaries within the conceptual final landform are shown in Figure 3. Alternate uses for the voids will be considered as part of the Final Void Management Plan to be developed and submitted by 30 June 2018. Catchment areas of the final voids will be minimised post-mining to protect against flooding from the lease area, with surface flow runoff from most rehabilitated and revegetated areas being directed to the local drainage network. All areas, with the exception of the final void catchments, will be free draining. The aim of this drainage design is to maintain effective catchment contribution and yield to the Hunter River following the cessation of mining.

A Final Void Management Plan will be prepared in accordance with regulatory requirements as part of the closure planning process to integrate the documentation of void management strategies. The final void plan will be developed by 30 June 2018 in consultation with regulators and stakeholders and may be updated as further research and stakeholder expectations change. The final void plan will be included as part of a subsequent revision to the Strategy, which will be submitted to DPE by 30 June 2018 for review and approval or in consultation with DPE a revised timeline may be made.

### 3.8 Rehabilitation Area - Pasture

Rehabilitated pasture landscapes will aim to support a financially viable and environmentally sustainable livestock grazing operation. Post-mining landuses will be consistent with surrounding landuses, and not impact on biodiversity values of adjacent woodland and offset and conservation areas. During the life of mine grazing trials will be used to ensure that the land performs as required to meet the criteria for pastures equivalent to surrounding lands.

Pasture rehabilitation areas are cultivated and broadcast sown with the pasture seed mix in a single pass. The pasture seed mix generally used by Mt Arthur Coal is shown in Table 1. This seed mix is indicative only and will be refined and specified in the MOP.

**Table 1: Mt Arthur Coal pasture seed mix**

Species	Seed mix (kg/ha)
Couch	10
Lucerne	3
Green Panic	3
Seaton Park Sub-clover	3
Haifa White Clover	3
Kikuyu	3
Wimmera Rye	7
Perennial Rye	7
Phalaris	5
Shirohie Millet (summer)	10
Oats (winter)	10

### 3.9 Rehabilitation Area - Woodland

In addition to the offset and conservation areas, State approvals require the rehabilitation / regeneration of 2642 ha of woodland corridors on open cut mining disturbed land. Federal approvals require the rehabilitation/regeneration of 1915 ha of woodland corridors on open cut mining disturbed land. The rehabilitation/regeneration areas for these approvals each comprise a 500 ha Box Woodland Establishment Area, in accordance with the EPBC 2011/5866 approval Section 1.3.

The Box Gum Establishment area and rehabilitation woodland corridor areas currently include approximately 124 ha of woodland rehabilitation and 365 ha of grassland rehabilitation. The woodland areas vary in age, species composition and community structure. The BMP outlines the broad strategy for the establishment of the 2642 ha rehabilitated woodland areas, including preliminary rehabilitation objectives (BMP Section 3.2). The detailed program of rehabilitation works for these areas is included in the MOP. The MOP includes the outcomes of the ecological baseline surveys and any mine planning considerations, including site constraints and opportunities for native vegetation establishment. Further detail is contained in the BMP.

Areas of Box Gum Woodland (and Native Woodland, Table 2) rehabilitation, are currently, and will be, seeded with a tree, shrub and grass seed mix targeting the establishment of Upper Hunter Box-Ironbark Woodland vegetation community (which is the same community as Central Hunter Box-Ironbark Woodland) shown in Table 3. The seed mix also includes an exotic sterile cover crop to assist with initial slope stabilisation, weed and dust control, while native vegetation establishes. The seed mix is subject to change as monitoring data is collected and analysed for improvements. The Box Gum Woodland area is mainly on visual dump 1 and the MacLeans emplacement area as shown in Figure 3. The native woodland areas will cover all other woodland areas of rehabilitation other than offset areas which have specific requirements. All species mixes are indicative only and will be refined and specified in the MOP.



**Table 2: Mt Arthur Coal Native Woodland Seed Mix**

Species	Seed mix (kg/ha)
Narrow-leaved ironbark	1.0
White box	0.8
Spotted gum	0.3
River red gum	0.4
Kurrajong	0.3
Golden wattle	1.0
Barbed wire grass	0.5
Wallaby grasses	0.5
Rough spear grass	0.5
Shirohie millet	5.0
<b>Total</b>	<b>10.3</b>

**Table 3: Mt Arthur Coal Box Gum Woodland Seed Mix**

Species	Seed mix kg/ha
Narrow-leaved Ironbark	0.2
White Box	0.3
Grey Box	0.3
Blakely's Red Gum	0.3
Kurrajong	0.2
Showy Wattle	0.3
Kangaroo Thorn	0.3
Lightwood	0.2
Hickory Wattle/Silver-leaved Wattle	0.2
Sticky hop-bush	0.3
Black she-oak	0.2
Native blackthorn	0.1
Mixed endemic grass seed (including <i>Cymbopogon refractus</i> , <i>Bothriochloa decipiens</i> , <i>Bothriochloa macra</i> , <i>Dichanthium sericeum</i> , <i>Chloris truncata</i> , <i>Aristida</i> sp., <i>Sporobolus creber</i> )	2.0
Couch	1.0
Slender spear grass	0.05
Oats	5.0

### 3.10 Offset Areas

The Mt Arthur Coal mine has been designed to minimise environmental impacts, including specific impacts on threatened flora and fauna species. The approach to habitat, vegetation and rehabilitation has been developed to integrate offset areas with local and regional vegetation corridors. It will achieve this through conserving, improving and creating woodland and forest communities, including habitat for threatened species, such that the net area of vegetation communities and the condition of habitats increase over time. The BMP aims to provide linkages between post-mining landforms and existing remnant patches, thereby improving the habitat opportunities for local fauna. These areas may be utilised for strategic grazing – the management of which will ensure alignment to the conservation values of the offset areas.

Offset and conservation area establishment is designed to protect and enhance the extent and condition of threatened communities and species habitat values within the offset and conservation areas. In particular, the objective of the offset and conservation areas is to conserve and enhance areas of the Box Gum Woodland threatened ecological communities (TEC) within the offset and conservation areas and to provide habitat for the regent honeyeater (*Anthochaera phrygia*) and swift parrot (*Lathamus discolor*). Further detail on the management and implementation of the offset areas is provided in the BMP.

Mt Arthur Coal's biodiversity offset strategy comprises the following conservation and Offset Areas:

- Mt Arthur Conservation Area
- Saddlers Creek Conservation Area
- Thomas Mitchell Drive Onsite Offset Area;
- Thomas Mitchell Drive Offsite Offset Area;
- Roxburgh Road Offset Area;
- Middle Deep Creek Offset Area;
- Oakvale Offset Area; and
- Edderton Rd Revegetation Area.

## 4 Rehabilitation goal, objectives, completion criteria and performance indicators

The Project Approval Objectives are the overarching rehabilitation requirement that Mt Arthur Coal is required to meet in order to relinquish rehabilitated lands. The Project Approval Table 14 is shown in Appendix 3 and these objectives have been linked to the detailed objectives developed for Mt Arthur Coal as shown in Table 4.

Mt Arthur Coal has developed the following goal, rehabilitation objectives, completion criteria and performance indicators to meet the overarching rehabilitation requirements of the existing Project Approval, the EA and Directors General's Report. These criteria and indicators are underpinned by a range of management documents, including industry standards, BHP Billiton "Our Requirements" and Mt Arthur Coal plans and procedures. These documents will complement the Strategy, and provide for a dynamic review point, with progress against the document requirements updated to the Annual Environmental Management Report (AEMR) and MOP. The rehabilitation management and performance indicators are aligned to the completion criteria and defined in more detail within the MOP rehabilitation tables. Together these criteria aim to demonstrate rehabilitation compliance and success.

### 4.1 Hierarchy of the Mt Arthur Coal rehabilitation process

There are many different ways of presenting a structure that demonstrates achievement of rehabilitation and how this will be managed and measured. The Strategy has used a combination of the Rehabilitation Handbook, the Project Approval as well as DPE and DRE guidance in order present a measure of successful rehabilitation. The headings are not the important descriptor rather the content and understanding of how each aspect is connected that is important.

- Goal – Conceptual rehabilitation outcomes proposed in EA that generally describe the intended final land uses, vegetation types to be established and rehabilitation processes to be implemented on site.

- Rehabilitation Objectives – Specific requirements that must be achieved in order to complete rehabilitation outcomes for the project, developed by regulatory authorities during the determination of the project and enforced through the Project Approval. These Rehabilitation Objectives provide high level requirements for each domain and must be complied with.
- Completion Criteria – Provides measurable criteria that demonstrate that the Rehabilitation Objectives and Project Approval requirements have been met. These criteria are discussed in further detail and built upon in the MOP.
- Performance Indicators – Provide specific and measurable targets to track the progress of rehabilitation activities and whether they are trending towards the achievement of targeted Rehabilitation Objectives. Where performance indicators are not met, this will trigger adaptive management responses and remedial actions will be implemented. The standards against which performance indicators are measured may change throughout the mine life as research and rehabilitation techniques improve.

### 4.2 Goal

Mt Arthur Coal has developed a “Goal” to meet the long term expectations of regulators and stakeholders so that through the review and feedback process the final landform will provide sustainable benefit to the region. The Goal aligns with the requirements of the Project Approval and elaborates the intent of these requirements rather than disparaging their purpose. The goal is considered to be permanent for the life of mine and will not change significantly over the life of mine. The goal cannot easily be directly measured, but rather, requires the components of the rehabilitation hierarchy to show progress to the goal. When the rehabilitation objectives are achieved the goal is shown to have been achieved.

The Goal is:

**“Create a safe, stable, non-polluting and sustainable landscape that achieves the intended final land uses and is consistent with key stakeholder agreed social and environmental values.”**

### 4.3 Process to achieve rehabilitation success

The rehabilitation process uses metrics that can quantitatively demonstrate the progress towards completion criteria and therefore achievement of the rehabilitation objectives. The development of suitable criteria is an iterative process and acceptable values or levels may change over time aligned with monitoring results, research and technology. Rehabilitation objectives, completion criteria and performance indicators are presented in Table 4 to provide a quantitative evaluation point of rehabilitation at Mt Arthur Coal. Furthermore criteria are nominated for each phase of rehabilitation in the MOP so that rehabilitation success can be tracked throughout the life of the mine.

Mt Arthur Coal implements a Rehabilitation and Ecological Monitoring Procedure (MAC-ENC-PRO-080) (REMP), which details the assessment method, data collection and frequency of measurement using performance/leading indicators. The REMP uses the ‘rapid assessment process’ which is, assessment within 6 months of rehabilitation planting/seeding and then annually for at least five years or until the rehabilitated area is determined to have achieved a stable, self-sustaining targeted vegetation community, by an independent expert assessment. The Head of HSE business partnership is responsible for ensuring the REMP data collection processes comply with any regulatory requirements.

The performance indicators and completion criteria for the site may be subject to change over the life of the project, as best practice rehabilitation standards evolve. The performance indicators have been designed to provide an appropriate benchmark or guide against which to assess the rehabilitation management of project lands and the resulting improvements. These performance indicators will be analysed regularly through the annual review process so that improvements can be incorporated into the rehabilitation process.

# MAC-ENC-MTP-047

## REHABILITATION STRATEGY



Completion criteria will be described in more detail in the MOP. The performance indicators and completion criteria will also be reflected in the REMP which is used for the collection of on ground data and to inform the assessment of performance. Data and analysis of the progress will be presented in the AEMR and will include opportunities for improvement.

The rehabilitation objectives, completion criteria and performance indicators for the project have been related to the identified domains of the rehabilitation program described in Section 5 of the Mt Arthur Coal Open Cut Mine Modification Project as presented in (Appendix 3). Generally in accordance with the Project Approval, these measures are elaborated in Table 4.

Table 4: Rehabilitation objectives, performance indicators and completion criteria of the Mt Arthur Coal rehabilitation program

Approval Feature	Approval Objective	Closure Domain (Primary)	Detailed Objective	Completion Criteria	Performance / Leading Indicator
Mine site (as a whole)	Safe, stable and non-polluting final landforms designed to incorporate natural micro-relief and natural drainage lines to integrate with surrounding natural landforms	All Domains Water management area; Final Void Rehabilitated Areas – Pasture; Rehabilitated Areas – Native Woodland; Rehabilitated Areas – Box Gum Woodland; Offset Areas; and Non-operational lands	Safe, stable and non-polluting final landforms designed to incorporate natural micro-relief and natural drainage lines to integrate with surrounding natural landforms	Closure criteria and proposed final land use developed through stakeholder consultation Landforms are independently assessed as safe and stable compatible with surrounding natural landscape Restoration of mined land achieves visual amenity Ecologically sustainable land management practices aligned with approved domain TSF capped to ensure long-term containment of emplaced material and sustains proposed land use Removal, treatment and/or containment of hazardous or contaminated material The rehabilitated post-mining landscape will not cause environmental impacts greater than surrounding non-mined land	Independent Geotechnical inspections landforms completed Emplacement areas progressively rehabilitated Comparison to analogue sites Stakeholder consultation documentation Reporting progress in the AEMR “Annual Rapid Assessment” of indicators including: Vegetation ground cover Landform stability and erosion control Drainage Growing media (topsoil) characterisation and depth characterisation of emplacement material Independently reviewed plan and design for TSF capping Design shows capping to prevent acid formation Design shows capping to prevent ground or surface water contamination
Agricultural land	Rehabilitate at least 33 hectares of Class II agricultural capability land in the area identified in the rehabilitation plan (see Appendix 7) Rehabilitate other areas identified for agricultural use in the rehabilitation plan to sufficient agricultural capability to support grazing	Rehabilitated Areas - Pasture	Rehabilitated pasture landscapes support environmentally sustainable livestock grazing Post-mining landuses will be consistent with surrounding landuses, and not impact on biodiversity values of adjacent woodland and conservation areas.	Land is compatible with proposed land use Return appropriate areas of land to sustainable and productive grazing use Post mining land use does not negatively impact on the biodiversity or environmental values Encourage sustainability and diversity of land use through stakeholder consultation	Pasture species mix identified for preferred land capability Pasture productivity assessment Soil assessment Grazing trial assessment Post-mining land ownership is consistent with post-mining land use Land use is aligned to current and foreseeable future usage of adjoining and regional land Participate in local and regional forums to assess land use options
Revegetation areas	Restore at least 2,642 hectares of self-sustaining woodland ecosystems in accordance with the rehabilitation plan, including at least 500 hectares of White Box Yellow Box Blakely’s Red Gum Woodland.	Rehabilitated Areas – Native Woodland; Rehabilitated Areas – Box Gum Woodland; - Onsite Conservation and Offset areas	Rehabilitation will establish at least 2142ha of native woodland vegetation community (excluding 500 ha Box Gum Woodland). The rehabilitated post-mining landscape will be compliant with relevant regulatory and corporate requirements. Rehabilitation areas will include at least 500 ha of re-established Box Gum Woodland. All onsite biodiversity offset and conservation areas will be managed to increase their biodiversity and habitat value, and meet regulatory requirements.	Suitable vegetation for re-establishment aligned to proposed plant communities Revegetation has facilitated fauna recolonisation and landscape function Plant communities are creating effective habitat linkages and are aligned to surrounding native vegetated lands Biodiversity Offset Management Plan, as conditioned in the Project Approval, is implemented	Sustainability of vegetation type and suitability to final landform type Native vegetation selection incorporates local species and sourcing seed of local provenance (where possible) Management plan in place for threatening issues such as overgrazing, fire, weeds, drought and pests Evidence to demonstrate that the ecosystem will progress towards self-sustaining recruitment Annual rapid assessment, monitoring and reporting Minimum rehabilitation of 2142ha of native woodland vegetation community Minimum rehabilitation of 500 ha of re-established Box Gum Woodland
Final Voids	Designed as long term groundwater sinks and to maximise groundwater 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 risk of flood interaction.	Final Voids	Mining voids remaining in the rehabilitated post-mining landscape will be safe, stable and non-polluting	Final voids assessed by a qualified geotechnical engineer for stability and do not pose a safety risk Void use is compatible with long-term void relinquishment options No long term groundwater impact to downstream users Final voids are consistent with achievable key stakeholder agreed social and environmental values	Void opportunity assessment and recommendations developed in consultation with stakeholders Independent assessment of void design and stability Hydrological modelling Measurement of water quality Defined final use

Approval Feature	Approval Objective	Closure Domain (Primary)	Detailed Objective	Completion Criteria	Performance / Leading Indicator
Creek diversions and realignments	Flows to mimic pre-development flows for all flood events up to and including the 1 in 100 year ARI Incorporate erosion control measures based on vegetation and engineering revetments Incorporate structures for aquatic habitat Revegetate with suitable native species	Water management.	Rehabilitated water management features will be re-instated and managed as stable, non-eroding and non-polluting landform features that either hold water (i.e. dams) or allow the unimpeded flow of water (i.e. drainage lines and watercourses) as designed.	Decommissioned mine water management facilities rehabilitated to stable and non-eroding landforms and/ or watercourses. Rehabilitated water management features will be re-instated and managed as stable, and non-polluting landform features that either hold water (i.e. dams) or allow the unimpeded flow of water (i.e. drainage lines and watercourses) as designed	Independent hydrological assessment showing the diversions will function as designed Evidence to demonstrate that the ecosystem will progress towards self-sustaining
Surface infrastructure	To be decommissioned and removed, unless agrees otherwise DRE	All Domains	To be decommissioned and removed, unless agrees otherwise DRE	Unless required for post-mining use, infrastructure areas decommissioned and demolished, resulting in safe, stable and non-polluting landscape	Hazardous materials assessment of infrastructure completed to identify the potential health and environmental risks associated with demolition Infrastructure removed and demolished Independent contaminated site assessment after infrastructure removal No visual contamination
Community	Ensure public safety Minimise the adverse socio-economic effects associated with mine closure.	Final voids, Rehabilitated Areas Pasture; Rehabilitated Areas Native Woodland; Rehabilitated Areas Box Gum Woodland; Offset Areas	Ensure public safety Minimise the adverse socio-economic effects associated with mine closure. Land use provides social and economic value to the local and wider community	Sustainability and diversity demonstrated by assessment of vegetation type, land use type and suitability to final landform Ongoing management requirements no greater than adjacent non-mined land Post-mining land use is compatible with surrounding land use in terms of optimal social and economic benefit (local and wider community)	Construction of emplacements as per design Progressive rehabilitation Assessment of land use opportunities in conjunction with stakeholders Evidence to demonstrate that the ecosystem will progress towards self-sustaining recruitment (woodlands) Pasture areas are independently shown to support stock

### 5 Consultation with stakeholders

Comprehensive consultation with key stakeholder's, regarding Mt Arthur Coal's existing and proposed mine and rehabilitation program, was undertaken during both the Consolidation Project Environmental Assessment (2009) and the recent Modification Project Environmental Assessment (Feb 2013). As well as meetings with relevant authorities and stakeholder groups, this program included house-to-house consultation visits of neighbouring landholders. An outcome of the consultation is Mt Arthur Coal's commitment to investigate improved rehabilitation and landform design options, resulting in the establishment of FLDP. The objective of the FLDP is to satisfy community and other stakeholder concerns by establishing landforms that are stable, more compatible with the surrounding landscape and enhance biodiversity.

Mt Arthur Coal will continue consultation throughout the life of the mine with neighbouring operations, agency and community stakeholders, to optimise landscape and landuse outcomes through implementation of this Strategy. Mt Arthur Coal commits to engage with local stakeholders regarding proposed operations, potential impacts and management, and opportunities. This engagement includes;

- the operation of a 24-hour free call community response line to allow the community to contact the operation directly;
- access to information including approval documents, environmental assessments, management plans, environmental audits and environmental management and monitoring reports on a publicly accessible website, at: <http://www.bhpbilliton.com/home/aboutus/regulatory/Pages/default.aspx>;
- Community Consultative Committee (CCC) meetings. CCC provides an interface between the community, mine management and the relevant government departments. The community representatives on the CCC are able to share information from CCC meetings with the wider community and to report back on community issues at CCC meetings;
- consultation with local area Aboriginal stakeholders and stakeholder groups,;
- the Mt Arthur Coal Community Investment Fund which provides financial and in-kind support to local not-for-profit organisations and partners with community development programs;
- participation in the Upper Hunter Mining Dialogue (UHMD), coordinated by the NSW Minerals Council to address cumulative impacts from mining in the Upper Hunter and identify opportunities for improved management and innovation.

Records of consultation associated with revision of the Strategy are included in Appendix 5. Muswellbrook Shire Council (MSC) and the DRE were consulted through the review process and those comments have been incorporated into the Strategy where possible and reasons for not incorporating some considerations were given to the relevant stakeholder.

### 6 Rehabilitation strategy key components

Mt Arthur Coal has proven experience in achieving successful mine rehabilitation with rehabilitation works being completed in various mining areas. Rehabilitated areas will continue to be established and managed in accordance with methods currently in place at Mt Arthur Coal under the MOP which includes commitments to progressive rehabilitation and monitoring.

The following sequential strategy is followed to maximise rehabilitation success. Further details on the various rehabilitation methodologies that will be used for each of the nominated domains are provided in the MOP.

# MAC-ENC-MTP-047

## REHABILITATION STRATEGY

### 6.1 Planning

The EA and MOP contains specific details on rehabilitation planning. There are five main elements that are considered in the rehabilitation planning process:

1. Pre-mining surveys to document existing land use values.
2. Rehabilitation objectives – what do you want to achieve? What is the agreed end land use following stakeholder consultation?
3. A description of the site – including likely limiting factors.
4. A detailed plan of the site – what goes where and when?
5. Relevant methods for revegetation.

Rehabilitation is integrated into the Mt Arthur Coal mine planning process and is governed by mining titles, environmental assessments, project approval conditions and licences. However, rehabilitation is highly influenced by Mt Arthur Coal values, policies and procedures to achieve the best possible outcome. An original conceptual final landform design is shown in the 2013 EA.

Rehabilitation will be undertaken progressively during the life of the mine. Progressive rehabilitation of mining operations will minimise the area of exposed disturbance and reduce Mt Arthur Coal's environmental impacts. Progressive rehabilitation will also enable efficiencies through better integration of equipment use during mining and rehabilitation and improved topsoil management. Ultimately, this practice will lead to enhanced rehabilitation outcomes.

Sufficient personnel and resources will be allocated during mining to enable progressive rehabilitation. Progressive rehabilitation of mined land may also enable the progressive return of security bonds upon successful rehabilitation of defined areas. Rehabilitation planning will consider the logical sequence of actions needed to achieve rehabilitation success.

The landform rehabilitation goal is to create a fully-functioning landform that satisfies post-mining land use criteria including water quality and catchment management, vegetation species and diversity, self-sustaining final landforms and visual aesthetics consistent with the surrounding landscape and landuse.

The effects of mining across Mt Arthur Coal Complex range from negligible in undisturbed areas to significant in the mine pit and overburden emplacement areas. Mt Arthur Coal will mine coal reserves and generally place overburden spoil behind the advancing pit.

The aim of the overburden emplacement design at Mt Arthur Coal is to ensure that:

- Overburden emplacement capacity is balanced with the final landform design in order to minimise areas of disturbance and create a stable landform with visual relief where possible;
- Runoff water quality will be similar to undisturbed lands and will not degrade receiving stream channels;
- The rehabilitated landform will support vegetation species and composition diversity aligned to plant diversity in adjacent unmined lands;
- Land will support its designated post-mining uses; and
- The rehabilitated landform will be compatible with the surrounding countryside.

### 6.2 Final Voids

A Final Void Management Plan will be prepared in accordance with regulatory requirements and refined as part of the closure planning process to integrate the documentation of void management strategies. The final void plan will be included as part of a subsequent revision to the Strategy, which will be submitted to DPE by 30 June 2018 for review and approval.



# MAC-ENC-MTP-047

## REHABILITATION STRATEGY

The final voids are currently proposed to be used for water storage post-mining. Void locations and respective catchment boundaries within the conceptual final landform are shown in Figure 3 and 4. Alternate uses for the voids will be considered as part of the Final Void Plan. Catchment areas of the final voids will be minimised post-mining to protect against external flooding, with surface flow runoff from most rehabilitated and revegetated areas being directed to the local natural drainage network. All areas, with the exception of the final void catchments, will be free draining. The aim of this drainage design is to maintain effective catchment contribution and yield to the Hunter River following the cessation of mining.

Active open cut voids will preferentially be made available for further mining options, including overburden or tailings emplacement, short-term storage of clean or mine water, or access to potential underground operations.

The Environment Assessment design was to include low wall slopes of the final void landform with an overall slope of around 18 degrees. The final void landform will be rehabilitated with vegetation species and diversity that are appropriate for the complex landform. The highwall will also be rehabilitated using the best reasonable and feasible rehabilitation technologies available and re-vegetated with species that are appropriate for its stability, aspect, and water retention capabilities.

Design alternatives for the final void will continually be evaluated and will be prepared as part of the closure planning process at Mt Arthur Coal. Regardless of the final design alternative selected, the location and use of the final void will be outside the 100-year recurrence interval flood prone area of the Hunter River. 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, stakeholders and potential end users.

### 6.3 Overburden Emplacement Areas

As noted in Section 5.1.1 of the 2013 EA, the overall objective of the rehabilitation program is to achieve landuse capability following the cessation of mining that is comparable to pre-mining landuse capability and considers stakeholder's interests. Additionally, it is proposed to increase the percentage of native woodland to improve habitat value which also aligns with stakeholder interests. This is in the form of shade trees and shelter belts.

The FLDP is an initiative to investigate, develop and deliver a more integrated landform that is compatible with the surrounding natural landscape. This project has defined criteria for the development of a stable emplacement design. The FLDP focus areas include:

- micro topographic relief research and geomorphological consideration
- landform height and stability
- dump development viability
- hydrology, soil stability
- erosion control
- vegetation and ecosystem function design
- visual relief and simulated noise and air quality consideration during dump development

The proposed design methodology chosen is an adaptation of the Geofluv™ approach. The Geofluv™ approach uses the characteristics of stable natural alluvial landforms in the local environment as an analogue on which to base the design of overburden landforms. Importantly, the approach does not replicate existing landforms, but rather uses the key characteristics that make these landforms stable in a new design. Natural landforms in alluvial materials are characterised by an integrated network of drainage channel, typically with slopes initially convex close to ridge lines, becoming concave and progressively flattening with increasing catchment area.

# MAC-ENC-MTP-047

## REHABILITATION STRATEGY

The landform design has been developed based on the following criteria:

- Use of a risk based approach to the hazards that exist – both in terms of environmental factors and safety matters;
- Consideration of the construction and design of the holding structure for tailings and emplacement material;
- Characterisation of emplacement and capping materials; and
- Location of appropriate capping materials.

Future use of areas disturbed by active mining is closely linked to landform design and general vegetation strategies found in the Synoptic Plan. The EA states 'The conceptual final landform provides an integrated landscape that is consistent with the Synoptic Plan and aims to link existing vegetation communities with mine rehabilitation areas to provide fauna movement corridors for the movement of fauna. These proposed corridors are consistent with, and will further complement both the Synoptic Plan and the final landforms of surrounding mining operations (Figure 5-1 in the EA).

As a consequence, the following emerge as important closure objectives:

- restoration of mined land to achieve visual amenity;
- biodiversity conservation; and
- ecologically sustainable land management practices.

Figure 3 and 4 provide diagrammatic representations of the post mining land uses and vegetation linkages.

An integral part of the rehabilitation program is the characterisation of the reject emplacement, overburden and soil materials. Initial pasture and cover crop sowings will temporarily stabilise steep slopes prior to tree plantings and sowings. Native grass species typical of the local area will be used in pastoral grassland establishment. Improved (exotic) pastures and occasional forage crops will also be considered on areas of class IV land (refer Section 5.1.8 of the 2013 EA).

For woodland establishment, different species combinations will be used to establish communities in accordance with the dominant species characterising those stated in Project Approval Condition 38 (a) and (b) which focus on the establishment of significantly threatened plant communities and species. Other vegetation communities will include areas sown to exotic and native grasses, and native woodland and box gum communities which will achieve Synoptic Plan linkages as well as function as woodlot and windbreaks for stocked areas.

As proposed in the 2013 EA (Section 5.1.3), the final land uses of the rehabilitated site will include pastoral and wildlife habitat opportunities with due consideration to visual amenity aligned to the surrounding landscapes. The construction of the final landform design includes the following:

- on the steeper outer slopes such as MacLeans overburden emplacement area, material will be placed in benches and then dozed into place, while on the upper surface such as for Main overburden emplacement area, the material can be placed and shaped using GPS equipment;
- rock will need to be placed into some of the steeper drainage lines, not as a highly engineered drop structure but rather as an integrated surface in the manner of a typical valley creek, with a GIS layer to be provided indicating the areas of erosion risk as part of the final design; and
- the design approach moves away from specifying maximum slopes, since it is not the steepness of the slope alone that represents an erosion risk, but rather a combination of the catchment area and slope.

# MAC-ENC-MTP-047

## REHABILITATION STRATEGY

The method used to quantify erosion risk incorporates both catchment and slope. The design seeks to minimise the extent of slopes steeper than 1:3 (v:h) to facilitate ease of construction. Importantly, there is a trade-off between steepness of slope, the extent to which water is shed to the drainage lines, and overall volumes. Balancing these requirements has resulted in some steep slopes remaining in the final landform with slopes between 1:3 and 1:2 (v:h), comprising around 6 percent of the total Applied Geofluv™ landform. These areas are mainly on the banks of drainage lines, or the upper slopes of some of the steeper areas.

While the site has committed to building these new geomorphological based landform designs, it is important to emphasise that the design will require the refinement and optimisation of the landforms as construction experience is obtained at Mt Arthur Coal. This will include evaluating the performance of the rocky materials selected for erosion protection in the drainage lines, revegetation strategies in and around the drainage lines and on the general slopes, and evaluation of the performance of the different soil types at Mt Arthur Coal in varying slope and catchment area configurations.

Management measures designed to reduce the visual impact created by the overburden emplacement have been incorporated into the mine plan. Such measures include:

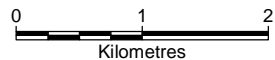
- The integration of tree corridors on overburden emplacements as part of progressive rehabilitation;
- The retention of the eastern flank of MacLean's Hill to assist in creating landscape diversity at the foot of overburden emplacements;
- Modifying final void high walls and low wall slopes to minimise final disturbance;
- Incorporating micro relief features throughout overburden emplacements to provide an enhanced naturally appearing landform and fauna habitat;
- The practical consideration of 'Geofluv type' designs on emplacements to sustainably manage water and create a natural looking and stable landform;
- The strategic design and rehabilitation of overburden emplacements for increased visual shielding of operations;
- Establishing visual and ecological planting patterns of native trees to achieve landscape patterns that complement the existing spatial distribution of tree and grass cover in a grazing landscape; and
- Minimising exposure of work areas to sensitive receivers where possible, largely through the timely rehabilitation of visible overburden emplacements.

Visual montages have been developed to show Geofluv aspects for several locations around the Mt Arthur Coal Mine to visualise predicted final landform appearance during and after completion. The visual montage is not an exact depiction as vegetation and landform will evolve during the planning and implementation process. The visual locations used (as indicated in red in Figure 5) are Muswellbrook Racecourse (north), Denman Rd (west), Golden Hwy – Saddlers Creek (south west), Muswellbrook Ironbark Ridge – Yammanie Way (north east) and Iron Bark Rd (north east). Figure 6 to 10 below give an indication of the predicted visual amenity of the proposed final landforms. These figures are not an exact rendition of the final landform. Labels have been included to provide further context to the location of the final landform.



Mapping Services, Brisbane

Scale 1:60,000 @ A3



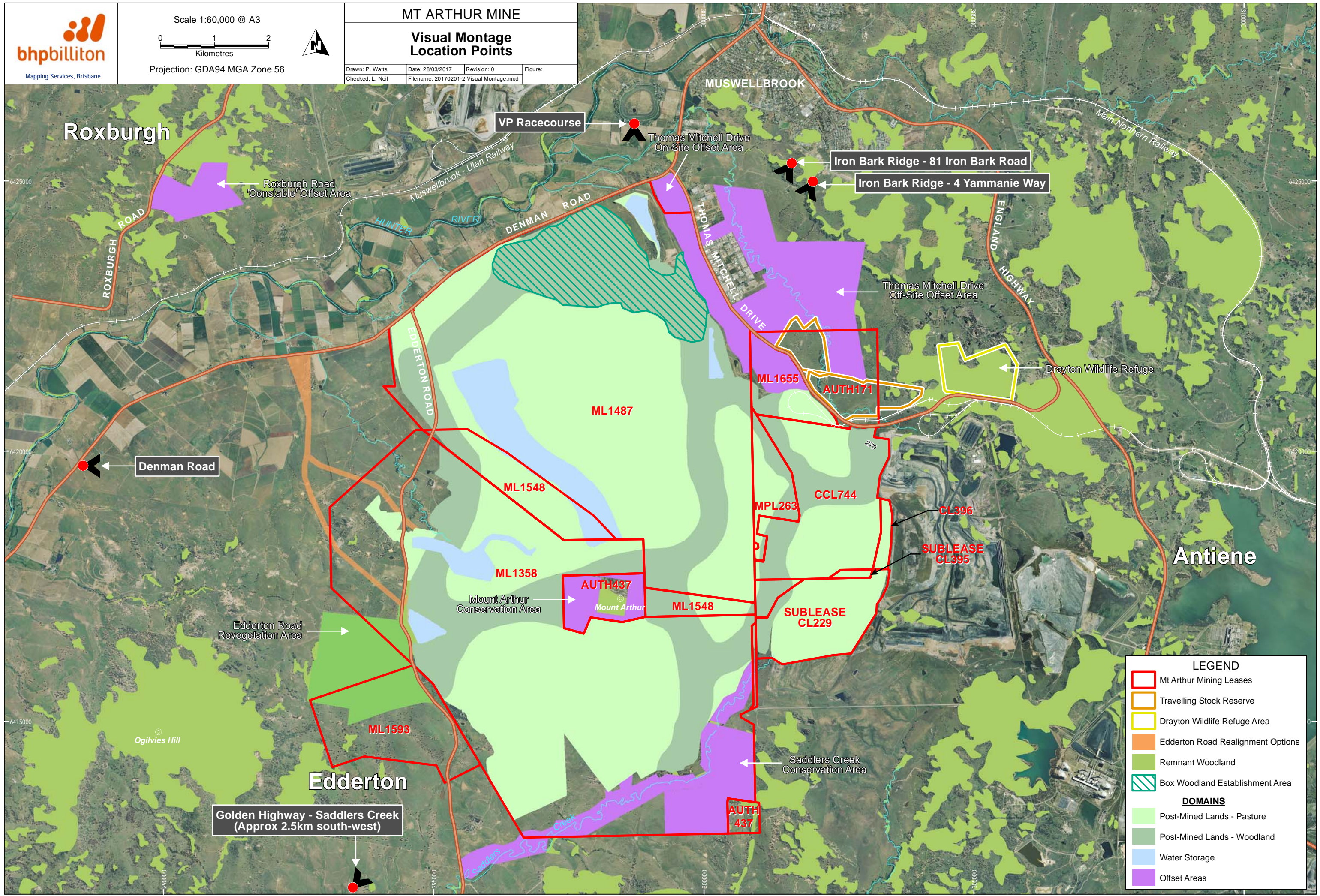
Projection: GDA94 MGA Zone 56



### MT ARTHUR MINE

### Visual Montage Location Points

Drawn: P. Watts Date: 28/03/2017 Revision: 0 Figure:  
Checked: L. Neil Filename: 20170201-2 Visual Montage.mxd



# Roxburgh

# MUSWELLBROOK

# Antiene

# Edderton

VP Racecourse

Iron Bark Ridge - 81 Iron Bark Road

Iron Bark Ridge - 4 Yammanie Way

Denman Road

Roxburgh Road 'Constable' Offset Area

Thomas Mitchell Drive On-Site Offset Area

Thomas Mitchell Drive Off-Site Offset Area

Drayton Wildlife Refuge

Edderton Road Revegetation Area

Saddlers Creek Conservation Area

Golden Highway - Saddlers Creek (Approx 2.5km south-west)

**LEGEND**

- Mt Arthur Mining Leases
- Travelling Stock Reserve
- Drayton Wildlife Refuge Area
- Edderton Road Realignment Options
- Remnant Woodland
- Box Woodland Establishment Area

**DOMAINS**

- Post-Mined Lands - Pasture
- Post-Mined Lands - Woodland
- Water Storage
- Offset Areas

ML1487

ML1548

ML1358

ML1593

ML1655

MPL263

CCL744

CL396

SUBLEASE CL395

SUBLEASE CL229

AUTH437

AUTH171

ML1548

AUTH 437

Mount Arthur Conservation Area

Mount Arthur

Ogilvies Hill

ROXBURGH ROAD

EDDERTON ROAD

DENMAN ROAD

THOMAS MITCHELL DRIVE

ENGLAND HIGHWAY

HUNTER RIVER

Main Northern Railway





Figure 6: Predicted view of landform from Muswellbrook Racecourse: A –landform at 2016, B – landform 5 years after completion, C - 10 – 15 years after completion, covered predominately with box woodland.





Figure 7: Predicted view of landform from Denman Rd: A –landform at 2016, B – landform 5 years after completion, C - 10 to 15 years after completion.



A



B



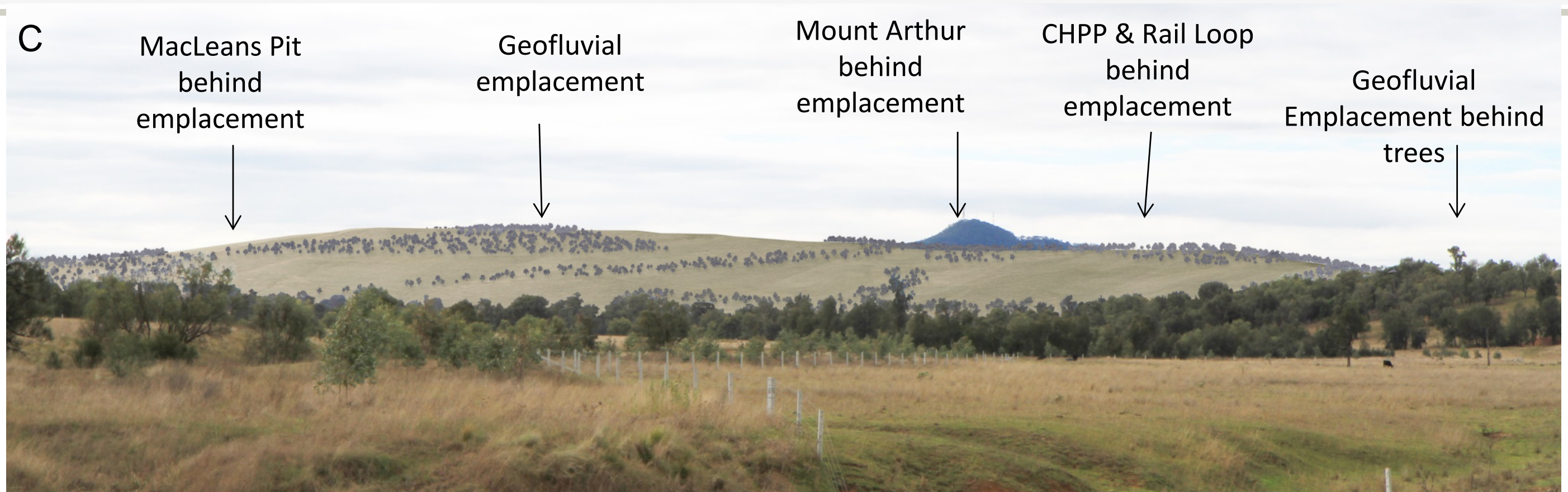


Figure 8: Predicted view of landform from Golden HWY – Saddlers Creek: A –landform at 2016, B – landform 5 years after completion, C - 10 to 15 years after completion, predominately pasture with woodland corridors.



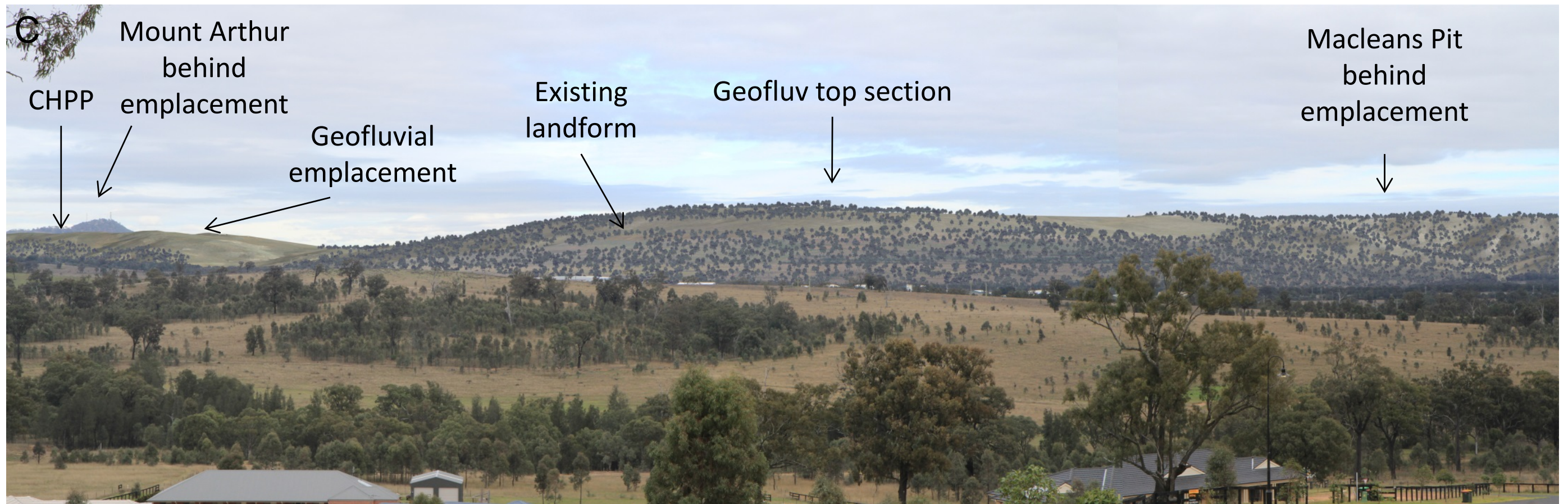


Figure 9: Predicted view of landform from Yammanie Road Muswellbrook: A –landform at 2016, B – landform 5 years after completion, C - 10 to 15 years after completion, covered predominately with box woodland.



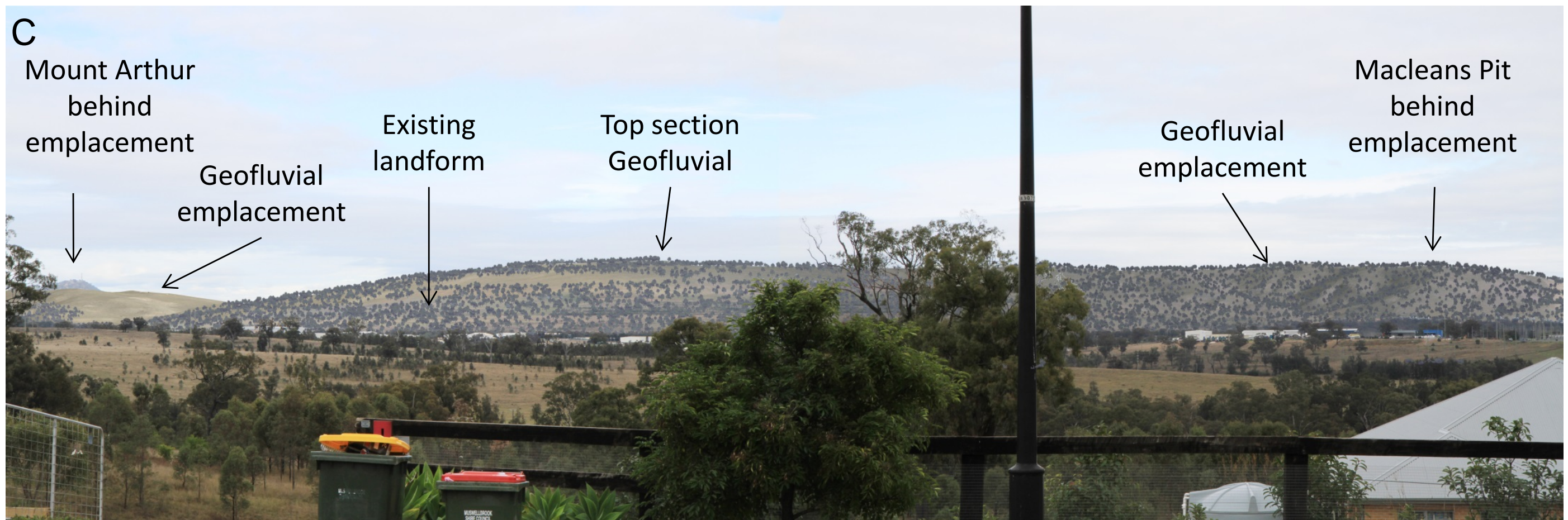


Figure 10: Predicted view of landform from Ironbark Road Muswellbrook: A –landform at 2016, B – landform 5 years after completion, C - 10 to 15 years after completion, covered predominately with box woodland.

## 7 Surface Water Management

The water management system for Mt Arthur Coal requires water to be sourced, captured, diverted, stored, monitored, utilised and reticulated across the site. This system is based on adherence to well established, best water management practices in the Australian mining industry. These principles are:

- Efficient use of water based on the concepts of 'reduce, re-use and recycle';
- Avoiding or minimising contamination of clean water streams and catchments; and
- Protecting downstream water quality for other beneficial uses such as agriculture and industry.

Temporary sediment controls such as the use of gabions, geotextiles, hay bales, sediment control fencing techniques, and similar techniques will be integrated with more permanent vegetation and engineering strategies to achieve landform stability.

The final landform drainage pattern will be designed and revegetated to achieve long-term stability and erosion control, harmonise with more general rehabilitation and revegetation strategies and integrate with surrounding catchments. Reconstructed creek lines will be vegetated with species prevalent within the existing creek channels where this doesn't impact on the stability of the reconstructed creek. Reconstructed creek channels will be established in accordance with best practice standards at the time of construction. Reconstructed creek design will include significant areas of rehabilitated overburden and other mine areas to ensure that the reconstructed channels are stable in a wide range of flows (Section 8.9.3 EA).

Surface water will be routed from and through the rehabilitation landform in stream channels. Where practical Geofluv type design of water paths will be used to ensure long term stability and natural incorporation into the surrounding landforms. Consideration will be given where possible to matching the pre-mine and post-mine discharges to natural channels so that the natural channels are not degraded. Stock dams and water features providing habitat for aquatic flora and fauna will be established at strategic locations across the landscape. Further details on their construction and components are provided in the MOP.

Temporary sediment detention features may be designed into the channels during construction periods. These features will provide protection of receiving waters' quality during construction.

Initial hydrological analysis is aimed primarily at MacLean's overburden emplacement area, and is intended to answer the following questions:

- Is there a risk of peak flows increasing with the revised landform impacting on Denman Road, and if so, how can this risk be mitigated?
- Can runoff from the revised landform towards Denman Road be contained in line with the Blue Book requirements to prevent sediment laden water impacting on the downstream watercourses?

The work undertaken for Maclean's overburden emplacement area includes delineation of the pre-mining and post-rehabilitation catchments, and determination of peak flows using the Regional Flood Frequency Estimation Tool (RFFET), Rational method (East NSW) and XP rafts. Blue Book sediment dam assessments have also been undertaken using the rainfall and runoff factors as determined previously during other sediment dam calculations. As far as is practical, the intention is to have sufficient sediment dam capacity to only need to remove sediment from the larger sediment dams every two to three years during operation. Contours of the landforms can be seen in Figure 11 - Figure 15.

Initial outcomes for MacLean's overburden emplacement area indicate that the provision of storage to meet Blue Book requirements will offset the increase in peak flows associated with the steeper post-rehabilitation catchments compared to pre-mining catchments. Where the sediment dams do not sufficiently mitigate the peak flows, other options will be implemented. Options currently being evaluated include additional flood attenuation on or downstream of the landform, with intent to reduce use of large drop structures.

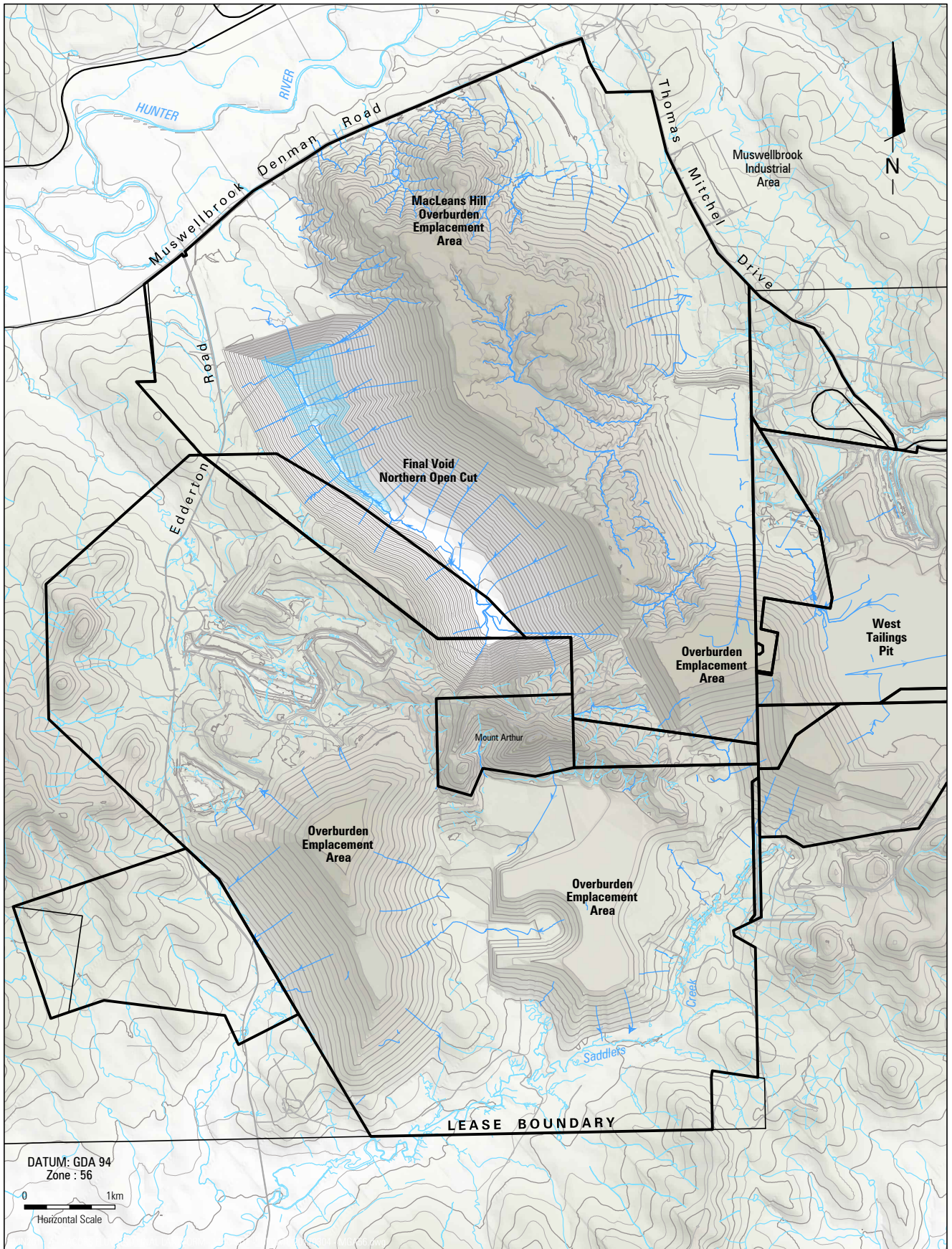
# MAC-ENC-MTP-047

## REHABILITATION STRATEGY



Associated with the overall design are a number of other technical assessments that will be detailed in the MOP. The design assessments will include; erosion risk assessments using Global Information System (GIS) methods to ensure that the future landform will be stable, sizing of suitable rock required to stabilise the drainage lines, and options to increase habitat diversity and sediment control within the geomorphologically designed drainage lines. Furthermore, assessment using erosion modelling to demonstrate long term stability and optimise aspects of the design will be made.

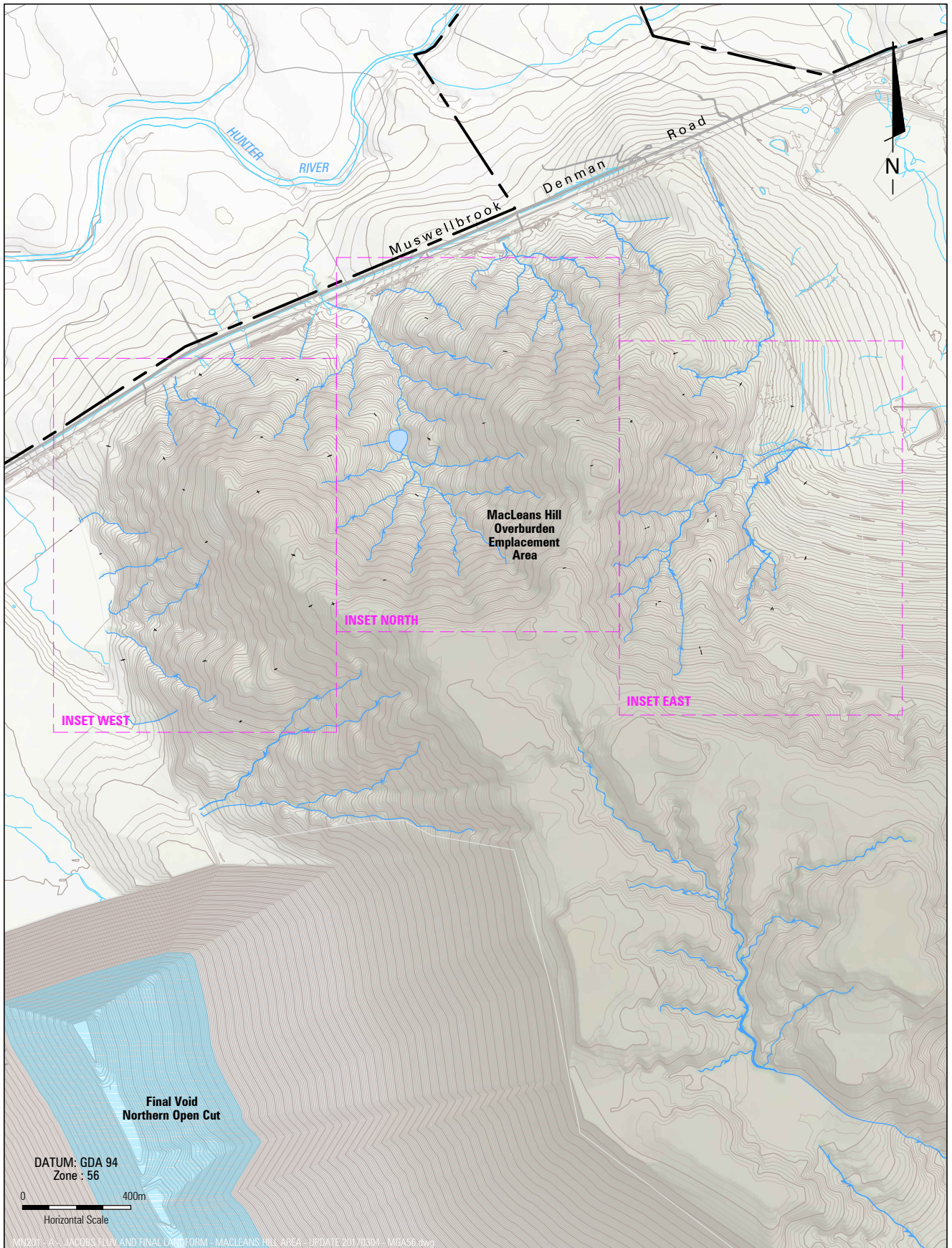




MT ARTHUR COAL PROJECT



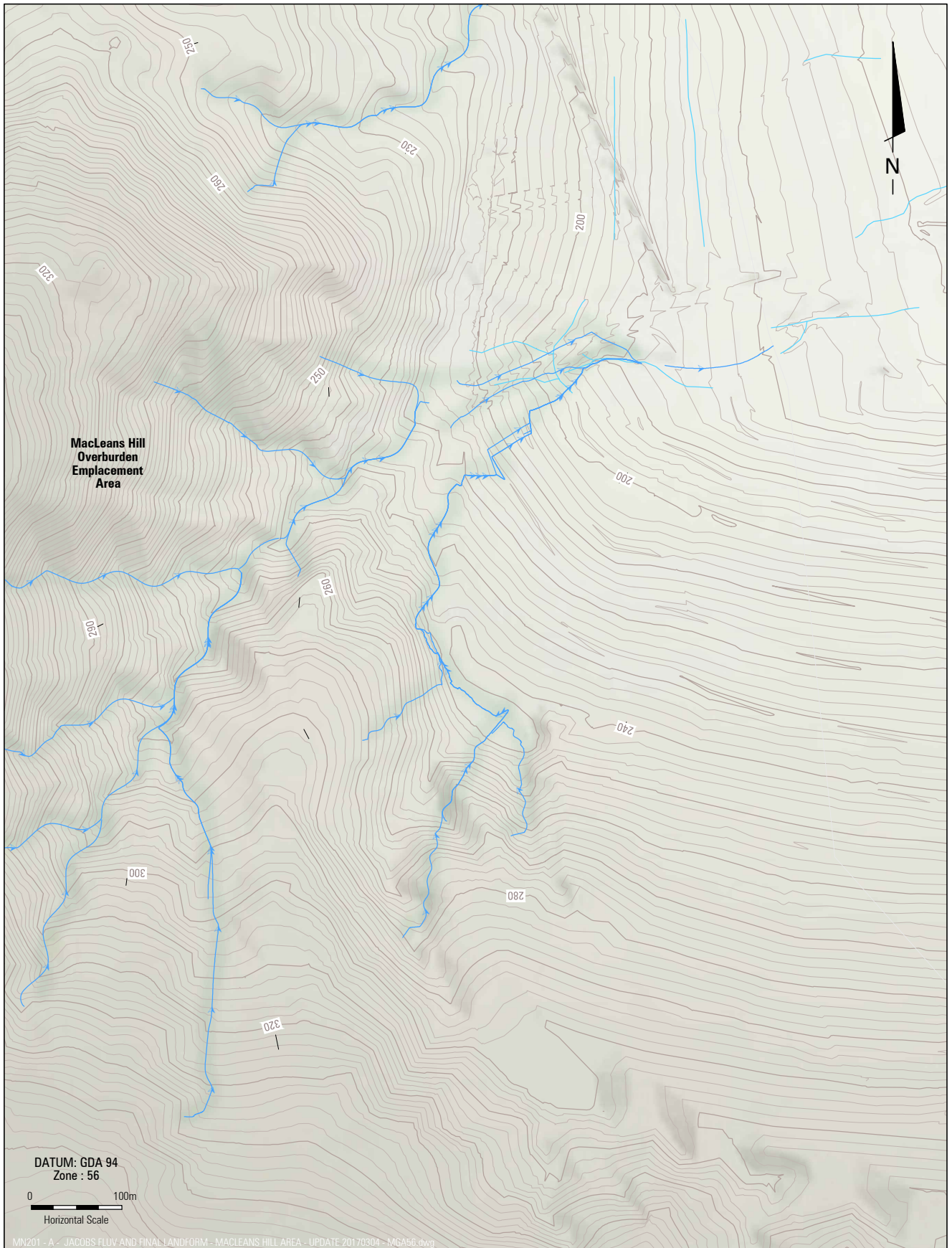
**FIGURE 11. Proposed final landform drainage plan**



MT ARTHUR COAL PROJECT



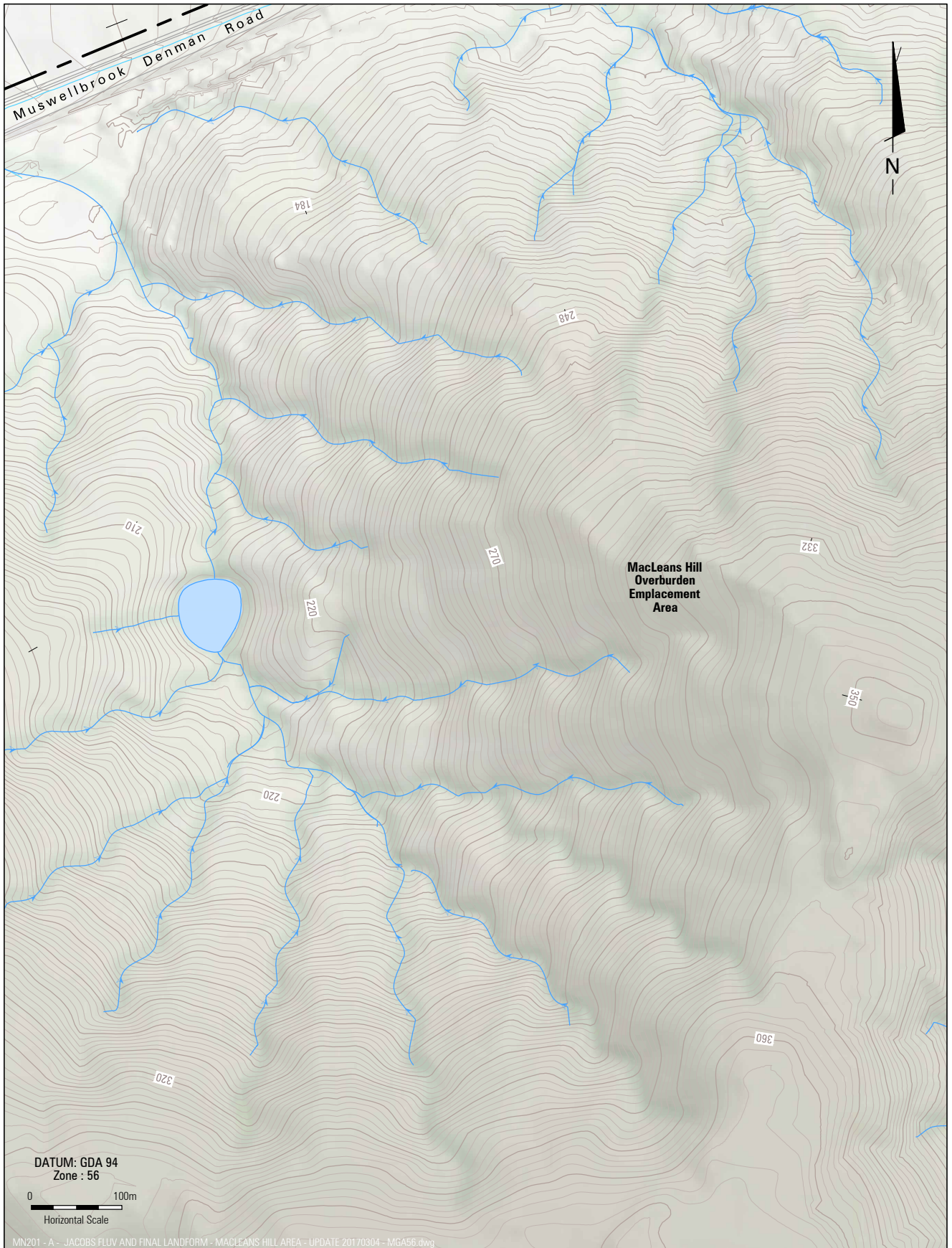
**Figure 12: Proposed Final Landform Drainage Plan showing inset locations west, north and east.**



MT ARTHUR COAL PROJECT  
Final Landform and Drainage  
MacLeans Hill - Inset East



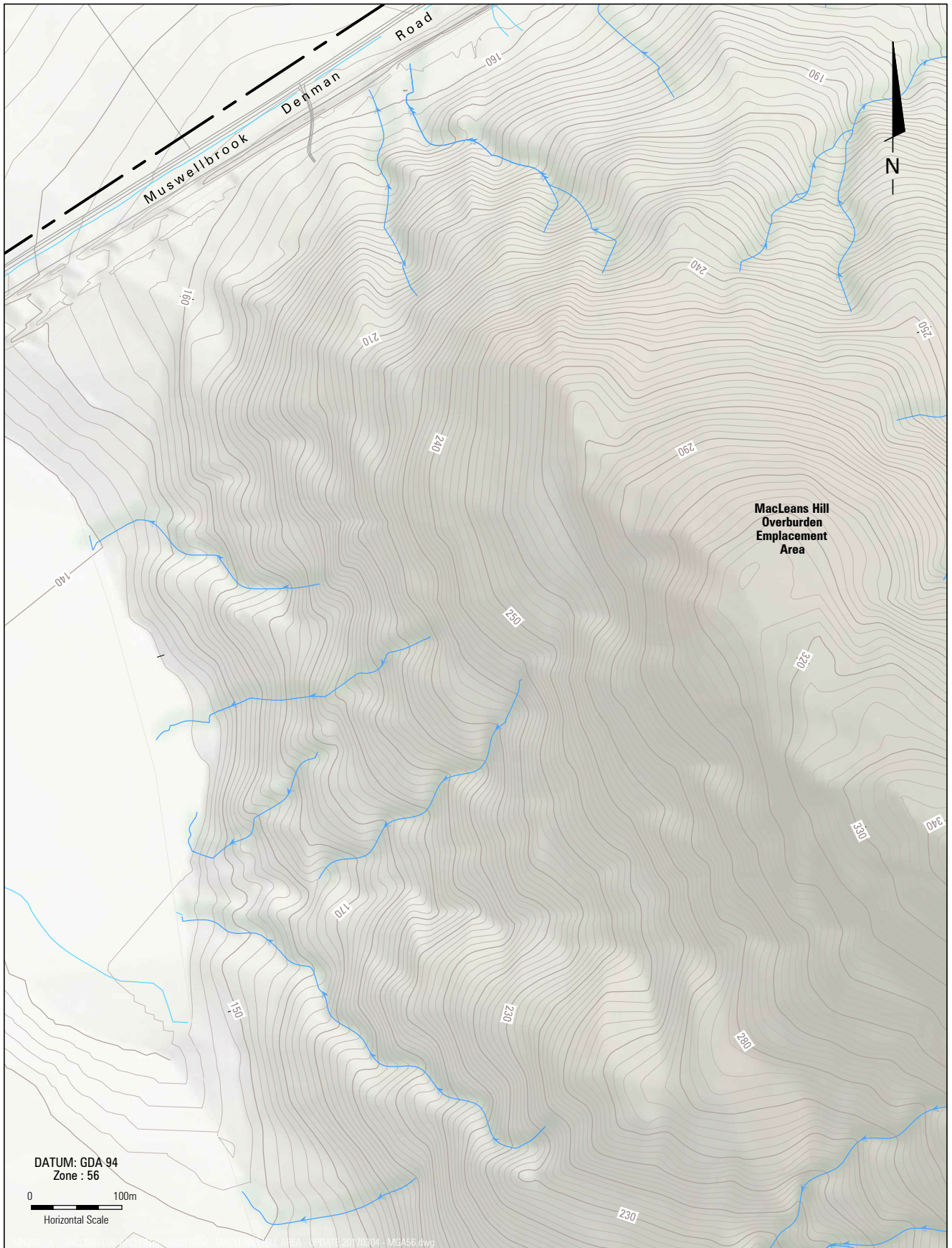
**Figure 13: Proposed Final Landform Drainage Plan east inset**



MT ARTHUR COAL PROJECT  
 Final Landform and Drainage  
 MacLeans Hill - Inset North



**Figure 14: Proposed Final Landform Drainage north inset**



MT ARTHUR COAL PROJECT  
 Final Landform and Drainage  
 MacLeans Hill - West Inset



**Figure 15: Proposed Final Landform Drainage Plan west inset**

### 7.1 Erosion and rock armouring

Substantial work was completed on erosion and rock armouring in the FLDP. The FLDP report indicates that the areas with slopes of 50% are not necessarily a high erosion risk provided the flow length is limited. Erosion assessment is presented in Appendix 4 showing erosion risk for an un-vegetated landform. Areas in green are low risk areas in yellow are medium risk and orange are higher risk. Minor erosion support will be added in the form of rock and mulch in the interim before vegetation is established. Once vegetation is established erosion will be controlled. The landform design has been checked for erosion risk and where steep areas remain of concern in the longer term once construction experience has been obtained in building these landforms, two possible management alternatives that could be considered include:

1. flattening some upper slopes if the volume constraints are not critical in these areas; or
2. incorporating rock cladding similar to that originally proposed for the ridge lines in the FLDP report.

Note that rock cladding for a bluff type result may require suitable rock to be brought from another location of the mine lease which may make the process impact the environment elsewhere and or be uneconomical.

### 7.2 Peak flow assessment

A hydrological assessment determining the peak flows pre- and during mining is given in the report by Jacobs 2016. The report has been updated to include the impact of both the planned and existing dams on the operational flows.

Key outcomes from the study are:

For the pre-mining environment, several of the culverts downstream of MacLean's overburden emplacement area on Denman Road are expected to overtop during flood events less extreme than the 1 year Average Recurrence Interval (ARI).

- The presence of the existing sediment dams, together with the new storage facility upslope of Dam C will result in non-worsening peak flows comparing the operational peak flows to the pre-mining peak flows. However, the attenuation effects of the dams will result in longer flow peaks.
- In terms of the sediment management
  - Dam A will require additional storage to be formed either in the dam or immediately upslope of the dam, requiring an additional 2000m<sup>3</sup>. This is likely to be addressed by the formation of a new dam (Dam B) in the adjacent catchment, the channel linking this adjacent catchment to Dam A having been mined through.
  - Dam C will require an additional 1500m<sup>3</sup> of storage for the lower portion of the catchment (up to roughly 200 Relative Level (RL)).
  - The pond to be formed on the landform at 200RL upslope of Dam C will be adequate and will most likely only require the removal of sediment twice over the life of the mine.

### 8 Characterisation of soils and overburden

In order to understand the selective handling of soils, a materials characterisation of overburden will be undertaken throughout the development of the mine.

Topsoil characterisation is undertaken in order to:

- Identify any physical or chemical deficiencies or toxicity (particularly alkalinity, salinity and sodicity) which may affect such things as vegetation establishment, landform stability and propensity for spontaneous combustion; and
- Develop selective placement strategies and / or develop suitable amelioration techniques.

Overburden characterisation will be undertaken in order to:

- Identify material for use in the root zone which is capable of supporting sustainable vegetation establishment;
- Identify materials toxic to plant growth or which may contaminate surface or ground water, and hence may require special handling, treatment or disposal; and
- Identify the propensity for erosion resistance and stability,
- Identify any propensity for spontaneous combustion.

There are a range of procedures and tests which may be utilised and are described in the MOP. These include:

- Timing of characterisation.
- Properties influencing plant growth and water quality.
- Amelioration techniques.

Although successful revegetation can be achieved on some overburden strata, superior results are generally achieved where topsoil is respread. If correctly characterised, stripped, stockpiled and respread topsoil generally has superior physical and chemical characteristics (e.g. structure, nutrition) compared to overburden. These topsoils may contain native seed and beneficial micro-organisms which have been shown to be advantageous to the more rapid development of a sustainable and productive ecosystem.

Not all topsoil material is suitable for surface spreading. The MOP provides more detail on suitability assessment and processes required to successfully manage the topsoil resource. Processes may include some or all of those listed below:

- Pre-mining soil survey. This survey will build on the information as provided in the 2009 EA (Appendix Q) and outline the selection of suitable topdressing material and identify preferred and problematic material on a strip by strip basis;
- Calculation of the volume of suitable topsoil available for life-of-mine rehabilitation;
- Advantages and disadvantages of using topsoil;
- Topsoil testing and acceptable values;
- Factors to be considered when clearing remnant vegetation and areas of pasture;
- Important factors in topsoil stripping and stockpiling;
- Important factors in topsoil re-spreading and ground preparation; and
- Recommended amelioration techniques.

### 9 Clearing and reuse of vegetation

Land use disturbance will be minimised by the intent of clearing the smallest practical area of land at any one time and leaving it exposed for the shortest practical time. This will be achieved by:

- Limiting the cleared width to that required to effectively operate the mine; and
- Programming the works so that only the areas which are scheduled for mining activities are cleared.

Proposed use of felled timber will follow current practice and includes practices such as harvesting of brush material that is laden with fruit / seed, mulching and incorporating understorey and saplings into stripped topsoil, and respreading coarse timber residue onto re-contoured land to generate fauna habitats.

### 10 Revegetation

Post mining land use objectives will determine the generic form of vegetation required e.g. native woodland/box gum woodland/pasture ecosystem, and grazing. The landscape and revegetation management strategies at Mt Arthur Coal Mine are described in the 2013 EA and have been designed to incorporate the objectives of the Synoptic Plan.

The regional habitat links are designed to provide linkages between areas of existing native vegetation, offset areas, rehabilitation areas and offsite vegetation areas. The establishment of ecological corridors will enhance flora and fauna integrity both locally and regionally. Separate native vegetation strategies will apply to specific domains including:

- Rehabilitation Area – Pasture;
- Rehabilitation Area – Native Woodland;
- Rehabilitation Area – Box Gum Woodland
- Offset Areas;
- Water Management; and
- Non-operational lands.

Rehabilitation at Mt Arthur Coal is generally divided into areas for biodiversity outcomes and areas of pasture (the predominant pre mining site use). The Strategy aims for a net increase in native vegetated areas at the end of mine life. Mt Arthur Coal is required to restore at least 2,642 hectares of self-sustaining woodland ecosystems, including 500 hectares of White Box Yellow Box Blakely's Red Gum Woodland. Mt Arthur Coal is also required to rehabilitate at least 33 hectares of Class II agricultural capability land and rehabilitate other areas identified for agricultural use to sufficient capability to support grazing.

Revegetation techniques that may be used in the rehabilitation of mined land to achieve land use objectives include:

- Direct seeding of native tree, shrub, groundcover and grass species;
- Tube-stock planting – predominantly native tree, shrub and groundcover species;
- Brush material harvested from the local area;
- Translocation of key threatened plant species; and
- Respreading of topsoil from pre-mining plant communities which are aligned to the proposed post mining plant communities.



Mt Arthur Coal has successfully applied these general techniques which will be further refined to meet specific future land use objectives and vegetation outcomes. Where necessary, research and trials will be undertaken to test alternative techniques and refine methodologies.

## 11 Rehabilitation Management Plan

The MOP (which satisfies the requirement for a Rehabilitation Management Plan under Schedule 3 Condition 44 of PA09\_0062 MOD1) describes a range of factors or limitations likely to affect plant growth and how these will be addressed including:

- Landform factors;
- Soil/overburden conditions;
- Surface water management;
- Erosion and sediment control;
- Weeds/biological issues;
- Soil compaction;
- Climate and weather;
- Research program related to techniques used in the rehabilitation program; and
- Grazing/feral animal threats.

The primary revegetation considerations generally include:

- Species selection;
- Sowing rates and species proportions;
- Tube stock densities;
- Consideration of habitat augmentation;
- Seed pre-treatment requirements;
- Seed spreading and planting techniques;
- Soil amelioration and fertilizer requirements;
- Use of temporary cover crops to assist soil stabilisation;
- Protection from vertebrate pest species, domesticated stock and unauthorised access; and
- Maintenance requirements.

The Strategy and associated MOP, together with the BMP focus on the re-establishment of:

- significant and/or threatened plant communities, including:
  - Upper Hunter White Box – Ironbark Grassy Woodland;
  - Central Hunter Box – Ironbark Woodland;
  - Central Hunter Ironbark – Spotted Grey-Gum Box Forest;
  - Narrabeen Foothills Slaty Box Woodland;
  - Hunter Floodplain Red Gum Woodland Complex;
  - White Box Yellow Box Blakely's Red Gum Woodland;
  - Hunter Lowlands Red Gum Forest; and

- significant and/or threatened plant species, including:
  - River Red Gum (*Eucalyptus camaldulensis*);
  - Pine Donkey Orchid (*Diuris tricolor*);
  - Tiger Orchid (*Cymbidium canaliculatum*); and
  - Weeping Myall (*Acacia pendula*); and
- habitat for significant and/or threatened animal species.

## 12 Management and monitoring

It is essential to monitor rehabilitation development and address rehabilitated areas that are not meeting the criteria presented in Tables 5-1 and 5-2 of the 2013 EA or the requirements of the Project Approval. As such, identification of ongoing maintenance is an important objective of the monitoring programme and the continual improvement process. Good initial planning and practice will minimise the need for remedial maintenance. The Rehabilitation and Ecological Monitoring Procedure is the primary document for monitoring and management of the rehabilitation process.

Until mining leases are relinquished, periodic field inspections will be undertaken of site-wide rehabilitated areas. These inspections will assess maintenance requirements, such as revegetation works, sedimentation and erosion control, and site safety. Monitoring program results, maintenance activities, and any refinement of rehabilitation or monitoring methodology will be reported in the site's AEMR. Further details on the monitoring, site security and maintenance programs are provided in the MOP.

## 13 Review of the strategy

Any required amendments identified during the review will be consulted with relevant stakeholders and updated in a revision of the strategy and resubmitted to the DPE for approval.

Study on voids, including use opportunities will be completed by 30 June 2018. The study is aimed at understanding the completion options and management related to those options. Specifically stability, land use, cost and safety will be considered in the study which will result in a better understanding for both regulators and stakeholders. The study will then provide a framework for discussion with regulators and stakeholders to continually evaluate the best options for voids.

Study on landform design, opportunity and location will be made in 2018 with the intent of updating detailed design of short to mid-term landforms. The design will complement the current geomorphological landform design. The design will be included into future Strategy updates and MOP versions. Longer term design will not be completed in detailed design due to the dynamic nature of expectations and technology.

Any other major amendments to the Strategy that affect its application or that of the MOP, will be undertaken in consultation with the appropriate regulatory authorities and stakeholders.

### 14 Bibliography

Andrews, N, (1999) Synoptic Plan – Integrated Landscapes for Coal Mine Rehabilitation in the Hunter Valley of New South Wales, Prepared for the NSW Department of Mineral Resources.

ANZMEC and Minerals Council of Australia (2000) Strategic Framework for Mine Closure.

DIIS (Department of Industry, Innovation and Science) (2016c), Mine rehabilitation, Australian Government, Canberra.

Hansen Bailey (2009) Mt Arthur Coal Consolidation Project Environmental Assessment. Prepared for Hunter Valley Energy Coal Pty Ltd.

Landloch Pty Ltd (2014) Future Landform Design Project – Final Report. Report prepared for BHP Billiton Mt Arthur Coal

Muswellbrook Shire Council (Aug 2011) Draft Mining Rehabilitation Policy (Policy No. M40/1)

NSW Department of Planning & Environment (Sept 2014) Project Approval 09\_0062 MOD 1 Hunter Valley Energy Coal Pty Ltd

Resource Strategies (2013) Mt Arthur Coal Open Cut Modification Environmental Assessment. Prepared for Hunter Valley Energy Coal Pty Ltd.

The NSW Department of Trade and Investment, Regional Infrastructure and Services guideline ESG3: Mining Operations Plan (MOP) Guidelines September 2011

# MAC-ENC-MTP-047

## REHABILITATION STRATEGY



### Appendix 1 - Document Control Authorisation

Business Process Owner Endorser Authorisation			
Position	Name	Date	Signature
Manager Environment A&I (east)	Mark Garrahy	26/05/2017	

Approver Authorisation			
Position	Name	Date	Signature
Head HSE Business Partner	Sarah Withell	26/05/2017	

Amendment History			
Date	Version	Page	Details
1.0	30/9/11		Final draft – submitted for approval to DP&I.
2.0	20/9/12		Minor amendments following DP&I comment
Final	14/11/12		Approved by the Department of Planning & Infrastructure on 14/11/12.
3.0	DRAFT 30 <sup>th</sup> June 2016		Amendments following Modification Project Approval for submission to DP&E
4.0 Final	26/05/2017		Amendments following regulator engagement and consultation, including update from the FLDP

# MAC-ENC-MTP-047

## REHABILITATION STRATEGY



### Appendix 2 – Regulatory conditions

Project Approval Condition	Requirement	Section/s of the Rehabilitation Strategy
38	The Proponent shall ensure that the offset strategy and/or rehabilitation strategy is focused on the re-establishment of:	
	(a) significant and/or threatened plant communities, including: <ul style="list-style-type: none"> <li>• Upper Hunter White Box – Ironbark Grassy Woodland;</li> <li>• Central Hunter Box – Ironbark Woodland;</li> <li>• Central Hunter Ironbark – Spotted Grey-Gum Box Forest;</li> <li>• Narrabeen Foothills Slaty Box Woodland;</li> <li>• Hunter Floodplain Red Gum Woodland Complex;</li> <li>• White Box Yellow Box Blakely's Red Gum Woodland;</li> <li>• Hunter Lowlands Red Gum Forest; and</li> </ul>	Sections 3 and 10
	(b) significant and/or threatened plant species, including: <ul style="list-style-type: none"> <li>• River Red Gum (<i>Eucalyptus camaldulensis</i>);</li> <li>• Pine Donkey Orchid (<i>Diuris tricolor</i>);</li> <li>• Tiger Orchid (<i>Cymbidium canaliculatum</i>);</li> <li>• Weeping Myall (<i>Acacia pendula</i>); and</li> </ul>	Sections 3 and 10
	(c) habitat for significant and/or threatened animal species	Sections 3 and 10
40	The Proponent shall prepare and implement a Biodiversity Management Plan for the project to the satisfaction of the Secretary. This plan must:	
	(b) describe how the implementation of the offset strategy would be integrated with the overall rehabilitation of the site (see below);	
41A	The Proponent shall rehabilitate the site to the satisfaction of the DRE. The rehabilitation must comply with the objective in Table 14, and be consistent with the rehabilitation plan shown in Appendix 7 and the final landform plan shown in Appendix 8.	Section 4

# MAC-ENC-MTP-047

## REHABILITATION STRATEGY



Table 14: Rehabilitation Objectives

Feature	Objective
Mine site (as a whole)	<ul style="list-style-type: none"> <li>• Safe, stable and non-polluting</li> <li>• Final landforms designed to incorporate natural micro-relief and natural drainage lines to integrate with surrounding landforms</li> </ul>
Final voids	<ul style="list-style-type: none"> <li>• Designed as long term groundwater sinks and to maximise groundwater flows across back-filled pits to the final void</li> <li>• Minimise to the greatest extent practicable:                             <ul style="list-style-type: none"> <li>○ the size and depth of final voids</li> <li>○ the drainage catchment of final voids</li> <li>○ any high wall instability risk</li> <li>○ risk of flood interaction.</li> </ul> </li> </ul>
Agricultural land	<ul style="list-style-type: none"> <li>• Rehabilitate at least 33 hectares of Class II agricultural capability land in the area identified in the rehabilitation plan (see Appendix 7)</li> <li>• Rehabilitate other areas identified for agricultural use in the rehabilitation plan to sufficient agricultural capability to support grazing</li> </ul>
Revegetation areas	<ul style="list-style-type: none"> <li>• Restore at least 2,642 hectares of self-sustaining woodland ecosystems in accordance with the rehabilitation plan, including at least 500 hectares of White Box Yellow Box Blakely's Red Gum Woodland.</li> </ul>
Creek diversions and realignments	<ul style="list-style-type: none"> <li>• Flows to mimic pre-development flows for all flood events up to and including the 1 in 100 year ARI</li> <li>• Incorporate erosion control measures based on vegetation and engineering revetments</li> <li>• Incorporate structures for aquatic habitat</li> <li>• Revegetate with suitable native species</li> </ul>
Surface infrastructure	<ul style="list-style-type: none"> <li>• To be decommissioned and removed, unless DRE agrees otherwise.</li> </ul>
Community	<ul style="list-style-type: none"> <li>• Ensure public safety</li> <li>• Minimise the adverse socio-economic effects associated with mine closure.</li> </ul>

Note: The rehabilitation plan for the site is shown in Appendix 7.

42	The Proponent shall prepare a revised Rehabilitation Strategy for the Mt Arthur mine complex to the satisfaction of the Secretary. This strategy must:	
	(a) be prepared in consultation with the DRE and Council, and be submitted to the Secretary for approval by the end of September 2015, unless otherwise agreed with the Secretary;	Section 1 and 5
	(b) investigate options for:	Section 13

# MAC-ENC-MTP-047

## REHABILITATION STRATEGY



	<ul style="list-style-type: none"> <li>increasing the area to be rehabilitated to woodland on the site;</li> <li>reducing the size of final voids on site; and</li> <li>beneficial future land use of disturbed areas, including voids;</li> </ul>	
	(c) describe and justify the proposed rehabilitation plan for the site, including the final landform and land use; and	Section 6
	(d) include detailed rehabilitation objectives for the site that comply with and build on the objectives in Table 14.	Section 4
	<i>Note: The strategy should build on the rehabilitation plan in Appendix 7.</i>	
43	The Proponent shall carry out rehabilitation progressively, that is, as soon as reasonably practicable following disturbance (particularly on the face of emplacements that are visible off-site). Interim stabilisation measures must be implemented where reasonable and feasible to control dust emissions in disturbed areas that are not active and which are not ready for final rehabilitation.	Sections 3 and 10
	<i>Note: It is accepted that parts of the site that are progressively rehabilitated may be subjected to further disturbance in future.</i>	
44	The Proponent shall prepare and implement a Rehabilitation Management Plan for the Mt Arthur mine complex to the satisfaction of the DRE. This plan must:	
	<ul style="list-style-type: none"> <li>(a) submitted to DRE for approval by 30 September 2015;</li> <li>(b) be prepared in consultation with the Department, NOW, OEH and Council;</li> <li>(c) be prepared in accordance with relevant DRE guidelines;</li> <li>(d) describe how the rehabilitation of the site would be integrated with the implementation of the biodiversity offset strategy;</li> <li>(e) include detailed performance and completion criteria for evaluating the performance of the rehabilitation of the site, and triggering remedial action (if necessary);</li> <li>(f) describe the measures that would be implemented to ensure compliance with the relevant conditions of this approval, and address all aspects of rehabilitation including mine closure, final landform including final voids, and final land use;</li> <li>(g) include interim rehabilitation where necessary to minimise the area exposed for dust generation;</li> <li>(h) include a research program that seeks to improve the understanding and application of rehabilitation techniques and methods in the Hunter Valley;</li> <li>(i) include a program to monitor, independently audit and report on the effectiveness of the measures, and progress against the detailed performance and completion criteria; and</li> <li>(j) build to the maximum extent practicable on other management plans required under this approval.</li> </ul>	Mine Operations Plan and section 1

### Appendix 3 – Mt Arthur Coal Rehabilitation Program completion criteria

The Goals, Objectives and Completion Criteria of the Mt Arthur Coal Rehabilitation Program

Goal: Successful design and rehabilitation of landforms to ensure structural stability, revegetation success and containment of wastes		
Objective	Domain	Completion Criteria
Rehabilitation is consistent with the Environmental Assessment (EA)	All Domains	Stable and permanent, drainage and benching, batter slopes developed using a mix of existing methods and industry practice Closure criteria and proposed final land use are developed through stakeholder consultation All mining and overburden emplacement areas will be progressively rehabilitated
Maximise likelihood of long-term landform stability and minimise erosion		Slope angles and lengths are compatible with regulatory requirements Growing media are characterised and managed accordingly in context of the post-mining land use and landscape Drainage is designed to maximise infiltration and prevent ponding on areas of known dispersive material to minimise erosion and present a stable landform
Optimise final void dimensions	Final Void	Safe and stable rehabilitation of final voids Void use is compatible with long-term plans for voids Void water consistent with predictions of gradual change over a long time frame
Ensure removal, treatment and/or containment of hazardous or contaminated material	Areas of active mining; Overburden Emplacement; Final Void; and Infrastructure Areas.	Licensed hazardous materials managed in accordance with regulatory requirements Secure and safe containment, remediation and/or removal of waste substances Hazardous materials assessment of infrastructure completed to identify the potential health and environmental risks associated with demolition of these facilities
Ensure removal, treatment and/or containment of hazardous or contaminated material	Tailing Storage Facility	Infrastructure associated with mine related activities removed, unless deemed as being required post-mining Contaminated or hazardous materials have been capped Historic tailings deposits are assessed as non-acid generating contained Allowance for potential subsidence of materials deposited in the tailings storage facility incorporated into final landform design



Goal: Successful design and rehabilitation of landforms to ensure structural stability, revegetation success and containment of wastes		
Determine suitable vegetation for re-establishment aligned to proposed plant communities	Rehabilitated Areas – Pasture; Rehabilitated Areas – Native Woodland; Rehabilitated Areas – Box Gum Woodland; Offset Areas; and Non-operational lands.	Sustainability of vegetation type and suitability to final landform type Plant communities are aligned to the physical and chemical characteristics of the growing media Effective habitat linkages are aligned to surrounding vegetated lands Native vegetation establishment will consider local species and sourcing seed of local provenance Threatening processes, such as weeds, overgrazing, uncontrolled fire and pest species will be managed in accordance with relevant legislation and selected final land use Biodiversity Offset Management Plan, as conditioned in the Project Approval, is implemented Plant growth characteristics will facilitate fauna recolonisation and landscape function

Post-mining land use compatible with surrounding land uses and provides optimal environmental and community benefits

Goal: Post-mining land use compatible with surrounding land uses and provides optimal environmental and community benefits		
Objective	Domain	Completion Criteria
Return appropriate areas of land to sustainable and productive grazing use	Rehabilitated Areas – Pasture; and Non-operational lands	Pasture species mix aligned to preferred land capability and pasture productivity
Ensure final land use is compatible with surrounding land use	Rehabilitated Areas – Pasture; Rehabilitated Areas – Native Woodland; Rehabilitated Areas – Box Gum Woodland; Offset Areas;	Final land use consistent with surrounding land uses Final land use takes into account local and regional initiatives Final land use is compatible with surrounding land function and land use requirements Final land use compatible with land capability and growing media
Incorporate land use in terms of optimal social and economic benefit to the local and wider community	Non-operational lands; and Final Void	Land use is aligned to present current and likely future usage of adjoining land Land use is planned to provide social and economic value to the local and wider community whilst not negatively impacting on the biodiversity or environmental values. Land use will be aligned to the relevant land zonings as per the current Muswellbrook Local Environment Plan Post-mining land ownership is consistent with post-mining land use

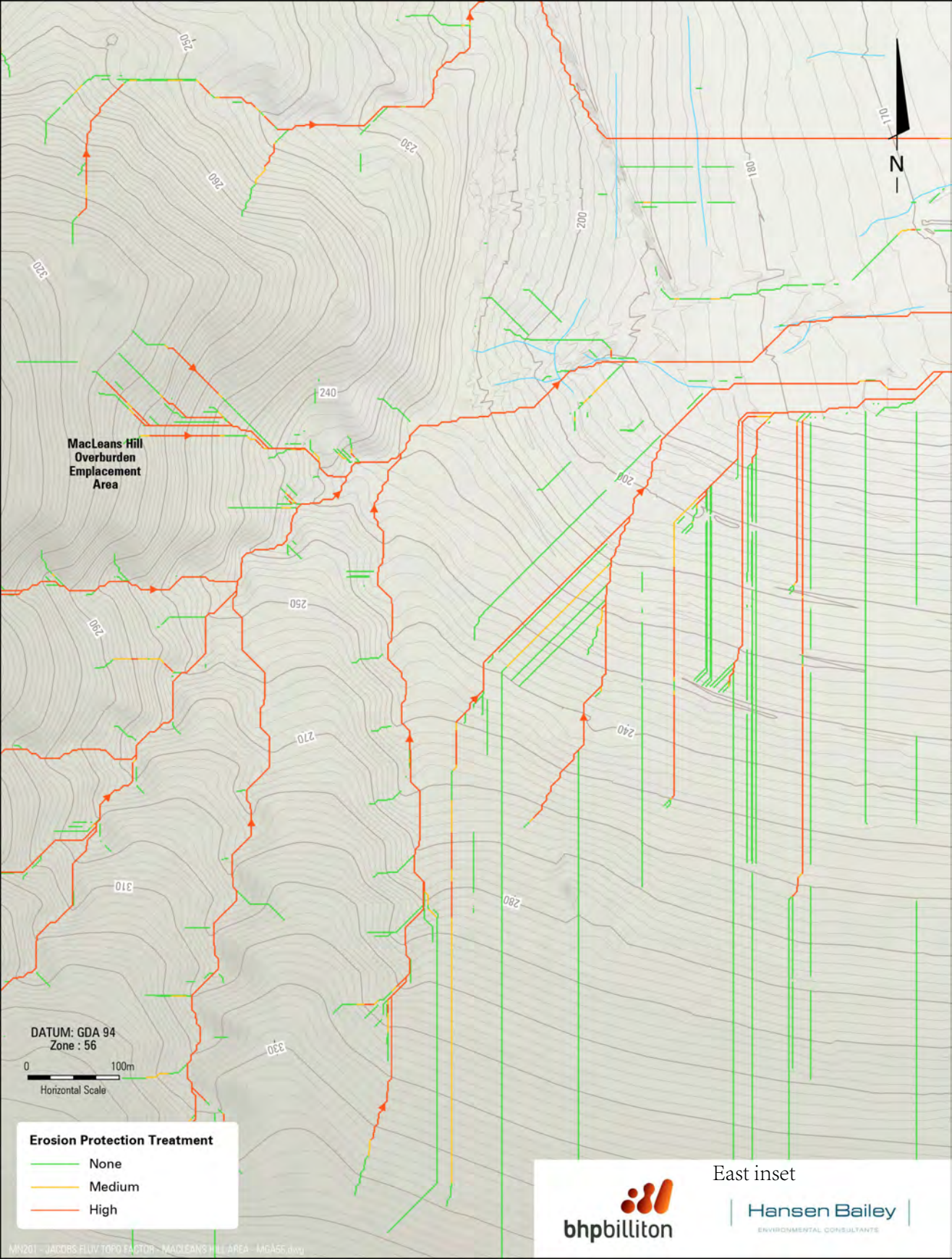
**Goal: Post-mining land use compatible with surrounding land uses and provides optimal environmental and community benefits**

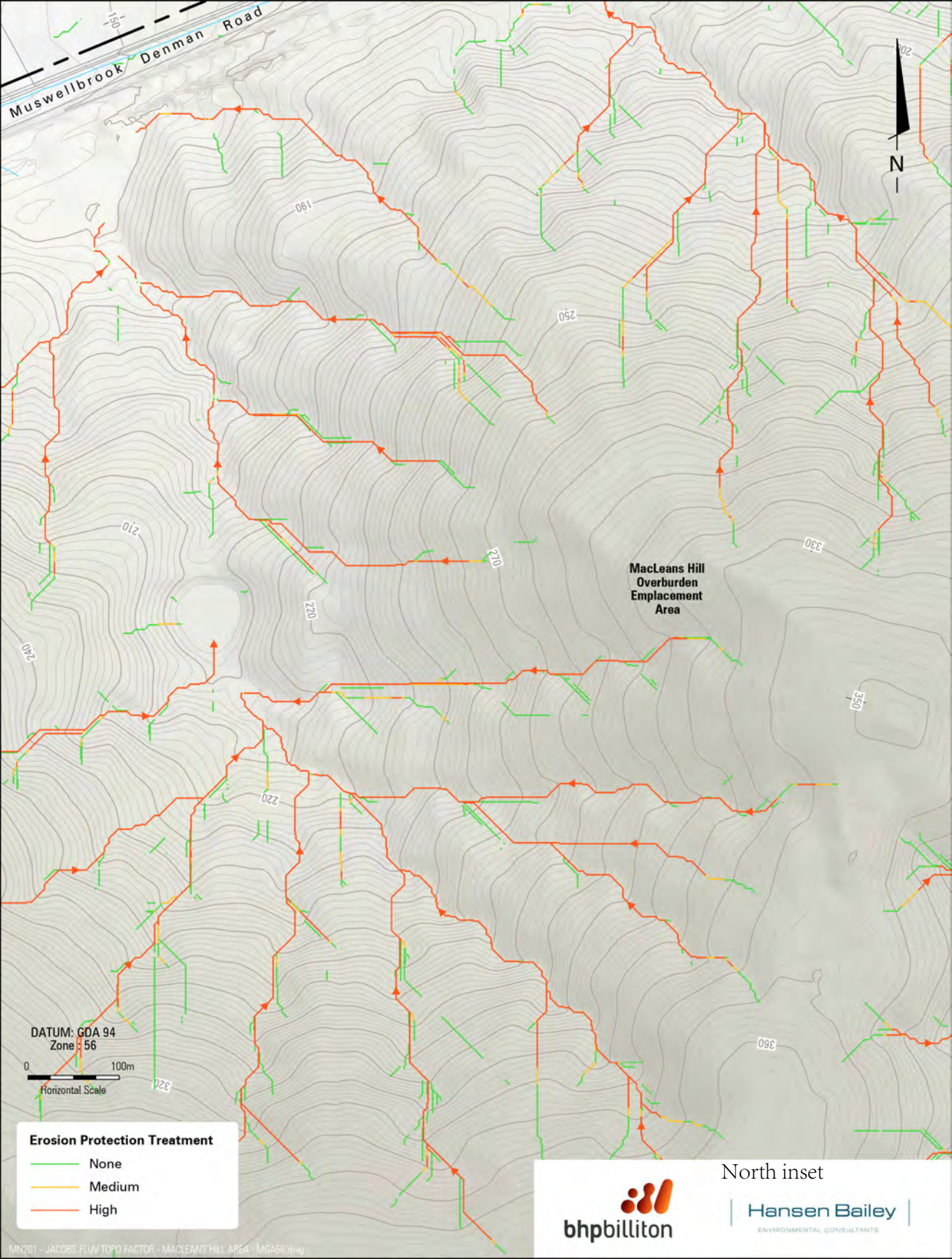
<p>Encourage sustainability and diversity of land use</p>	<p>Rehabilitated Areas – Pasture; Rehabilitated Areas – Native Woodland; Rehabilitated Areas – Box Gum Woodland; Offset Areas; and Non-operational lands.</p>	<p>Sustainability and diversity demonstrated by assessment of vegetation type, land use type and suitability to final landform Ongoing management requirements no greater than adjacent non-mined land Ecosystem resilience, health and composition are monitored in rehabilitated and established landscapes</p>
---	---	---

### Appendix 4 – Topography erosion factors

Assessment of erosion risk for un-vegetated landforms (ie shaped overburden and soil materials) is shown in Appendix 4. Required levels of vegetative and engineered erosion management controls will be tailored to address the likelihood of erosion risk according to the colour coding. The erosion risk is further tested after the emplacement is constructed with the as built survey design. The figures in Appendix 4 are for understanding the erosion assessment process only, they are not final designs of the landform. Once areas are vegetated the risk reduces to unlikely.

Red = erosion is likely, orange = some erosion likely, yellow = minor erosion possible, green = erosion unlikely



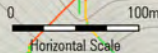


Muswellbrook Denman Road



MacLeans Hill  
Overburden  
Emplacement  
Area

DATUM: GDA 94  
Zone: 56

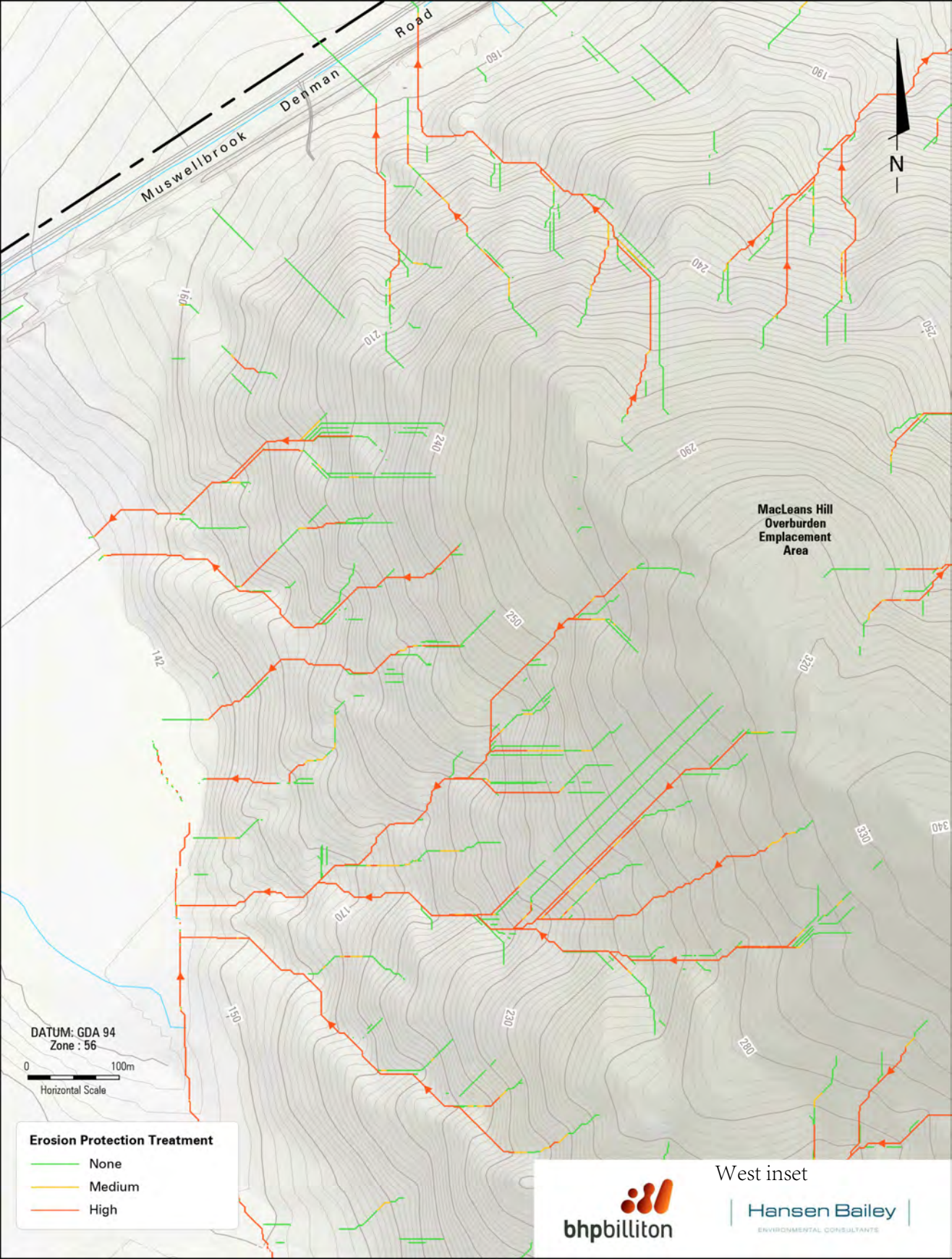


Erosion Protection Treatment	
	None
	Medium
	High

North inset



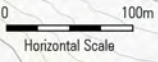
Hansen Bailey  
ENVIRONMENTAL CONSULTANTS



Muswellbrook  
Denman Road

MacLeans Hill  
Overburden  
Emplacement  
Area

DATUM: GDA 94  
Zone : 56



- Erosion Protection Treatment**
- None
  - Medium
  - High



West inset

Hansen Bailey  
ENVIRONMENTAL CONSULTANTS

# MAC-ENC-MTP-047

## REHABILITATION STRATEGY

---

### Appendix 5 – Correspondence records

Records of consultation with Muswellbrook Shire Council and the Division of Resources and Energy have been attached in this appendices. Consultation was made over the period of review to ensure consideration of community and regulator expectations are included into the rehabilitation process.

**From:** [Peter Ainsworth](#)  
**To:** [King, Demus](#); [David Blackmore](#); [Matthew Newton](#); [Michael McFadyen](#); [Anthony Keon](#)  
**Cc:** [Neil, Luke](#); [Withell, Sarah \(NEC\)](#); [McLaughlin, Donna \(NEC\)](#)  
**Subject:** RE: Meeting on 1 December 2016: actions arising  
**Date:** Monday, 5 December 2016 9:58:42 AM  
**Attachments:** [image001.png](#)

---

Hello Demus

DRE can meet on Monday 12<sup>th</sup> at 1pm at our office in Maitland. I will make arrangements to lock in that time from my end.

To assist the discussion next week I have included the comments DRE provided to Mt Arthur in August on the Rehabilitation Strategy. The most recent version of the document (a September draft) does not appear to have substantially addressed these comments.

Please provide any information relevant to Monday's discussion ahead of the meeting to ensure we make best use of the time. In particular, the timeframe of commitments leading up to the March submission of a MOP would be useful if provided prior to the meeting.

Thank you

Peter

DRE comments provided in August (italics):

*As discussed at our meeting on Tuesday 23<sup>rd</sup> August at DRE's Maitland office, I provide the following comments on the draft Rehabilitation Strategy (MAC-ENC-MTP-047) for Mt Arthur Coal Mine:*

### **Rehabilitation Objectives**

*Greater specificity required with regard to rehabilitation objectives:*

#### *Establishment of significant or threatened plant communities*

- *Further detail is required with regard to where each specific vegetation community will be established and the area that each community will cover.*
- *A commitment to achieving the following objectives for each vegetation community is required:*
  - *The vegetation composition of the rehabilitation is recognisable as the target vegetation community*
  - *The vegetation structure of the rehabilitation is recognisable as, or is trending towards the target plant community*
  - *Levels of ecosystem function have been established that demonstrate the rehabilitation is self-sustainable*
- *The completion criteria associated with these objectives is to be developed as part of the*



*Mining Operations Plan as regulated by DRE. This process will need to involve further investigation to determine the appropriate benchmarks that rehabilitation must achieve in order to meet the objectives.*

- *The final landform plan is required to clearly indicate as to where the 500ha of White Box Yellow Box Blakely's Red Gum Woodland will be established.*
- *Further clarity is required in regards to the breakdown of the 2,642 ha of self-sustaining woodland ecosystems to be established and where they will be located on site.*

*The draft Strategy outlines that for woody native ecosystem establishment, different species combinations will be used to establish communities in accordance with the dominant species characterising those stated in the Project Approval Condition 38 (a) and (b). Further clarity is required to determine whether this means:*

- *that species will be selected from all of these communities and included in the one seed mix for use across the site, which may result in a "Novel" ecosystem;*  
*OR*
  - *that a separate species mix will be selected specifically to re-establish each community type.*
- *If the objective is to re-establish a specific community type, then the latter method would be more appropriate.*

#### *Establishment of pasture ecosystem and grazing*

- *Mt Arthur Coal is required to rehabilitate at least 33 hectares of Class II agricultural capability land. The Strategy needs to show where this area will be established as well as outline the location of other pasture areas that are to be established and to what capability.*

#### *Rehabilitation – Native Woodland*

- *Where it is proposed to establish native woodland, but not specifically for the purpose of achieving a significant or threatened plant communities, the objectives need to be specific to the intended outcome. For example, where trees are to be established for visual amenity purposes and/or shelter belts for cattle rather than for the re-establishment of a specific community type. The location of these type of areas should also be shown on the final landform plan within the strategy.*

#### **Natural Landform Design – Macro/Micro Relief**

- *Table 14 in the development consent requires Mt Arthur Coal to integrate micro relief into the final landform design. Whilst the Strategy shows visual montages of how this may look at the completion of mining, further detail is required in relation to the following:*
  - *A polygon to show where these natural landform design principles will be implemented – further landform design details can be provided in the MOP*
  - *Justification for where these principles will not be adopted on site (e.g. existing*

*rehabilitation area along Thomas Mitchell Drive)*

- *Include visual montages that show key interim stages (eg. Upon landform completion, 5 years after completion, 10 -15 years after completion)*
- *Enhance visual montages by including labelling to highlight the natural landscape features integrated into the final landform.*
- *It is the expectation that detailed landform design will be presented in the MOP for submission to DRE. As discussed at the DRE / BHP Billiton meeting on 23 August 2016, MOP Plans should be developed separately for the different zones on site in order to provide better granularity in landform design.*

### **Final Voids**

- *Table 14 of the development consent requires Mt Arthur Coal to minimise to the greatest extent possible the size and depth of final voids as well as any highwall instability risks. Whilst this detail should be included in the MOP, a commitment should be made in the Rehabilitation Strategy that Mt Arthur Coal will commence investigations in regards to the options available to meet this commitment and produce a final landform plan to reflect the preferred option in consultation with DPE and DRE.*

### **Rehabilitation Domains**

- *To assist in structuring the rehabilitation objectives and completion criteria, as required in the MOP, the domains as shown in the Strategy should be based on the final land use domains. The draft Strategy contains a mix of both final land use as well as mine domains (e.g. tailings dam), which provides uncertainty in terms of final land use outcomes. Mine and infrastructure domains can be presented as subdomains in the MOP submitted to DRE.*

*As discussed at the 23<sup>rd</sup> August meeting, Mt Arthur Coal undertook to provide clarification regarding submission and timeframes for a revised MOP, intended for submission towards the end of 2016. It is anticipated that key aspects of the Rehabilitation Strategy (including points raised above) and key findings of rehabilitation mandatory audit will be described in detail in the MOP.*

*Please contact me if you wish to discuss any of these matters further.*

**Peter Ainsworth | Manager and Principal Inspector Environment  
NSW Department of Industry**

**Division of Resources and Energy | Environmental Sustainability Unit  
516 High Street Maitland NSW 2320 | PO Box 344 Hunter Region Mail Centre NSW  
2310**

**T: 02 4931 6480 | F: 02 4931 6790 | M: 0409 638 641 | E:**

**[peter.ainsworth@industry.nsw.gov.au](mailto:peter.ainsworth@industry.nsw.gov.au)**

**W: <http://www.industry.nsw.gov.au>**

---

**From:** King, Demus [mailto:[Demus.King@bhpbilliton.com](mailto:Demus.King@bhpbilliton.com)]  
**Sent:** Friday, 2 December 2016 2:25 PM  
**To:** [peter.ainsworth@industry.nsw.gov.au](mailto:peter.ainsworth@industry.nsw.gov.au); [david.blackmore@industry.nsw.gov.au](mailto:david.blackmore@industry.nsw.gov.au);  
[matthew.newton@industry.nsw.gov.au](mailto:matthew.newton@industry.nsw.gov.au); [michael.mcfadyen@industry.nsw.gov.au](mailto:michael.mcfadyen@industry.nsw.gov.au);  
[anthony.keon@industry.nsw.gov.au](mailto:anthony.keon@industry.nsw.gov.au)  
**Cc:** Neil, Luke; Withell, Sarah (NEC); McLaughlin, Donna (NEC)  
**Subject:** Meeting on 1 December 2016: actions arising

Hello all

Thank you for your time yesterday afternoon. We appreciated the frank discussion and have set out the actions arising with next steps.

Firstly, we would like to reiterate our commitment to working with you in an open, efficient and collaborative way, as we do with our other government and community stakeholders. In our view, ensuring you have access to the information you require to meet your short, medium and long term obligations is of mutual benefit.

With this in mind we would like to reassure you that the business is focussed on timely delivery of our obligations to a standard that meets or exceeds the regulators expectations. We hope you share our view that this is best achieved through ongoing dialogue and trusted informal engagement. Working through the actions arising and early discussion on potential risks to timeframes will help us all deliver good outcomes.

We remain very focussed on moving to completion a number of matters and key documents. These are reflected in the actions arising as set out below:

Action 1: DRE to consider its next steps on the Mandatory Audit process and advise MAC accordingly.

Action 2: DRE to provide MAC with a list of additional information it requires to establish a current baseline for rehabilitation. MAC has undertaken to work with DRE to provide available information through co-operative, informal discussions.

- MAC awaits a list of questions and requested information from DRE

Action 3: MAC to consult with DRE on the draft of the Revised Rehabilitation Strategy (RRS), noting its link with the MOP.

- MAC would like to meet with DRE to discuss the latest draft of the RRS and proposes 12 December after 1pm. Grateful if DRE could advise a suitable time as soon as possible to facilitate travel arrangements.

Action 4: MAC to provide a timeline for the completion and submission of the revised Rehabilitation Strategy, MOP and RCE, including key milestones, consultation programme and timeline management approach.

- MAC will provide the timeline at the meeting proposed for 12 December.

Please let us know if this does not reflect your understanding of our summing up discussion yesterday.

Once again, many thanks and we look forward to working closely with you into the future.

Kind regards



**Demus King**  
**Lead Corporate Affairs NSWEC**  
**Operations Australia**  
[demus.king@bhpbilliton.com](mailto:demus.king@bhpbilliton.com)  
T +61 2 6544 5800  
M +61 416 207 273  
Private Mail Bag 8, Thomas Mitchell Drive  
Muswellbrook NSW 2333 Australia

**[bhpbilliton.com](http://bhpbilliton.com)**

---

This message and any attached files may contain information that is confidential and/or subject of legal privilege intended only for use by the intended recipient. If you are not the intended recipient or the person responsible for delivering the message to the intended recipient, be advised that you have received this message in error and that any dissemination, copying or use of this message or attachment is strictly forbidden, as is the disclosure of the information therein. If you have received this message in error please notify the sender immediately and delete the message.

---

This message is intended for the addressee named and may contain confidential information. If you are not the intended recipient, please delete it and notify the sender. Views expressed in this message are those of the individual sender, and are not necessarily the views of their organisation.

**From:** Neil, Luke  
**To:** ["peter.ainsworth@industry.nsw.gov.au"](mailto:peter.ainsworth@industry.nsw.gov.au); ["matthew.newton@industry.nsw.gov.au"](mailto:matthew.newton@industry.nsw.gov.au); ["david.blackmore@industry.nsw.gov.au"](mailto:david.blackmore@industry.nsw.gov.au)  
**Cc:** [King, Demus](#); [Withell, Sarah \(NEC\)](#); [McLaughlin, Donna \(NEC\)](#)  
**Subject:** FW: DRE Rehabilitation Strategy Meeting 12 Dec 2016  
**Date:** Friday, 16 December 2016 8:29:00 AM  
**Attachments:** [image001.png](#)  
[10193A\\_Plan 1.pdf](#)

---

Hi Guys,

Thanks for making the time for our discussion on the rehabilitation Strategy and the MOP.  
Please see summary of the discussion below.

### **Rehabilitation Strategy Meeting with DRE**

12 December 2016 (1pm)

Attendees – DRE: Matthew Newton, Peter Ainsworth and David Blackmore

Attendees – MAC: Luke Neil and Demus King

- DRE agreed to the timeframe presented for the rehabilitation strategy (31 Dec 2016) and MOP submission with the due date of 31 March 2017. MAC will ensure early discussion with DRE on the MOP before consultation with other stakeholders.
- MAC went through all the line items provided to MAC from the DRE consultation meeting 23 August 2016. DRE were in agreeance with the responses provided by MAC. The main points from the discussion were:
  - Vegetation types, and pasture locations are shown in Figure 3b of the MOP and figure 3 of the new rehabilitation strategy.
  - Further staged montages will be included in the Strategy for MacLeans area. Labels on the montage will be improved for explanation
  - Commitment to a final void study for use options was made
  - Criteria and performance indicators will be updated in alignment with the DRE nomenclature, with further detail provided in the MOP
  - Rehabilitation domains will be further aligned with the MOP
- DRE discussed the new guidelines/process for MOP's, which will be a detailed 2 – 3 year plan that shows where and when Rehabilitation will occur. Furthermore the plan will be enforced for that 3 year period and will require contingency plans for when rehabilitation is not progressing as planned so that rehabilitation matches or exceeds the planned commitment for that period.
- DRE discussed that the new MOP will have an annual reporting requirement which will have detailed information on all the performance indicators and criteria for measuring compliance.
- MAC suggested that this reporting process is potentially duplication as rehabilitation data is already presented in the AEMR and will still be required. Further discussion on this point for clarification will be required as the MOP is updated.
- MAC intends to submit the final rehabilitation plan by 31 December 2016, and submission of the Strategy will not impact on the MOP timeframe as committed to the 31 March 2017
- MAC committed to sending an electronic version of the 3b plan. Note that this will be updated in February with the new mine plan data (Attached).

If you have any comments or further feedback feel free to provide these to us.

regards Luke



**Dr Luke Neil**  
**Principal Environment Analysis & Improvement**  
**Minerals Australia / HSE**

[Luke.Neil@bhpbilliton.com](mailto:Luke.Neil@bhpbilliton.com)

P +61 7 3319 2103

M +61 429 186 152

480 Queen St, Level 14

Brisbane, 4000, Australia

**[bhpbilliton.com](http://bhpbilliton.com)**

**Think B4U Print**

*1 ream of paper = 6% of a tree and 5.4kg CO2 in the atmosphere*

*3 sheets of A4 paper = 1 litre of water*

**From:** [King, Demus](#)  
**To:** [Gove, Bindi](#); [Withell, Sarah \(NEC\)](#); [Bailey, Sarah \(NEC\)](#); [Neil, Luke](#); [McLaughlin, Donna \(NEC\)](#); [Smith, Nigel \(NEC\)](#); [Woodbyrne, Nick \(NEC\)](#)  
**Subject:** FW: dot point minutes for the meeting with MSC  
**Date:** Thursday, 3 November 2016 1:57:19 PM

---

Hi all

Below are the draft minutes for the meeting with the Muswellbrook Mayor yesterday, attended by Luke and I.

Grateful if you could have a quick look and check whether the language / info is ok to send out in writing. Sarah B, we discussed the info on Edderton Rd this morning.... but just wanted to check once more before I hit send.

Thanks all for your input and assistance in the preparation for this meeting. Luke, again, many thanks for coming down to attend.

Demus

-----  
Many thanks for your, and your colleagues' time yesterday. It was a good follow-up to our initial meeting on 20 October 2016 and we appreciated the opportunity to respond to some of the issues you raised.

We have captured the key points from the discussion at 11.30 on 2 November 2016. Grateful if you could review and confirm/add/amend as needed to ensure it accurately reflects our discussion.

- MSC advised that consultation between MAC and MSC is now through the elected arm of the Council, not its employees. This is the case with all mines except those where the Elected Council has delegated responsibility to the Council staff.
- MSC disappointed that MAC did not meet with DPE, DRE and MSC on Tuesday 25 October. MAC noted the inappropriateness of a consultation process that has the regulator present at consultations between stakeholders and MAC. MAC noted that this message had also been delivered to DPE.
- MSC noted that it was providing feedback on the latest draft of the Revised Rehabilitation Strategy (RRS) to DPE today.
- MAC noted that it has a current and approved Rehabilitation Strategy. As a consequence of the modification of the project approval in September 2014, MAC was required to review and update the strategy, hence the current drafting of a RRS. MAC confirmed that a series of extensions had been sought and granted, with the latest on 2 September 2016.
- MSC noted that while montages provided some value in understanding how the rehabilitation might look in the future, the strategy must contain sufficient detail to enable stakeholders to understand how it was going to be achieved and how success would be measured. MAC advised that this aligned with discussions with DPE and further detail will be included in the next draft of the RRS. MAC would like to consult

with MSC on the draft documents and progress as quickly as possible to a final RRS for submission, noting that the expectation is not to reach full alignment (but get as close as possible). It would then be up to the regulator to assess the submitted document together with a consultation report. MSC agreed and noted that they would continue to engage with MAC and the regulators bilaterally. MSC also noted the importance of including some information on closure planning in the RRS (Table14/condition 41A).

- MSC sought agreement that Applied Geofluvial would be done retrospectively on VD1. MAC confirmed that no rehabilitation shaping conducted prior to the granting of the consent (26 September 2014 (Mt Arthur Coal - Open Cut Consolidation Project 09\_0062)) would be redone. All rehabilitation activities after that date would apply micro and macro relief.
- MSC discussed a variety of existing concerns, including the topsoil on the Denman Rd visual bund, watering damage to planted trees and failed plantings on VD1. MAC responded, outlining the work that has occurred including seeding of 74 Ha and tubestock planting (approximately 4000 trees). MSC noted the value of using Jute matting (or similar product) to hold topsoil in place.
- MSC noted concerns from the Thoroughbred studs over visual aspects of MAC from Edderton and Denman roads, and discussed a commitment to plant a screen. MAC has planted trees on Edderton Rd closer to the Denman road intersection. Further work is not currently proposed to plant along Edderton RD but might be considered depending on road alignment discussions. MSC suggested that MAC should consider a post and rail fence opposite EdenGlassie to improve the visual aspect. MAC did not respond to this suggestion.
- MAC advised that a plan to treat the weeds along the Denman Road Bund is already underway:
  - A team of people are currently hand pulling weeds off the bund. This will be followed up with an ongoing weed control program which may involve spraying.
  - The broader annual weed control program will be implemented across MAC properties in the next two weeks.
- MSC sought advice on when the mining activity would reach the 200 metre zone of Edderton Rd. MAC noted that that depended on a range of factors, including the rate and direction of mining. MAC agreed to seek advice on a rough estimate and respond in the minutes (advice is sometime in 2019, may be earlier or later).
- MAC noted the value of broad consultation processes and sought MSC advice on the Community Consultative Committee (CCC). MSC suggested it was ineffective and that MSC had withdrawn from it. MSC suggested a number of individuals as potential members.
- MSC noted that other mines attended a quarterly Mine Manager's Forum. MSC hoped MAC would attend and noted that VPA money could be better coordinated through such a forum.
- MAC noted the value of the recent meetings with MSC and sought to formalise them into a regular monthly meeting with ad hoc meetings where necessary, such as on the future drafts of the RRS as that was brought to finalisation. MSC agreed and noted that the meetings had been useful, had progressed well and gave some confidence for the future.





**From:** [King, Demus](#)  
**To:** [martin.rush@Muswellbrook.nsw.gov.au](mailto:martin.rush@Muswellbrook.nsw.gov.au)  
**Cc:** [steve.mcdonald@muswellbrook.nsw.gov.au](mailto:steve.mcdonald@muswellbrook.nsw.gov.au); [Scott Brooks](#); [fiona.plesman@muswellbrook.nsw.gov.au](mailto:fiona.plesman@muswellbrook.nsw.gov.au); [Neil Luke](#)  
**Subject:** Meeting notes and actions arising: meeting 13 Dec 2016 - draft of the Revised Rehabilitation Strategy  
**Date:** Monday, 19 December 2016 8:10:40 AM  
**Attachments:** [image001.png](#)

---

Martin

Many thanks for your, and your colleagues' time on 13 December 2016 on the most recent draft of the MAC revised rehabilitation strategy.

We have captured the key points from the meeting. Grateful if you could review and confirm/amend as needed to ensure it accurately reflects our discussion.

- MSC discussed the new contour figures (11 and 12) in the rehabilitation strategy and stated that it would be good to see where the pasture and vegetation areas will be for the final landforms. MAC pointed out that the domains and post mined pasture and woodland areas are presented on Figure 3 in the strategy and figure 3b in the MOP in more detail. These figures also include new contouring for MacLeans and the VD emplacement areas.
- MSC stated that the MacLeans emplacement looks engineered to an extent, with it being somewhat symmetrical unlike a natural landform. MAC stated that the design has been based on natural analogues from the Hunter valley and is a very similar design to other natural landforms in the area and across NSW. The Applied Geofluvial design for MAC has the benefit of experience from other Hunter valley designs and also work in WA. Therefore the design would be considered to have evolved since previous designs and aligns with best practice.
- MSC commented on the drainage from near the ridgeline of the main emplacement area saying it would be good to have stock and native animal watering points. MAC agreed that the intent is to have some watering points but would ensure that they do not affect the stability or salinity of the surrounding areas. A small area within the MacLeans emplacement is already designed to have a watering point. Others will be designated as further design work is implemented.
- MSC asked about the intent for tracks and access around the final landforms so that the area could be used for post mining land uses. MAC agreed that this is the intent, however a permanent design of where all the tracks, access and watering points will be has not been developed and will depend largely on where tracks are existing at the end of mine life.
- MSC discussed the void and that it doesn't seem to have changed from the previous design. MAC agreed and stated that void assessment for closure needs more work. MAC has committed to doing an assessment on void design which will include minimising void depth and size, as well as post mining options that will best meet the community and regional objectives. The work is currently being scoped with the intent to proceed with the work in FY18. The result in part will be a framework for which decision making of a final void option can be determined in consultation with stakeholders and regulators.
- MSC raised the issue of staged plans for the strategy or the MOP. MAC noted that there are several mine plan options under review. There is not a single plan that can be used for staged planning before Feb 2017. When an option is chosen MAC will be able to

incorporate staged plans into the revised MOP in consultation with DRE.

- MSC asked how MAC would show compliance with the new Strategy, noting they did not understand how the previous version would meet this requirement. MAC replied that the new version has further detail on criteria and performance indicators and shows the feedback loop on implementing work, monitoring and collecting data, assessing the data and reporting publically and finally from the assessment updates to the relevant plans and processes is made to improve rehabilitation based on the performance. This process will also be detailed further in the MOP. The format of the Strategy and the MOP will be a good tool for understanding compliance of rehabilitation progress at MAC. It will also enable continual improvement of the rehabilitation process through the feedback loop design.
- MSC asked about weed control on some of the offset sites. MAC noted the concern and stated that there is a weed monitoring and management program in place and that further work had been completed recently on the offsets.
- MSC asked about the closure plan as this is not a consent condition. MAC replied that there is a closure plan and this is currently under review. It is a BHPB requirement to have a closure plan for each site and the plan is referenced in the new strategy.
- MSC raised the issue of weeds on the Denman Rd bund. MAC replied that substantial hand weeding had occurred and the 4 km stretch is almost completed. Furthermore several thousand trees were planted and are currently being staked and watered. The management of the bund will continue to ensure good survival of the trees.

#### Actions

- MSC asked which way does the water flow along the ridge of the Main emplacement. MAC agreed to verify if it went North or North and south.
- MSC requested that a montage be developed from Denman Rd further to the North East of the current Denman montage vantage point. MAC agreed that it can be done, but may not be completed in time for submission of the strategy at the end of the year. This will be discussed with the consultant and MAC will provide feedback on the time frame to MSC.
- MSC raised the Drayton Sublease rehabilitation requirements and wanted to know how we were working with Drayton to ensure that if the mine closed that appropriate works would be completed on this leased area. MAC will provide a response to MSC on this issue.
- MSC stated that a previous inspection at MAC showed that there were erosion rills forming vertically between the contour banks. MAC will investigate and reply back to MSC on the status of erosion for the VD area.
- MSC requested an understanding of the tree planting success on the VD areas. MAC will provide this information to MSC once the information from the recent inspection is available.



**Demus King**  
**Lead Corporate Affairs NSWEC**

**Operations Australia**

[demus.king@bhpbilliton.com](mailto:demus.king@bhpbilliton.com)

T +61 2 6544 5800

M +61 416 207 273

Private Mail Bag 8, Thomas Mitchell Drive

Muswellbrook NSW 2333 Australia

**[bhpbilliton.com](http://bhpbilliton.com)**

## Neil, Luke

---

**From:** Peter Ainsworth <peter.ainsworth@industry.nsw.gov.au>  
**Sent:** Wednesday, 26 April 2017 3:57 PM  
**To:** Neil, Luke  
**Cc:** Matthew Newton; Withell, Sarah (NEC); McLaughlin, Donna (NEC); King, Demus; Garrahy, Mark  
**Subject:** RE: Mt Arthur Coal - Mine Operations Plan FY18 - 22 response to DRE review

Hello Luke

Thank you for providing these notes regarding our discussion of the draft MOP and the Rehabilitation Strategy on Friday last week.

It is a good summary of the main points discussed that require further attention prior to submitting the MOP for approval.

Please provide an indication regarding your anticipated MOP submission date.

Peter

**Peter Ainsworth** | Manager and Principal Inspector Environment  
Division of Resources and Mining  
516 High St | Maitland NSW 2320  
PO Box 344 | Hunter Region MC 2301  
T: +61 (0)2 4931 6605 | F: +61 (0)2 4931 6790



---

**From:** Neil, Luke [mailto:[Luke.L.Neil@bhpbilliton.com](mailto:Luke.L.Neil@bhpbilliton.com)]  
**Sent:** Tuesday, 25 April 2017 11:03 AM  
**To:** Peter Ainsworth  
**Cc:** Matthew Newton; Withell, Sarah (NEC); McLaughlin, Donna (NEC); King, Demus; Garrahy, Mark  
**Subject:** Mt Arthur Coal - Mine Operations Plan FY18 - 22 response to DRE review

Hi Peter

Thanks for your discussion regarding the content of the FY18 – 22 MOP on Friday 21 April 2017.

I have noted the discussion in a summary below, and if there is anything incorrect or missing from the summary please contact me to discuss. These points are being added to the MOP and Rehabilitation Strategy.

### DRE feedback on Rehabilitation Strategy

- In General the Rehabilitation Strategy meets the intent for a high level rehabilitation strategy
  - MAC noted
- Some of the content is too detailed including seeding rates and these are better placed in the MOP
  - MAC agree and will remove and ensure they are in the MOP.
- The inclusion of geomorphological landform design is a step in the right direction. It would be good to get more information on where this type of landform will be implemented such as by locations on a map.

o The geomorphological design is new to MAC and there is still a lot of study needed to verify where the design can be implemented and still meet requirements for land use, safety, cost and stability. MAC will be ensuring the landforms are constructed in line with the current Approval MOD1. MAC is commencing a study into void use optionality and management as well as the design implications of further Geoflur™ or natural landform type design across the site during 2018. The design outcome is aimed at stability, land use and diversity of habitat in line with the current Approval MOD1. Importantly we will measure and analyse the development of the Mac Leans landform design to ensure we capture learnings and improvement opportunities. However, as the life of the project could be many decades, detailed design or location of the design will likely be made in medium term time frames. Wording in the Strategy and the MOP will be updated to ensure that this is clear.

#### DRE feedback on the MOP

- Section 3 – Rehabilitation risks needs updating with content to describe drought impacts and controls as well as opportunities regarding more than average rainfall for opportunistic planting / seeding.
  - o MAC Agree. There is opportunity to explain this further and this will be included in the MOP and reference to the Rehabilitation and Ecological monitoring procedure will be made.
- Table 6 needs to have further clarification on the criteria so that they are SMART.
  - o Mac agree and this will be updated in the table
- Section 7 – tailings management is not clear on how the tailings controls will ensure drying and consolidation so that appropriate capping and rehabilitation can occur.
  - o MAC agree, and the appropriate controls will be added to this section and the tailings management procedure referenced.
- Generally the species rates for pasture and woodland should be listed as a guide and subject to change as further monitoring and improvements will need to be used to adjust rates into the future. Adding a statement that shows that this is a guide and subject to change will allow flexibility for this section while allowing for improvement.
  - o MAC agree, and this will be updated.
- Add species names for the woodland species.
  - o MAC agree, these will be added.
- Table 12 – rehabilitation phases need reviewing, these should align with the recent audit and be representative of future expectations for phase at the end of the MOP period.
  - o MAC agree, the table will be updated to be representative of the audit and the future expected rehabilitation phase.

We will continue to update the MOP with the above information and submit the mop in the near future.

Regards Luke



**Dr Luke Neil**  
**Principal Environment Analysis & Improvement**  
**Minerals Australia / HSE**

[Luke.Neil@bhpbilliton.com](mailto:Luke.Neil@bhpbilliton.com)

P +61 7 3319 2103

M +61 429 186 152

480 Queen St, Level 14

Brisbane, 4000, Australia

**bhpbilliton.com**

**Think B4U Print**

*1 ream of paper = 6% of a tree and 5.4kg CO2 in the atmosphere*

*3 sheets of A4 paper = 1 litre of water*