LIDDELL

GLENCORE

Mining Operations Plan 2018-2020

Amendment B

Mine Name	Liddell Coal Operations
Company	Liddell Coal Operations Pty Ltd
Operator	Liddell Coal Operations Pty Ltd
Mining Title and Leaseholder	ML 1597, ML1313, CCL 708, Sublease ML1552 Liddell Tenements Pty Ltd.
Reporting Officer	Ben de Somer
Date Submitted	7 February 2020

Liddell Coal Operations
Mining Operations Plan 1 December 2017 – 1 December 2020

Name of Mine	Liddell Coal Operations
MOP Commencement Date	1/12/2017
MOP Completion Date	1/12/2020
Mining Authorisations (Lease / Licence No.)	ML1597, ML1313, CCL708, Sublease ML1552
Name of Authorisation / Authorisations Holders (s)	Liddell Tenements Pty Limited
Name of Mine Operator (if different)	N/A
Name and Contact Details of the Mine Manager (or equivalent)	Mark Faulkner
Name and Contact Details of the Environmental Representative	Ben de Somer
Name of Representative(s) of the Authorisation Holder(s)	Murray Gregson
Title of Representative(s) of Authorisation Holder(s)	Operations Manager
Signature of Representative(s) of Authorisation Holder(s)	
Reporting Officer	Ben de Somer
Date	7/2/2020
Version	Amendment B

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1 Introduction

1.1 Overview

Liddell Coal Operations (LCO) is an established open-cut mine located at Ravensworth, approximately 25 kilometres (km) north-west of Singleton, and 26 kilometres southeast of Muswellbrook, in the Upper Hunter Valley of New South Wales. LCO is operated and managed by Liddell Coal Operations Pty Limited, a wholly owned subsidiary of Glencore Coal Pty Limited (Glencore), on behalf of a joint venture between Glencore (67.5 percent (%)) and Mitsui Matsushima Australia (32.5%). The location of LCO is illustrated on **Plan 1A** (refer to **Appendix A**).

LCO has approval to produce up to 8 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal. Product coal, both semi-soft and thermal, is transported to the Port of Newcastle by rail for sale into the export market. LCO also has approval to truck up to 0.5 Mtpa of reclaimed tailings to local power stations.

1.2 Purpose

This plan has been prepared to satisfy the requirements of a Mining Operations Plan (MOP) in accordance with the NSW Trade and Investment – Division of Resources and Energy (DRE) guideline *ESG3: Mining Operations Plan (MOP) Guidelines, September 2013* (DRE 2013). This MOP also satisfies the requirements for a Rehabilitation Management Plan in accordance with DA 305-11-01 MOD 7 (Schedule 3, Condition 39) (**Appendix B**) and EPBC 2013/6908 Condition 5. This MOP documents the following:

- Proposed mining operations as approved by development consent DA 305-11-01 (MOD 7) issued under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act);
- Long-term mine closure principles and proposed final land use outcomes; and
- Proposed rehabilitation methods and progress during the MOP term.

1.3 History of Operations

Underground mining commenced at LCO in 1923, and open cut operations in 1946. Mining operations have been continuous at LCO since the 1950s, with operations intermittent prior to this time. Four separate mines once operated at LCO, being the former:

- Liddell, Durham, and Foybrook mines, all of which included both open cut and underground mining operations; and
- Hazeldene, a former underground mine.

The extent of historical underground and open cut workings is illustrated on **Plan 1C**.

In June 1989, the Liddell Joint Venture purchased the Liddell Colliery and lodged an application with Muswellbrook Shire Council to extend operations using both open cut and underground mining methods. This application was approved on 1 May 1990 (DA 24/90).

In 1993, the Liddell Joint Venture acquired the Foybrook leases, excluding the Antiene Void, and lodged a further development application to extend open cut mining operations in the Foybrook lease. Muswellbrook Shire Council granted development consent for this application on 31 March 1994 (DA 101/93).

Development Consent DA 305-11-01 granted in 2002 by the (now) Department of Planning and Environment (DP&E) consolidated DA 24/90 and DA 101/93 into a single consent, and approved the continuation of open cut operations at LCO until 31 December 2023. DA 305-11-01 remains the current development consent for LCO. The current open cut operation accesses coal reserves not previously recovered by underground mining that utilised partial extraction techniques.

DA 305-11-01 allows for the use of three mining methods at LCO; truck and excavator, dragline, and highwall mining (utilising an auger or continuous miner). Limited highwall mining has been undertaken

intermittently to extract coal from areas where open cut mining is not feasible. There have been no dragline operations to date at LCO.

Since approval, DA 305-11-01 has been modified six times: Modifications (MOD) 1 to 4 approved a number of administrative changes, construction of new infrastructure and modifications to existing infrastructure, and an increase in production from 4.5 Mtpa to 8 Mtpa (refer to **Section 1.4.1**).

MOD 5 was approved by the DP&E on 1 December 2015 and approved the extension of mining in the South and Entrance Pits to the south east, and, upon completion of mining in these pits, the mining of coal resources under the Mine Infrastructure Area (MIA) during which the MIA will be relocated to temporary facility. An additional approximate 38 Mt of ROM coal will be recovered from the extended open cut mining areas. MOD 5 also approves a five year extension of the mine life to the end of 2028, as well as the construction of a tailings emplacement within the South Pit void.

MOD 6 was approved by the DP&E on 16 February 2016 and approves construction and operation of a tailings pipeline from the Coal Handling and Preparation Plants (CHPPs) at Ravensworth Operations and Liddell Colliery to the West Pit Void at Ravensworth East Mine.

MOD 7, approved by DP&E on 12 February 2019, comprised of minor amendments to facilitate required remediation works on a portion of the Mountain Block Offset Area. The minor amendments also sought to facilitate improved operational efficiencies at LCO whilst providing the necessary flexibility required for the development of the final landform to the established rehabilitation objectives established for LCO.

Section 2 provides more detailed description of the proposed activities in the MOP term.

1.3.1 History of MOPs

Table 1 lists the history of MOPs at LCO since the granting of DA 305-11-01 in 2002.

Table 1 History of MOPs

MOP	Status	Issue date	Expiry Date
2018 - 2020 MOP Amendment B	Current	17/2/2020	1/12/2020
2018 - 2020 MOP Amendment A	Superseded	17/9/2019	1/12/2020
2018 - 2020 MOP Addendum 2	Superseded	24/10/2018	1/12/2020
2018 - 2020 MOP Addendum 1	Superseded	22/06/2018	1/12/2020
2018 - 2020 MOP	Superseded	29/11/2017	1/12/2020
2015 - 2022 MOP Amendment A	Superseded	20/01/2017	16/03/2022
2015 - 2022 MOP	Superseded	16/03/2015	16/03/2022
2008 – 2015 MOP Amendment C	Superseded	14/04/2014	31/05/2015
2008 – 2015 MOP Amendment B	Superseded	17/10/2011	2015
2008 – 2015 MOP Amendment A	Superseded	25/03/2010	2015
2008 – 2015 MOP	Superseded	11/04/2008	2015
2002 – 2008 Amendment A	Superseded	03/02/2004	2008
2002 – 2008	Superseded	21/05/2002	2008

1.4 Current Consents, Authorisations and Licences

1.4.1 Development Consents

As outlined in **Section 1.3**, the development consent applicable to LCO is DA 305-11-01 MOD 7, approved by the DP&E on 12 February 2019 under Sections 76(A) and 80 of the EP&A Act. Hence, LCO is classified as a Level 1 Mine as defined by *ESG3 Mining Operations Plan (MOP) Guideline* (DRE, 2013). **Table 2** summarises the modification history of DA 305-11-01 and key features of the project approved by each modification.

In addition to the State development consent, on 24th December 2014 LCO was granted EPBC Approval 2013/6908 for a controlled action under the *Environment Protection and Biodiversity Conservation Act*

1999 to expand the existing Liddell open cut coal mine operations in the Hunter Valley region in New South Wales, under the following Controlling Provisions:

- Listed threatened species and communities (sections 18 & 18A)
- Listed migratory species (sections 20 and 20A)
- Water resources/trigger (sections 24D and 24 E)

Mining activities commenced within the approval area on the 19 May 2015 and the approval expires 31 December 2044.

Table 2 Development Consents

Consent	Details	Issue Date	Expiry Date
DA 305-11-01	Development Consent for the continued operation of the Liddell Colliery including increase of ROM coal production to 4.5 Mtpa with product transferred via the Liddell Coal loading facility and the Main Northern Railway to the Port of Newcastle, using existing infrastructure and extension of open cut mining to two new pits.	20 Nov 2002	31 Dec 2023
DA 305-11-01 MOD 1	MOD 2 - a 47 hectare extension to the open cut mining footprint, an increase in ROM coal production from 4.5 up to 8 million tonnes per year, construction and operation of a new coal handling and preparation plant (CHPP), and modifications to coal handling, loading and stockpiling facilities, an increase in rail transportation of product coal from 3.4 up to 6 million tonnes per year, and construction of an access haul road adjacent to the Main Northern Railway Line and an overpass haul road bridge.	1 Aug 2003	31 Dec 2023
DA 305-11-01 MOD 2	Modification of the development consent boundary to incorporate a groundwater monitoring bore.	18 July 2007	31 Dec 2023
DA 305-11-01 MOD 3	MOD 3 – RE-use of treated effluent and storage of in Dam 13, and realignment of the Old New England Highway and the Access Road intersection.	7 May 2008	31 Dec 2023
DA 305-11-01 MOD 4	MOD 4 – Construction of additional offices and workshop facilities.	27 Oct 2009	31 Dec 2023
DA 305-11-01 MOD 5	MOD 5 - Extension of the existing Entrance Pit and South Pit to the south east, mining of coal resources under the MIA upon completion of mining in the South and Entrance Pits, and an associated extension in the mine life at LCO from 2023 to 2028. MOD 5 also allows the construction of a tilings emplacement in the South Pit void.	1 Dec 2014	31 Dec 2028
DA 305-11-01 MOD 6	MOD 6 - construction and operation of a tailings pipeline from the Coal Handling and Preparation Plants (CHPPs) at Ravensworth Operations and Liddell Colliery to the West Pit Void at Ravensworth East Mine	16 Feb 2016	31 Dec 2028
DA 305-11-01 MOD 7	MOD 7 – Minor amendment to permit the required delivery of Mountain Block Offset area and the efficient delivery of the final landform to the established rehabilitation objectives	12 Feb 2019	31 Dec 2028

1.4.2 Mining Titles

The mining titles applicable to LCO are listed below in **Table 3**. During the previous MOP term, LCO applied to modify ML1597 with an Ancillary Mining Activity (AMA) approval for rehabilitation activities associated with Mountain Block discussed in Section 9.1.2. Subsequently, ML1597 was varied with AMA1020 on the 21st January 2020, refer to **Appendix E**.

Table 3 LCO Mining Titles

Mining Title	Title Holder	Issue Date	Expiry Date
ML 1597	Liddell Tenements Pty Ltd	5 Nov 2007 Varied with AMA1020 21 Jan 2020	5 November 2028
CCL. 708	Liddell Tenements Pty Ltd	17 May 1990	30 December 2023
ML 1313	Liddell Tenements Pty Ltd	5 May 1993	13 October 2023
Cumnock Sublease MML 1552	Liddell Tenements Pty Ltd	25 Jan 2006	10 March 2025

1.4.3 Licences

1.4.3.1 Environment Protection Licence

LCO currently operates under Environment Protection Licence (EPL) 2094, which is renewed annually on 30 June. The licence covers the scheduled activities of 'mining for coal' and 'coal works'.

EPL 2094 outlines air quality, surface water quality and blast criteria. EPL 2094 also enables discharges off-site in accordance with the Hunter River Salinity Trading Scheme (HRSTS). Monitoring is reported to the Environment Protection Authority (EPA) as part of the LCO EPL Annual Return.

1.4.3.2 Surface Water Extraction Licences

Table 4 lists the surface water licences currently held by LCO.

Table 4 Surface Water Extraction Licences

Surface Water Extraction Licences						
Locality	**Licence No.**	**Holder**	**Use**	**Water Source/ Management Zone/Type**	**Annual Use (ML)**	**Annual Allocation (ML)**
Bowmans Creek	WAL 18320	Enex Foydell Pty Ltd	Irrigation	Jerrys Water Source/ Jerrys Management Zone/ Unregulated River	Nil	50
Bowmans Creek	WAL18304	Enex Foydell Pty Ltd	Irrigation	Jerrys Water Source/ Jerrys Management Zone/ Unregulated River	Nil	32
Bowmans Creek	WAL18318	Novacoal Australia Pty Ltd	Irrigation	Jerrys Water Source/ Jerrys Management Zone/ Unregulated River	Nil	55
Bayswater Creek	WAL 18306	Mitsushima Australia Pty Ltd Enex Liddell Pty Ltd Gabume Pty Ltd	Industrial (coal mining)	Jerrys Water Source/ Jerrys Management Zone/ Unregulated River	Nil	100
Hunter River via AGL Macquarie	WAL7815	Liddell Tenements Pty Ltd	Industrial	Hunter Regulated River Water Source/ Zone 1B Regulated River	Nil	20
Swamp Creek	20SL042837	LCO Pty Ltd	Monitoring		Nil	N/A – Diversion Works

1.4.3.3 Groundwater Licences

LCO currently holds the following groundwater licences as shown in **Table 5**:

Table 5 Groundwater Licences

Groundwater Licences					
Locality	**Licence No.**	**Holder**	**Lot/DP**	**Purpose**	**Annual Extraction Allocation (ML)**
Haz 6	20BL168066	Liddell Tenements Pty Ltd	81/607296	Monitoring	N/A
Dur 3	20BL168065	Liddell Tenements Pty Ltd	31/837350	Monitoring	N/A
LC1	20BL168064	Liddell Tenements Pty Ltd	353/867083	Monitoring	N/A
Durham 1	WAL41499	Liddell Tenements Pty Ltd	33/862516	Industrial	6000
8 South 3 & 4	WAL41498	Liddell Tenements Pty Ltd	32/870789	Industrial	6000
Durham 2 & 4	WAL41497	Liddell Tenements Pty Ltd	3/237654	Industrial (2 bores)	1000
Haz 2	WAL39760	Liddell Tenements Pty Ltd	81/607296	Industrial (2 bores)	5500
ALV1, ALV2, ALV3, ALV4, ALV7, ALV8	20BL168053	LCO Pty Ltd	43/654013 201/848078 4/255403 81/607296 6/255403 32/545601	Test bore/ Monitoring	N/A
Bowmans Creek Alluvial	WAL18302	Liddell Southern Tenements Pty Ltd	32/545601	Irrigation	5
Bowmans Creek Alluvial	20WA210940	Enex Foydell Limited	6/1077004	Irrigation	5
M49	WAL41493	Liddell Southern Tenements Pty Ltd	32/545601	Dewatering	2500
Mt Owen 1	WAL41493	Mt Owen Pty Ltd	353/867083	Stock, domestic, farming and test purposes	2500
Mt Owen 2	20BL169544	Mt Owen Pty Ltd	353/867083	Dewatering	2500
Middle Liddell	WAL41498	LCO Pty Ltd	1/237766	Dewatering	6000

1.4.3.4 Radiation Density Gauge Licence

LCO holds Radiation Management Licence 5061082 (expires 12 September 2020) to possess radioactive apparatus and substances. Radiation density gauge locations at the CHPP are recorded and registered by the EPA.

1.5 Land Ownership and Land Use

The area within and surrounding the LCO is dominated by mining and power generating activities, as illustrated on **Plan 1C**. Surrounding mining operations include Ravensworth Operations to the south, Ravensworth Underground Mine and the Ravensworth Central Coal Processing (RCCP) facility to the south west, and the Mount Owen Complex (incorporating Mount Owen, Ravensworth East and Glendell mining operations) to the east. Other mines in the wider surrounding area include Ashton Coal, Integra and Hunter Valley Operations. Bayswater and Liddell Power Stations are located to the west and north-west of LCO respectively.

Lake Liddell lies immediately adjacent to the western boundary of LCO, with the Main Northern Railway line traversing LCO from northwest to southeast. The remaining land within the vicinity of LCO is predominantly used for grazing purposes with a small number of privately owned rural residences located to the north east and north-west of LCO. The nearest private residence to LCO is approximately 1 km from the LCO development consent boundary. Two properties owned by AGL Macquarie are also located to the north west of LCO. Land ownership and land use is illustrated on **Plan 1C** and detailed in **Appendix C**.

1.6 Stakeholder Consultation

Extensive stakeholder consultation specifically related to the activities proposed in this MOP term, including environmental management, proposed rehabilitation strategies, and final land goals for LCO was recently undertaken as part of the preparation of the Environmental Assessment accompanying the development application for MOD7, MOD 6,MOD 5. These consultation activities are outlined in Modification 7 Environmental Assessment (Hansen Bailey, 2018), *Greater Ravensworth Area Tailings Pipeline Modification Environmental Assessment* (MOD 6 EA) (Hansen Bailey, 2015) and *Liddell Coal Operations Proposed Modification to DA 305E-11-01 Environmental Assessment* (MOD 5 EA) (SLR, 2013).

The Rehabilitation Strategy prepared to support the MOD 5 EA (MOD 5 EA Appendix S) (Umwelt, 2013) was prepared in consultation with community stakeholders and regulators including the RR, DPIE, NSW Office of Water (NOW), NSW Office of Environment and Heritage (OEH), Forests NSW, Singleton Council (SC) and Muswellbrook Shire Council (MSC).

During the 2018-2020 MOP preparation, the plan was distributed to DPIE (formerly DP&E), DPI Crown Lands and Water Division (formerly DPI Water), OEH, SC and MSC for comment with key points summarised herein. DP&E have reviewed the MOP and generally found the plan to be comprehensive and to an acceptable standard. Feedback from DP&E regarding the specificity of several completion criteria in Section 6 has been addressed in this MOP with the exception of one item. LCO have not specified the legislation to be complied with for pest control since this criteria mainly identifies that legislation is to be complied with and the legislation may change over time.

MSC provided feedback noting that active mining areas of LCO are no longer within the Muswellbrook LGA, a concern regarding the timeliness for Mountain Block relinquishment and noted that LCO does not intend to relinquish rehabilitation during the MOP term. These comments have been addressed with **Section 9** specifying that timelines will be clearly identified and detailed in Q1 2018 when the remediation strategy is appended to this MOP as per consultation with DRG/DPE. Commentary on the amount of relinquished rehabilitation is included in **Section 7.5.**

DPI Crown Lands and Water Division provided feedback on the 28/11/2017 with changes either incorporated into this document or noted for inclusion in the required Q1 2018 amendment (inclusion of Mountain Block Strategy). As per the feedback, a number of groundwater licence references have been updated to reflect changes under the *Water Sharing Plan North Coast Fractured and Porous Rock Groundwater Sources 2016*. Also, LCO will consult with DPI Crown Lands and Water Division regarding information on 20BL017861 and 20BL169544 extraction/allocation. A summary of other comments from DPI Crown Lands and Water Division and LCO's response is below;

- **Section 2.3.4** – Land Preparation – The requirement for works on waterfront land to be undertaken in accordance with Guidelines for Controlled Activities on Waterfront Land 2012; specifically erosion and sediment control must be undertaken in accordance with *Managing Urban Stormwater: Soils and Construction, Volume 1*(Landcom, 2004). **Section 2.3.4** has been updated to reference the LCO documents which detail land preparation and management of erosion and sediment control; specifically the LCO Water Management Plan and LCO Biodiversity Management Plan.
- **Section 3.3.3** – Surface Water – Recommendation to include additional detail regarding the monitoring program, specifically the in-stream gauging of Bowmans Creek. **Section 3.3.3** has been modified to clearly identify this monitoring however it should be noted that full detail of the monitoring program is included in the LCO Water Management Plan referred too.
- **Section 3.3.7** – Biodiversity – Recommendation to detail the design and implementation remediation targets for Bowmans Creek and any remediation plan for Bowmans Creek should be consistent with *A Rehabilitation Manual for Australia Streams*, Land and Water Resources Research and Development Corporation 2000. LCO note that the Biodiversity Management Plan and Biodiversity Offset Management Plan detail the remediation and protection strategies for Bowmans Creek.
- **Section 4 –** Post Mining Land Use - Where the water captured by dams is intended to be accounted through harvestable rights, consideration should be given to the final ownership of the land to ensure the dams will be within the maximum harvestable right, or otherwise licensed or decommissioned. LCO note that this issues and similar will be addressed during the detailed closure planning stage of the operation.

- **Section 9.2** – Trigger Action Response Plan (TARP) – Recommendation to update the TARP to include timeframes for proposed actions and notifications to relevant regulatory authorities. LCO note that any triggers and appropriate actions occurring are identified in the Annual Review.

Copies of correspondence received from stakeholders regarding the 2018-2020 MOP have been appended to the document**.** Proposed consultation activities for this MOP term are summarised in the sections below.

1.6.1 Community Consultation

The LCO Community Consultative Committee (CCC) meets approximately twice per year to provide a formal forum for interaction between the community and mine management. The CCC consists of two representatives from LCO, at least one representative from Muswellbrook Shire Council and Singleton Council, and at least three representatives from the local community. Environmental performance, rehabilitation progress and upcoming mining activities are discussed at the CCC.

LCO also utilises newsletters and the LCO public website to distributed relevant information to local residents and the broader community, (http://www.liddellcoal.com.au/EN/Pages/default.aspx).Specific consultation with the Aboriginal community will be undertaken (if required) in accordance with the *Aboriginal Cultural Heritage Consultation Requirements* (ACHCRs) (DECCW, 2010).

LCO operate Community Response and Blasting Information Hotline (free call 1800 037 317) 24 hours per day, 7 days per week. All enquiries regarding blasting and/or community complaints that are received are responded to by LCO in an efficient manner and reported in the Annual Review (AR) and CCC minutes.

Consultation will continue in the MOP term with Coal & Allied, in the capacity of neighbouring landholders. Specifically, LCO regularly liaises with Coal & Allied regarding the management of the Chain of Ponds Inn, a State Heritage listed item located adjacent to LCO on land owned by Coal & Allied (refer to **Section 3.3.12**).

1.6.2 Statutory Authorities

LCO reports to government and other agencies regarding environmental performance in accordance with consent and licencing conditions. Statutory reporting includes:

- Provision of the AR to the DP&E, RR and other relevant government agencies;
- Provision of the Annual Review
- Reporting exceedance of EPL conditions to the EPA;
- Provision of the EPL Annual Return to the EPA; and
- Provision of the National Pollution Inventory (NPI) to the Commonwealth Department of the Environment

1.6.3 MOP Consultation with the RR

A meeting was held on the 17 October 2017 between LCO and the then DRE to discuss the scope of the 2018-2020 MOP. Key discussion points during the meeting have been addressed in this document including proposed revised completion criteria, Mountain Block Remediation Strategy and discussion surrounding the final landform. During the MOP Term, LCO intend to continue consultation with DRG and relevant stakeholders to refine the completion criteria with the aim to have clearer/measureable appropriate to the post mining land use.

During 2019, LCO received approval of DA305-11-01 Modification 7, refer to Section 1.3, triggering MOP Amendment A. Updates to the plan included reflecting Mod 7 revised rehabilitation condition (DA305-11-01 Schedule 3 Condition 39) as well as incorporating recommendations from the 2019 Independent Environmental Audit. During January 2020, LCO received approval of AMA 1020 revising ML1597 and triggering MOP Amendment B, refer to Section 1.4.2. For both amendments, LCO consulted with RR on the scope of the changes proposed and consultation requirements. Further consultation with other regulatory agencies was not required as it is considered the updates are minor in nature and do not constitute a change in management outcomes also noting that LCO will complete consultation with identified stakeholders during the preparation of the next MOP 2021-2023 in 2020.

2 Proposed Mining Activities

2.1 Project Description

In accordance with DA 305-11-01 LCO has approval to undertake open cut mining until 31 December 2028, producing up to 8 Mtpa ROM coal. As at December 2016 the remaining recoverable reserves within the approved extraction area total (approximately) 29.9Mt. ROM coal is processed at the LCO CHPP to produce both thermal and semi-soft coking coal products that are transported via rail to the Port of Newcastle for export. LCO also has approval to reclaim and sell up to 0.5 Mtpa of screened tailings directly to AGL Macquarie, via road haulage at up to 114 truck movements per day, 5 days per week.

LCO employs approximately 360 full-time personnel and up to 100 contractors, and operates 24 hours per day 7 days per week.

During this MOP term, mining will continue to advance in a southerly direction in both the Entrance Pit and continue deeper in the South Pit which has reached the planned southern extent. Open cut mining will primarily utilise truck and shovel mining methods. Following progressive removal of vegetation and soils, overburden will generally be blasted, stripped and emplaced in-pit behind mining. Overburden emplacements will be progressively rehabilitated in areas that have been dumped to the final dump height.

Key components that are proposed to be undertaken in this MOP term, as approved under DA 305-11-01, include:

- Open cut mining in the South Pit and Entrance Pit; at a combined rate up the 8 Mtpa ROM coal;
- ROM coal processing at the LCO CHPP to produce thermal and semi-soft coal products;
- Co-emplacement of coarse rejects with overburden in-pit;
- Continued tailings emplacement at the existing tailings emplacement facilities;
- Construction of the Greater Ravensworth tailings pipeline infrastructure in 2018-2019 as per DA 305-11-01 Mod 6;
- Construction of minor additional surface infrastructure including powerlines, water management infrastructure and haul roads;
- Continued use of the Coal and Allied rail loading facilities and rail loop.
- Continue implementation of the Mountain Block Remediation Strategy

DA 305-11-01 also approves the construction of a new conveyor and connection to the existing overland conveyor to convey up to 1.5 Mtpa ROM coal to the RCCP for processing, and up to 2Mtpa ROM coal from Mount Owen Complex. Further, DA305-11-01 approves emplacement of tailings in the South Cut Pit. Construction of this infrastructure is unlikely to be required in the MOP term. If it is determined that the new conveyor is required LCO will consult with the RR and if required prepare a MOP Amendment to address construction and operation of the conveyor.

Proposed activities in the MOP term are further discussed in **Section 2.4**.

2.2 Asset Register

The asset register (**Table 6**) provides a summary of the key features of each primary domain (refer to **Section 5.1**), and principal activities required for rehabilitation. This asset register is intended to provide a suitable level of context for the Rehabilitation Cost Estimate (RCE) (**Section 2.2.1**).

The areas for each primary domain represent the total disturbance footprint for each domain at the commencement of the MOP term, as depicted on **Plan 2** (refer to **Appendix A**)

Table 6 Asset Register

Major Assets	Decommissioning/ Rehabilitation Activities	Approvals Required	Area/ Length
Domain 1 - Active Mining			
South Pit and Entrance Pits	Progressively backfill open cut pit with overburden Develop Final Void design Regrade final void highwalls and lowwalls, and cap all exposed coal, in accordance with design.	Closure Plan including Final Void Management Plan and Final Void detailed design.	223.5 ha
Domain 2 – Water Management			
Water management system including pipelines and underground bores	Decommission pipelines and bores Remove pipelines Seal bores Rehabilitate	EDG01 – Borehole Sealing Requirements on Land	n/a
Reservoir North Void	Decommission, remove sediments and convert to clean water farm dam	None	12 ha
Decant Dam	Decommission remove contaminated sediments and/or hazardous materials Convert to clean water farm dam	None	2.4 ha
Dam 1, Dam 3, Dam 5, Dam 6 (Clean Water Dams)	Retain post closure as farm water dams	None	8.6 ha
Dam 4 and Dam 17 (Dirty Water Dams)	Decommission, remove sediments and retain as clean water farm dam	None	16 ha
CHPP South Dam	Decommission Remove contaminated sediments Backfill Rehabilitate	None	0.3 ha
CHPP Settling Pond		None	0.2 ha
Workshop Sedimentation Dam		None	0.4 ha
Domain 3 – Infrastructure			
LCO CHPP incl, small buildings, industrial buildings, workshops, stockpile areas, CHPP car-parks and settling ponds.	Contamination assessment/s Develop demolition plan Disconnect services Remove radiation gauges in accordance with legislation Demolish and remove infrastructure including concrete footings Undertake remediation works (if required) Rehabilitate	Radiation licence/s Demolition certificate Phase 1 and, if required, Phase 2 Contamination Assessments	25.8 ha
CHPP conveyors and gantries			455 m
Fuel farms and hydrocarbon remediation area		Demolition certificate Phase 1 and, if required, Phase 2 Contamination	3656 m2

Major Assets	Decommissioning/ Rehabilitation Activities	Approvals Required	Area/ Length
Site services including 11kV and 33kV power lines and communications infrastructure	Decommission Remove power lines	None	n/a
Open cut facilities including admin buildings, car parks and ancillary buildings	Decommission Relocate or demolish built infrastructure Remove infrastructure Rehabilitation	Demolition certificate	29 ha
Haul roads (South Pit, Entrance Pit, Reservoir Area)	Decommission Remove hazardous materials Rehabilitate	Phase 1 and, if required, Phase 2 Contamination Assessments	39 ha
Ancillary disturbance requiring minor shaping including unsealed access roads	Decommission Rehabilitate	None	57 ha
Domain 4 – Overburden Emplacement			
290.8 ha currently active and will be progressively shaped and rehabilitated throughout the MOP term 796.7 ha undergoing rehabilitation			1087 ha
Domain 5 – Tailings Storage Area			
Antiene Tailings Dam	Decommissioning Filling and shaping Detailed capping design and Section 101 application Rehabilitation	Section 101,	71.5 ha
Reservoir West Reservoir South Durham Tailings Emplacement Area	Decommissioning Filling and shaping Capping Rehabilitation	Section 101	

2.2.2 Rehabilitation Cost Estimate

The Rehabilitation Cost Estimate (RCE) prepared for this MOP submission has been calculated to undertake the necessary works to achieve the desired final land use (refer to **Section 4** and **Plan 4**). The RCE provides for:

- Decommissioning and demolition of all surface infrastructure;
- Rehabilitation of all areas disturbed by mining as depicted in **Plan 2**, with the exception of dams to be retained for post mining use; and
- Mobilisation costs, project management and contingencies.

Elements subject to further detailed design (such as final voids) have uncertain costs and have therefore been costed based on industry and DRG accepted practices, and the current approved final landform.

As per consultation with RR regarding MOP Amendment B, LCO has submitted for assessment a revised RCE to reflect the increased disturbance footprint of ML1597 as approved by AMA 1020; required to rehabilitate Mountain Block Slope.

2.3 Activities over the MOP Term

2.3.1 Exploration

LCO's primary purpose for exploration is to achieve measured status remaining mineable coal reserves in accordance with the "Australasian code for Reporting of Exploration Results, Minerals Resources and Ore Reserves – the JORC Code 2012 Edition".

Due to the extensive historical mining within the reserve pit shells and the associated challenges of drilling through overburden spoil dumps and underground workings, it will not be possible for the entire mineable reserves to achieve measured status. However the existences of historical mine workings can benefit the structural validity of the modelled coal seams and the identification of geological structures within the LOM pit shells.

As a minimum LCO's reserve status must be indicated for all coal seams. Future exploration programs will be designed to achieve measured status in the resource model down to the Barrett coal seam where possible. Achieving measured status requires compilation and validation of both structural and quality properties of coal seams. In addition to achieving measured status, exploration may also be required to further examine and understand geological anomalies encountered during the mining process.

LCO will continue to undertake exploration and prospecting activities across the approved lease areas for the purposes of geotechnical, geological, hydrogeological and gas investigations. These leases include ML 1597, ML 1313, CCL 708, and ML 1552. More specifically, exploration work will involve core and/or open holes for structural definition, coal quality sampling, geotechnical assessment, groundwater monitoring and greenhouse gas assessment.

The techniques used for exploration and prospecting may include, but are not limited to:

- Aerial photograph interpretation;
- Field assessments (soil, vegetation, etc.);
- Drilling allowing for lithological and geophysical logging and/or coal quality sampling;
- Drilling associated with collecting gas concentration samples;
- Geophysical investigations;
- Magnetic surveys;
- Seismic surveys; and
- Excavation and bulk samples.

Any plans for exploration are dependent upon mine planning and economic conditions and appropriate notice of future exploration programs will be provided in accordance with relevant tenement conditions. Annual reporting of exploration activities will continue to be undertaken in accordance with the relevant tenement conditions.

2.3.2 Construction

Tailings Management

In order to manage tailings as the operations currently active tailings facilities near capacity, LCO will construct the pipeline approved under MOD 6 to transfer tailings from Liddell CHPP to the West Pit Void at Mt Owen Complex, including associated secondary flocculation plant.

LCO continues to review tailings capacity requirements in consideration of health, safety, environment and community expectations and economic considerations. Detailed design and feasibility analysis of all emplacement areas occurs prior to seeking approval for the commencement of emplacement activities. LCO maintains a good relationship with the NSW Resource Regulator and maintains compliance with all legislative requirements associated with the emplacement of tailings. LCO has consulted with NSW Resource Regulator regarding future emplacement areas and has committed to the following prior to commencing emplacement activities in any new emplacement area:

- Conducting detailed design and analysis of all future tailings emplacement areas;
- Consultation with relevant stakeholders; and
- Obtaining all relevant approvals required by relevant legislation.

Additional Minor Infrastructure

Construction of additional minor infrastructure in the MOP term includes:

- Additional water management infrastructure; and
- Additional haul roads

2.3.3 Mining Operations

Open Cut Mining

The open cut mining sequence at LCO includes:

- Land preparation including vegetation removal and pre-stripping topsoil;
- Removal of overburden;
- Coal extraction, predominantly using excavators and tucks;
- Coal processing and transport.

Mining will continue in the MOP term targeting the Lemington, Pikes Gully, Arties, Liddell, Barrett and Hebden seams. These seams range from 0.7 metres (m) to 9.5 m in thickness, and include semi-soft and thermal coal types. Mining will generally utilise hydraulic excavators and trucks which are suitable for working in the relatively small South Pit and Entrance Pit to recover coal from multiple seams.

Highwall Mining

Highwall mining, undertaken using an auger or continuous miner to extract coal at the base of the highwall, may continue to be undertaken in the MOP term where open cut mining methods are not feasible. The auger or continuous miner is driven into the coal seam, removed, and then re-established adjacent to the previous excavation. Highwall mining operations will be managed to cause negligible subsidence and allow for the safe removal of equipment. LCO is approved to undertake highwall mining following detailed design however none is planned to occur during the MOP term.

Recovery of Tailings

Since the 1960's, tailings have been placed in various emplacements at LCO, including old open cut pits and underground workings. Due to the age of these tailings emplacements, sampling has shown that some contain residual energy, which is of value to AGL Macquarie. LCO are approved for the reprocessing and recovery of tailings following detailed design however none is planned none is planned to occur during the MOP term

Mining Equipment

Table 7 lists the typical mining equipment currently in operation at LCO.

Table 7 Typical Mining Equipment Fleet

TYPE	MODEL	CAPACITY	No Units	FUNCTION
Hydraulic Excavator	Hitachi EX8000	43m³	1	Overburden
Hydraulic Excavator	Liebherr R996	36m³	2	Overburden
Hydraulic Excavator	Liebherr R9400	22m³	2	Coal and Partings
Rear Dump Truck	Hitachi EH5000	300t	18	Overburden
Rear Dump Truck	Caterpillar 789C	180t	15	Coal and Partings
Loader	Caterpillar 988H	12m³	1	Coal Handling and Prep
Track Dozer	Caterpillar D11T	N/A	1	Ancillary
Track Dozer	Caterpillar D11R	N/A	3	Coal Handling and Prep
Track Dozer	Caterpillar D11N	N/A	1	Ancillary
Track Dozer	Caterpillar D11R	N/A	1	Rehabilitation
Track Dozer	Caterpillar D10T	N/A	8	Ancillary
Rubber Tyred Dozer	Caterpillar 854K	N/A	1	Ancillary

TYPE	MODEL	CAPACITY	No Units	FUNCTION
Drill	Terex Reedrill	229mm	3	Overburden and Partings
Grader	Caterpillar 24M	N/A	1	Ancillary
Grader	Caterpillar 16M	N/A	2	Ancillary
Grader	Caterpillar 16G	N/A	1	Ancillary
Water Truck	Caterpillar 777F	70kL	4	Ancillary
Service Truck	Caterpillar 775F	25kL	2	Ancillary
Service Truck	Volvo FM	24kL	1	Ancillary

LCO will continue to review the mining fleet in the MOP term to ensure that efficient, productive and commercially viable mining activities are undertaken. Changes to the mining fleet may be undertaken where appropriate to ensure efficient and viable operations continue, in compliance with approved environmental outcomes.

2.3.4 Land Preparation

Land preparation and management of erosion and sediment control is detailed in the LCO Water Management Plan and LCO Biodiversity Management Plan. This section summarises key points of the process to provide an overview of activities.

Land preparation includes clearing vegetation and salvaging rehabilitation resources including suitable topsoils, subsoils and habitat resources such as logs and other woody debris and rocks. Prior to any site disturbance, a Ground Disturbance Permit is obtained from the LCO Environmental Manager (or delegate). The limits of clearing are marked by pegs placed at intervals at each side of the disturbed area to ensure no damage to any vegetation outside the limits. Clearing and stripping activities are undertaken on a progressive campaign basis to minimise disturbance. Generally topsoil stripping is limited (where possible) to 100 m in advance of mining in accordance with the procedures below.

It is not possible to identify a time of year when threatened species are not likely to be using hollows. For example, when most birds have ceased breeding in hollows (spring/summer), micro-bats are likely to be using them for periods of torpor in the cooler months. In addition, it is unlikely that the mine schedule will allow cessation of construction works for long periods of time to avoid known breeding or torpor periods.

The pre-clearing and tree felling procedure currently implemented at LCO is robust, and aimed at reducing impact to hollow-dependent species from clearing activities as much as possible. This procedure has been subject to continued refinement and improvement in order to enable works to occur in a manner that creates as little impact to native flora and fauna species as possible.

Most recently, this process has been updated (as part of adaptive management processes and in response to commitments from the LCO Extension Project (MOD5)) to add specific objectives, performance criteria, methodology and reporting requirements to place particular emphasis on the spotted-tailed quoll (in particular). This process will continue to be reviewed and updated as part of an adaptive management process, including positive feedback from the monitoring and reporting for this process and as further ecological data arises.

The pre-clearing and tree felling processes are documented in the sections below.

Pre-Clearing Process

Pre-clearing surveys are carried out when woody native vegetation (including areas of shrubs and ground cover and trees within grasslands) are required to be cleared. As part of this process, a qualified and experienced ecologist is required to search the area proposed for clearing for the key purpose of minimising the impact of clearing on native flora, fauna and habitat features. The pre-clearing survey is to occur no more than two weeks prior to the felling works, to ensure that temporary habitat features (such as bird nests) are not constructed between the pre-clearing survey and the felling works.

The following steps are to be completed as part of the pre-clearing process:

- Area to be cleared is designated visibly in the field;

- Ecologist is to identify and mark all habitat trees (being those containing hollows, cracks, splits, spouts, large amounts of decorticating bark, active bird nests and possum dreys) using spray paint and flagging tape;
- Searches for and marking of animal dens/burrows, with attention paid to determining if they are currently used. This may include visual inspection (for fresh diggings, scats or tracks (suggesting recent use) or overgrown vegetation and cobwebs (suggesting disuse)), use of hair sampling methods or remote cameras;
- Identification and marking of habitat features to be salvaged for later use. These may include fallen timber, hollow logs and boulders. These are to be marked with spray paint and flagging tape;
- Areas of open water or drainage lines are to be inspected for amphibian or other fauna activity;
- Searches for threatened flora and fauna species (or signs thereof), endangered populations and threatened ecological communities ahead of clearing;
- Searches for the presence of weed and vertebrate pest species that require management action;
- Assess and report suitable timber resources for salvage and reuse (such as for habitat augmentation or fencing timber); and
- Highlight specific times of the year when species may be using habitat features for breeding, and provide advice on mitigation measures if occupation is deemed likely. Mitigation measures may be recommended to provide additional consideration of potential threatened amphibian and micro-bat species (in particular). These may include additional pre-clearing surveys (such as nocturnal amphibian searches of waterbodies) or additional shaking of habitat trees prior to felling (to increase potential for micro-bats to vacate habitat trees prior to felling.

Particular attention will be paid to searches of potential spotted-tailed quoll habitats such as hollows, fallen timber/hollow logs, burrows and boulder piles. If such habitat is suspected to be being used by a spotted-tailed quoll, further searches/surveys will be completed to ensure this species is not resident in the area to be cleared. This may include spotlighting, trapping, hair sampling or remote camera surveys.

If previously recorded or unrecorded threatened species, endangered populations or EECs are identified during the pre-clearing process, the ecologist will provide advice to Liddell Coal relating to the significance of these records and a course of action will be negotiated and implemented.

The outcomes of these inspections are documented in a letter report which provides the locations of significant features identified (including coordinates and mapping) and advice on any specific actions recommended to mitigate impacts. This may include recommended measures to discourage fauna usage of the area to be cleared, additional inspections of identified nests to assess breeding status, delaying of clearing of target trees or specific recommendations to clear trees in a particular manner.

Tree Felling Process

A robust tree felling procedure will be implemented to minimise the potential for impacts on native fauna species (including threatened species) as a result of the clearing of habitat trees. As part of this process, particular attention will be paid to minimising potential for injury to the spotted-tailed quoll.

The supervision of all habitat tree felling works is to be completed by a suitably qualified and experienced ecologist. If an unanticipated ecological issue is encountered, further advice is to be sought on the most appropriate measures to ensure minimal impact on fauna species, particularly threatened species. Prior to the commencement of felling activities, a local veterinarian and/or qualified wildlife carer will be identified and their contact details kept on hand, in the case that their assistance is needed for injured wildlife. All personnel who are involved in the capture/handling/housing and/or transport of native fauna species (injured or uninjured) must be appropriately licensed under the requirements of the NSW Animal Ethics Committee.

The following sections document the steps required to be completed as part of the tree felling process.

Prior to Felling Habitat Trees

- Salvage of identified habitat features, additional surveys to determine threatened fauna usage of the area (if required), identification of active dens or burrows, any actions required to discourage fauna occupation and weed or feral fauna management requirements;
- Removal of non-habitat trees/vegetation as close to the habitat tree felling date as possible (less than one week) in order to create disturbance to discourage fauna usage of the habitat trees; and

- Shaking of habitat trees (with heavy machinery) to encourage fauna to abandon trees.

On Day of Felling of Habitat Trees

Complete a visual inspection of the area to be cleared for fauna species and nests that may have become active since pre-clearing surveys;

- Shake the habitat tree (with heavy machinery) for at least 30 seconds prior to felling to encourage fauna to abandon the tree;
- Lower the habitat tree as gently as possible with heavy machinery;
- Inspect all hollows in felled trees for remaining or injured fauna;
- Capture of any displaced or injured fauna. Unharmed fauna is to be released into nearby secure habitats on the same day (after dark if possible for nocturnal species). Injured fauna are to be triaged immediately and taken to a veterinarian or wildlife carer for further attention if required;
- Felled trees are to be rolled so that the number of hollows blocked against the ground is minimised;
- Felled trees are to remain in place at least overnight to allow any remaining fauna to escape; and
- Salvage of suitable hollows for use as compensatory habitat, where practicable.

If, at any time, the spotted-tailed quoll (or other threatened species) is identified in the area to be cleared, felling activities will cease until all recommendations from the ecologist to remove this species from the area (thus from potential harm) have been completed.

Following all felling activities, a report will be provided by the supervising ecologist. This will document the process followed, any fauna recorded and their fate. The report is also to include any recommendations for improvement of the process. These will be fed into the adaptive management system and included in future clearing works.

Soil Stripping and Stockpiling

Suitable topsoil and subsoils will be stripped in accordance with the Land Clearing and Stripping Procedure. Soils will be salvaged in areas that are not significantly infested with weeds to stripping depths that are determined in accordance with a soils distribution plan. Soils will preferably be stripped in slightly moist conditions to maintain soil structure.

When possible, stripped soils will be re-spread directly onto available rehabilitation areas. When direct respreading is not feasible, topsoils and subsoils will be stockpiled in separately designated stockpile areas in accordance with the procedures document in the Land Clearing and Stripping Procedure.

Soil stripping and stockpiling procedures include:

- Weed spraying prior to stripping, a number of times if necessary;
- Soils will be stripped when in a moist condition (when possible) to minimise loss of soil structure;
- Soils will be loaded using excavators or loaders. Loading areas will be watered by water carts to minimise dust generation and, where possible, loading will not occur in windy conditions;
- Stockpiles will be established away from mining areas, traffic areas and watercourses. Stockpiles will be established on level or gently sloping land where possible to minimise erosion;
- Suitable erosion and sediment controls will be installed including clean water diversion upslope and sediment controls at the downslope toe of stockpiles;
- Stockpiles will be windrowed no more than 3 m high to maximise surface exposure and retain biological activity;
- Stockpiles will be sprayed for weeds, as necessary;
- Stockpiles retained longer than three months will be shaped, ripped and seeded with a suitable cover crop to minimise dust generation, supress weed growth and preserve the soil seed bank;
- Compaction of temporary stockpiles may be considered to assist in repressing weed germination, as well as assisting with dust and water management;
- Stockpiles will be regularly inspected and maintained. Maintenance may include weed control, fertilising and reseeding, and repairing erosion and sediment controls; and
- Soil stockpiles will be demarcated with signage to minimise unauthorised use or disturbance.

2.3.5 Waste Rock Removal

Following land preparation overburden is generally blasted and removed using excavators and overburden haul trucks. A Blast Management Plan is implemented in accordance with DA Mod 7. Blast management is discussed in **Section 3.3.9**.

The blasted overburden is loaded into rear dump trucks and transported via internal haul roads to in-pit emplacement areas. Some waste overburden is crushed using a mobile crushing unit to produce road base materials for use on-site. Active overburden dumping areas are shown on **Plan 3A** to **Plan 3G**. Forecast volumes of waste rock for each year of the MOP are provided in **Table 8**.

2.3.6 Coal Stockpiling and Processing

Coal is trucked from the open cut areas via internal haul roads to an (approximate) 200,000 tonne ROM stockpile prior to processing in the CHPP. Coal with a low propensity to spontaneously heat may also be stockpiled in a 450,000 tonne supplementary stockpile adjacent to the ROM stockpile.

Loaders or dozers load coal from the stockpiles into the adjacent ROM dump bin that gravity feeds the coal onto a feed conveyor, through a primary sizer, and then onto the transfer conveyor to transfer the ROM coal to the CHPP for processing. At the CHPP ROM coal is crushed, sized, washed, screened, rinsed and dewatered. The ROM coal yields approximately 70% product. Rejects comprise approximately 21% coarse rejects and 9% fines (tailings).

Semi-soft and thermal coal products are stockpiled separately in product stockpiles that have an approximate combined capacity of 400,000 tonnes. The product coal stockpiles are formed by dumping coal off an overhead conveyor belt and coal is recovered by an underground reclaim tunnel through valves.

2.3.7 Coal Transport

ROM Coal

ROM coal is trucked from the open cut to the ROM stockpile.

Development consents for LCO, the RCCP and Mount Owen Complex approve transport of ROM coal between the operations for processing to optimise efficiency. In accordance with DA 305-11-01 LCO may:

- Transport up to 1.5 Mtpa ROM coal to RCCP by road, using the approved route along Liddell Station Road to the RCCP facility; and
- Receive up to 2 Mtpa of ROM coal from the Mount Owen Complex for processing and despatch.

As outlined in **Section 2.1** LCO has approval to construct an additional transfer point and conveyor connecting to the existing Mount Owen/Glendell/AGL Macquarie conveyor. Construction of the new ROM conveyor, and movement of ROM coal between LCO and Mount Owen Complex, is not anticipated to occur in the MOP term. LCO will consult with the RR and prepare a MOP amendment if the new ROM coal conveyor is required.

Product Coal

All product coal is transported from LCO to Newcastle by rail, via the Hunter Valley Rail Loop and the Main Northern Railway Line. The Hunter Valley Rail Loop operates 24 hours a day, seven days a week and has a daily capacity of 65,000 tonnes. From the Port of Newcastle, the coal is currently exported to Japanese, Korean and other Asian markets. Product coal transported from LCO is in the order of 6 Mtpa.

LCO monitors coal haulage movements as part of standard operations. Train loading is scheduled by the Hunter Valley Coal Chain (HVCC) Coordinator, and is scheduled to occur concurrently with other producers on the rail loop to maximise the capacity of the system. DA 305-11-01 MOD 7 allows LCO to load trains on all days of the year.

Reclaimed Tailings

LCO has approval to transport 0.5 Mtpa of the reclaimed tailings, which are sold on the domestic market to AGL Macquarie. DA 305-11-01 allows up to 114 truck movements per day, 5 days per week, to either the Liddell or Bayswater power stations along the New England Highway.

2.3.8 Coarse Rejects and Tailings

The processing of ROM coal in the CHPP produces both tailings and coarse reject by-products. Forecast volumes of tailings and coarse rejects for each year of the MOP term are provided in **Table 8**.

Coarse Rejects

Coarse rejects generated from the LCO CHPP are in the order of 26% of ROM coal processed, and consist of carbonaceous shale, mudstone and claystone, with minor coarser rocks such as siltstone and sandstone. During this MOP term coarse rejects will be co-dispersed throughout the overburden dumps in varying levels during dump construction with a final placement to be a minimum of 5m below the final landform. Capping of coarse reject will be undertaken using inert overburden to minimise the risk of spontaneous combustion. Carbonaceous shale in the coarse rejects has a very low spontaneous combustion potential.

Over the life of the mine, LCO has undertaken annual rehabilitation monitoring as per **Section 8** of this MOP. Both historic and recent monitoring results have shown no indication of co-disposal of coarse reject having a negative impact on rehabilitation progress. Monitoring of biodiversity trial areas has shown good development of tree communities along with no indication of negative impacts from co disposal of coarse reject emplacement.

Tailings

LCO has approval to dispose of tailings in the Antiene, Reservoir West and Reservoir South (RTEA) and the Durham emplacement areas (refer Plan 2).

The Antiene tailings dam reached capacity in 2009 and has since been in a period of desiccation prior to capping and final rehabilitation. LCO will decommission and rehabilitate the Antiene Tailings Dam in the MOP term. Decommissioning activities are outlined in **Section 2.3.10**.

As stated in **Section 2.3.2,** commencing 2018 LCO will construct the pipeline approved under MOD 6 to transfer tailings from Liddell CHPP to the West Pit Void at Mt Owen Complex.

During the MOP term tailings will be emplaced predominantly in the Durham Tailings Emplacement Area and onsite RTEA storages. LCO plans to cycle tailings deposition between each storage facility until the maximum fill level is reached prior to full time utilisation of the West Pit Void.

Utilising the unused capacity in the RTEA is expected to have the following benefits:

- to improve evaporation rates above solely pumping into the DTEA by intermittingly topping up each dam and allowing thinner layers to be deposited with a larger surface area.
- More efficient water extraction will also allow a thicker/stronger crust to form on the DTEA than would otherwise be the case.
- It is expected that this will then aid timely capping and rehabilitation of DTEA;
- Improve capping outcomes for RTEA by reducing the volume of capping material required to account for settlement areas and allow for free draining final rehabilitation; and
- Maximise the utilisation of existing tailings storage facilities

2.3.9 Waste Management

Wastes streams that will be generated in the MOP term include general wastes, hydrocarbon wastes and sewage. Waste will be managed in accordance with the LCO Waste Management Procedure that adopts the following principles:

- Waste avoidance;
- Waste re-use;
- Waste recycling; and
- Waste removal and disposal.

Management of specific waste streams anticipated to be generated during the MOP term have been outlined below.

2.3.9.1 General Waste

LCO disposes of general waste as follows:

- All fuel and oil filters are removed by a licensed contractor for recycling;
- All large tyres are disposed of in pit, and small tyres are disposed off-site by a licensed contractor;
- Batteries are stockpiled in covered areas and removed periodically by a licensed contractor;
- Scrap metal is collected and stored in workshop areas until periodic recycling by a licensed contractor;
- Paper and cardboard is regularly collected from workshop and office areas for recycling by a licensed contractor; and
- All domestic waste is disposed of to an approved Council landfill site by a licensed contractor.

2.3.9.2 Sewage

Sewage generated at the MIA is treated by a waste water treatment system to a quality suitable for human contact. The treated effluent is pumped to the South Cut for re-use in the mine water system, as approved under DA 305-11-01 Modification 3 in 2008.

Sewage generated by the CHPP and associated infrastructure is collected in the CHPP sewage treatment tanks, and pumped to the aerated sewage treatment plant prior to disposal at the designated effluent irrigation area. Deactivated sludge from the treatment plant is periodically removed by a licensed contractor for disposal.

Both waste water treatment plants are regularly maintained and sampled by a licensed contractor.

2.3.9.3 Hydrocarbon and Chemical Wastes

Fuel, lubricants and waste oils are stored in a bulk fuel area at the office and workshop complex, which consists of five tanks with capacities up to 110 kL. The bulk fuel storage area is bunded and linked to an oil water separator located nearby.

The fuel, lubricants and waste oil for the CHPP are stored within two tank farms located adjacent to the CHPP workshop. Both tank farms are contained within a concrete bund. All waste oil tanks located on site will be inspected weekly and emptied as required by licensed contractor.

Minor storages of chemicals and fuels in the workshop area may be temporarily stored on bunded pallets for accessibility and short term storage purposes. These self bunded pallets are inspected weekly by a licensed waste contractor and maintained as required. All storage of fuels and chemicals is conducted in accordance with LCO's Sustainable Development Procedure Hazardous Substances and Dangerous Goods.

Waste oils (including oils collected in oil water separators) and waste chemicals are removed by licenced waste disposal contractors.

Hydrocarbon contaminated material, including overburden and wash down bay silt, can be treated in the onsite Bioremediation Area which was established in 2014. Once treated to threshold limits the material may be disposed of onsite into overburden emplacements. All material will be handled in accordance with the internal Bioremediation Area Management Plan. Threshold limits have been determined in consultation with the Environmental Protection Agency. The operation of the bioremediation area is not a scheduled activity under the Protection of the Environment Operations Act 1997.

2.3.10 Decommissioning and Demolition Activities

Capping and rehabilitation of the Antiene Tailings Dam commenced in 2016 as shown on **Plan 3A**. Prior to decommissioning, LCO developed a detailed capping design. The Antiene Tailings Dam is listed as a Prescribed Dam in Schedule 1 of the Dams Safety Act 1978. Accordingly, LCO developed the capping design and management plan in consultation with the Dams Safety Committee (DSC). LCO has submitted an application to the RR to discontinue the use of the Antiene tailings dam in accordance with Section 101 of the Coal Mines Health and Safety Act (2002). Following decommissioning, LCO will apply to the DSC to have the dam de-listed as a prescribed dam.

As per the capping strategy and following initial capping of the Antiene Tailings Dam southern half, capping activities halted to allow for further consolidation at the northern end. LCO aims to recommence capping operations once confirmation of sufficient surface strength. At this stage approximately 23ha of the 33ha dam have had an initial capping layer of 1.5m created.

Rehabilitation of the other tailings dams are planned to commence following final rehabilitation of the Antiene Tailings Dam and adequate consolidation of tailings to provide for the safest possible tailings surface to cap and rehabilitate. LCO will gain experience rehabilitating the Antiene Tailings Dam and then apply the learnings following successful completion of the to the Reservoir South and Reservoir West Tailings Dams.

2.3.11 Progressive Rehabilitation and Completion

Rehabilitation at LCO is undertaken progressively over the life of the mine, with overburden emplacements and backfilled pits shaped and rehabilitated as areas become available. At the commencement of the MOP approximately 797 ha of mined land has been rehabilitated at LCO.

Rehabilitation progress in the MOP term is depicted on **Plans 3A to 3C**. It is anticipated that at the end of the MOP term approximately 984ha of land disturbed by mining will be undergoing rehabilitation. It is not anticipated that any rehabilitation areas will be relinquished in the MOP term.

2.3.12 Material Production Schedule

The material production schedule during the MOP term is provided in **Table 8**. Any proposed changes to this schedule will be outlined in the AEMR.

Table 8 Material Production Schedule during the MOP Term

	Unit	2017	2018	2019	2020
Stripped Topsoil	m^3	51,000	25,500	18,300	14,300
Rock/ Overburden	m^3	36,053,858	36,824,139	36,354,816	35,526,466
ROM Coal	Mt	5,207,105	5,898,959	5,746,569	6,222,929
Reject Material (Coarse)	m^3	1,332,543	1,605,824	1,800,427	1,695,444
Product Coal	Mt	3,430,381	3,779,861	3,346,000	3,962,337

3 Environmental Management

3.1 MOP Risk Assessment

The LCO Environment and Community risk register was reviewed and updated in March 2017 to identify and evaluate environment and community risks associated with the project. A Risk Assessment (BBRA) was undertaken in accordance with the GCCA Risk Management Standard (CAA FIN STD 0001), which establishes a qualitative risk assessment methodology in accordance with the Risk Management Handbook for the Mining Industry (MDG1010) and the requirements of the Joint Australian & New Zealand Standard AS/NZS 31000:2009 Risk Management - Principles and Guidelines. The workshop assessed 56 key environment and community risks. During the risk assessment, 10 elements were identified as having medium risk rankings and none of the elements were categorised as being a high risk.

In accordance with the current MOP Guidelines, LCO undertook an additional risk assessment in September 2017 with a key focus on mine closure and rehabilitation based issues. The risk assessment addressed a number of key aspects and how they relate to rehabilitation.

26 key risks to rehabilitation and closure of the mine were identified. Of these risks, 17 were ranked as low or negligible and 9 were ranked as medium. None were ranked as being high risk. During the workshop, all risks were identified as having current controls that are managing the risk at a satisfactory level.

A copy of the Risk Register developed at the MOP risks to rehabilitation workshop is also included in **Appendix D**.

Further details of the existing and proposed environmental management controls are provided in **Section 3.2**.

3.2 Environmental Risk Management

LCO maintains an Environmental Management Strategy (EMS) to provide a framework for environmental management and facilitate compliance with regulatory requirements. LCO's EMS is consistent with the requirements of ISO 14001.

The EMS includes a suite of environmental management plans, procedures and standards. The following management plans have been developed and approved to satisfy development consent requirements:

- Environmental Management Strategy
- Air Quality Management and Monitoring Plan
- Water Management Plan
- Noise Monitoring Program
- Biodiversity Management Plan
- Biodiversity Offset Management Plan
- Blast Management Plan
- Chain of Ponds Inn Blast Management Strategy
- Newdell Zone Substation Blast Management Strategy
- Lighting Management Plan
- Aboriginal Cultural Heritage Management Plan
- Spontaneous Combustion Management Plan
- Pollution Incident Response Management Plan

Monitoring requirements documented in the above Environmental Management Plans are consolidated in the LIDOC-90533967-797 Environmental Management Strategy.

Copies of the most current approved versions of these plans are available on the LCO website (www.liddellcoal.com.au). LCO are required to develop additional management plans, and revise a number of existing management plans in accordance with DA 305-11-01 MOD 7. Plans to be revised, and additional plan requirements, are noted in the sections below. Revised and additional plans will be provided to the RR as required and published on the LCO website when approved.

3.3 Environmental Issues Management

3.3.1 Air Quality

Air quality at LCO is managed in accordance with the Air Quality Management and Monitoring Plan which includes the following measures:

- Engineering controls (e.g. enclosure of conveyors);
- Operational control measures routinely implemented (e.g. road dust suppression); and
- Contingency measures implemented during periods of high particulate matter concentrations or adverse meteorological conditions, such as modification or ceasing of operations.

Best practice management measures and controls to be implemented during the MOP term include:

- Undertaking regular dust inspections. Mining activities may be ceased or modified if excessive dust is observed;
- Planning land clearing and progressive rehabilitation to minimise the total disturbance area necessary for mining operations;

- Employing effective dust suppression on the active haul road network, hardstand areas, ROM hopper and transfer conveyor points;
- Prompt, progressive rehabilitation of disturbed areas following completion of mining, including temporary rehabilitation of long term overburden dumps and mine infrastructure areas where practical;
- Regular maintenance of equipment to ensure efficient operation, reducing emissions; and
- Real time dust monitoring is undertaken to assist with the proactive management of dust on-site.

The risk of increased dust resulting from rehabilitation not being completed in accordance with the MOP schedule was assessed as being a low risk during the LCO MOP Risk Assessment (2017) (Appendix D). LCO implements progressive rehabilitation in accordance with an Annual Land Management and Rehabilitation Plan that is developed to optimise progressive rehabilitation and minimise the total disturbance footprint.

Three types of air quality monitoring are undertaken at LCO to comprise the whole monitoring network, namely:

- Compliance Monitoring: Air Quality and Meteorological Monitoring undertaken at privately owned residence, in accordance with development consent conditions (Appendix A). This comprises of High Volume (HiVol) Air Samplers which take a 24hr samples of Total Suspended Particulate Matter (TSP) and Particulate Matter <10µm (PM10) on a 6 day cycle. Samples are collected and examined by a NATA accredited laboratory.
- Management Monitoring: This primarily refers to real-time Air Quality and Meteorological Monitoring for reactive dust management, as provided for in the Dust Management Trigger Action Response Plan. This monitoring is not intended for use in assessing compliance with ambient air quality criteria to meet regulatory requirements. This comprises of a number of continuous Tapered Element Oscillating Microbalance (TEOM) which monitor the level of PM10 at locations surrounding the site on dominant wind directions.
- Supplementary Boundary Monitoring: This refers to four relocatable E-Bam units located close to the operational boundaries on dominant wind axis up and downstream. The supplementary real-time boundary monitoring serves two purposes: 1) aid determination of LCO's contribution to local dust concentrations when investigating exceedances of air quality criterion and 2) to supplement the reactive dust management system.

All air quality monitoring and equipment for LCO is undertaken by qualified consultants in accordance with:

- AS 2724.3 – 1984 Ambient Air – Particulate Matter – Determination of Total Suspended Particulates (TSP) – High Volume Sampler Gravimetric Method; and
- AS 3580.10.1 – 2003 Methods for Sampling and Analysis of Ambient Air – Determination of Particulate Matter – Deposited Matter – Gravimetric Method.

Air quality compliance monitoring results are documented in the AEMR, EPL Annual Return, as well as on the LCO public website and to the Community Consultative Committee (CCC).

3.3.2 Erosion and Sedimentation

Erosion and sediment control at LCO is managed in accordance with the Water Management Plan. The Erosion and Sediment Control Plan (incorporated into the Water Management Plan) provides a framework for the management of erosion and sedimentation during the construction, operation and rehabilitation phases of LCO, and:

- Meets the requirements of Managing Urban Stormwater: Soils and Construction, Volume 1, 4th Edition, 2004 (Landcom, 2004), or its latest version;
- Identifies activities that could cause soil erosion, generate sediment or effect flooding;
- Describes measures to minimise soil erosion and the potential for the transport of sediment to downstream waters, and manage flood risk; and
- Describes what measures would be implemented to maintain the structures over time

Erosion and sedimentation and uncontrolled discharge of sediment laden water offsite were identified as a low risk in the rehabilitation of LCO during the MOP Risk Assessment (2017).

LCO currently have the following controls in place to minimise the risk of erosion and sedimentation issues on site:

- Maintaining a closed mine water management system;
- Constructing drainage structures in accordance with an adequate drainage design;
- Minimising disturbance (and dirty water discharge) by implementing progressive rehabilitation in accordance with an Annual Land Management and Rehabilitation Plan; and
- Regular monitoring and maintenance of water management structures.
- Regular inspections of water levels, silt build-up, scouring or erosion and the presence of hydrocarbons; and
- Revegetation progress of disturbed areas.

Additional inspections will be carried out after high rainfall events to assess the effectiveness of all controls. Maintenance and management of erosion and sediment controls includes:

- Drawing down the water levels of sediment dams following rain events to restore the design capacity prior to the next storm event;
- Modify or replace structures if the type and/or location of structures are determined to be ineffective during inspections;
- De-silting sediment traps and dams before visual monitoring indicates the efficiency of the structure is impeded; and
- Visually inspect overburden emplacement area toe drains monthly (and after rainfall events great than 50 mm in a 24-hour period) to identify any visible signs of erosion or instability, and action repairs as required.

3.3.3 Surface Water

Surface water is managed in accordance with the approved Water Management Plan that incorporates the Surface Water Monitoring Program.

Surface water quality monitoring is undertaken monthly at locations onsite and in the surrounding catchment area including locations at Bayswater Creek, Bowmans Creek and onsite dams. Water quality parameters including pH, electrical conductivity (EC), total suspended solids (TSS) and Total Dissolved Solids (TDS) are evaluated by a NATA accredited laboratory. Additional monitoring is undertaken biannually and analysed for a range of inorganics.

Results of surface water monitoring undertaken are reported in the AEMR and in the EPL Annual Return (in the event of discharge).

Ongoing management of surface water during the MOP term will include:

- Reviewing the site water balance annually to update predictions of water supply security and the need to release water. Monitoring will continue to include the quantity of water pumped to the CHPP, haul road dust suppression usage and volumes and solids concentrations of tailings pumped to the tailings dams. This data will be used to calibrate various components of the model, including the rainfall runoff component (following periods of rainfall) and open cut groundwater inflows (during periods of low or no rainfall).
- Monitoring tailings moisture content and periodic testing of in-situ tailings density to inform the water balance model.
- Confirm dam volumes and surface areas (by survey) to inform the water balance model.
- Upstream and downstream water quality monitoring and stream flow gauging stations on Bowmans Creek. The gauging stations are installed upstream and downstream of the proposed Entrance Pit Final Void to monitor the effect of mining on stream flow.

3.3.4 Groundwater

Groundwater monitoring at LCO is included in the groundwater monitoring program that is included in the Water Management Plan.

LCO has been building baseline groundwater data using a network of 19 piezometers installed in 2002. Groundwater level is measured monthly and ground water quality testing is undertaken every two months. Eleven of the piezometers are also sampled biannually and analysed for a range of inorganics. Results of groundwater monitoring undertaken are reported in the AEMR.

Key monitoring and mitigation measures that will be undertaken in the MOP term include:

- Monitoring the Bowmans Creek alluvium and shallow bedrock groundwater systems in accordance with the approved Groundwater Monitoring Program.
- Installation of an additional monitoring piezometer within the predicted drawdown zone affecting the Bowmans Ck alluvium.
- Review the groundwater model to incorporate the additional site and monitoring data as mining progresses. The frequency of review and updates to the model will be determined based on the results of monitoring programs and other studies.
- Investigate options for additional groundwater licences if the updated model predicts future groundwater losses from the Bowmans Creek alluvial aquifer will be in excess of LCO's current licensed allocations.
- If and where necessary, alternative mitigation strategies including investigating options for adjustments to mining and/or dewatering plans, will be investigated to mitigate actual or predicted impacts on the alluvial system.

Additional details regarding the existing management of groundwater at LCO are described in the Water Management Plan.

3.3.5 Hazardous Materials

The risk of hazardous materials and dangerous good remaining on site post closure was ranked as a low risk in the LCO MOP Risk Assessment (2014). Hazardous materials at LCO are managed by the ChemAlert data management system at the CHPP and Chem Alert system at the open cut. Explosives are stored in an explosives magazine located to the north of the South Pit. The explosive magazine is covered by a WorkCover Dangerous Goods Licence No. 35/033031.

Radiation gauges are managed in accordance with a Radiation Management Plan and Radiation Gauge Licences. Dangerous goods and explosives are regulated under the following legislation:

- *OHS Amendment (Dangerous Goods) Act 2003* and the supporting OHS Amendment (Dangerous Goods) Regulation 2005;
- Occupational Health and Safety Regulation 2001;
- Occupational Health and Safety Act 2000; and
- The *Explosives Act 2003* and the supporting Explosives Regulation 2005.

In addition, the location of all PCBs on site are recorded Hard copies of the Safety Data Sheets are held at each site and in locations nominated by the respective Safety Management Plans.

3.3.6 Contaminated Land

The risk of contaminated land at closure was assessed as being a low risk during the LCO MOP Risk Assessment (2017). The current controls implemented by LCO to control the risk satisfactorily include:

- Transporting soils and sediments contaminated with hydrocarbons to the bioremediation area;
- Storing hydrocarbons in appropriate bunded storage areas;; and
- Reviewing water monitoring data to identify potential contaminants.

Potential for sub-surface contamination to occur is minimal due to there being no underground fuel tanks on site

As discussed in **Section 2.3.9**, LCO utilises a bunded bulk storage area for fuel, lubricants and waste oil, which is linked to an oil water separator located nearby. The fuel, lubricants and waste oil for the CHPP are stored within two tank farms located adjacent to the CHPP workshop. Both tank farms are contained within a concrete bund. With all waste oil tanks inspected weekly and emptied as required by licensed contractor.

Minor storages of chemicals and fuels in the workshop area may be temporarily stored on bunded pallets for accessibility and short term storage purposes. These self bunded pallets are inspected weekly by a licensed waste contractor and maintained as required. All storage of fuels and chemicals is conducted in accordance with LCO's Sustainable Development Procedure Hazardous Substances and Dangerous Goods. Waste oils (including oils collected in oil water separators) and waste chemicals are removed by licenced waste disposal contractors.

3.3.7 Biodiversity

LCO currently manages impacts to biodiversity using the following management plans and programs:

- Annual Rehabilitation and Land Management Plan;
- Weed and pest control programs;
- Annual Rehabilitation Monitoring Programs;
- Ongoing rehabilitation trials including tree corridor trials and grazing trial (refer to **Section 8.2.1**);
- Biodiversity Offset Strategy; and
- The Ground Disturbance Permit system that includes identification and demarcation of potential Spotted-tail Quoll habitat.

In accordance with DA 305-11-01 (MOD 7) LCO has an approved Biodiversity Management Plan.

The Biodiversity Management Plan describes short, medium and long term measures to integrate management of offset areas with remnant vegetation and rehabilitation areas at the site, and includes detailed descriptions of the proposed measures to:

- Implement revegetation and regeneration with disturbance areas and offset areas;
- Protect remnant vegetation and soils outside the disturbance areas;
- Rehabilitate creeks and drainage lines within the project boundary (where required);
- Manage salinity;
- Conserve and reuse topsoil;
- Undertake pre-clearance surveys;
- Manage impacts on fauna;
- Collect and propagate native seed;
- Salvaging and reuse material from the site for habitat enhancement;
- Salvage, transplant and/or propagate threatened flora in accordance with the *Guidelines for the Translocation of Threatened Plants in Australia* (Vallee et at., 2004);
- Undertake land management including managing grazing on LCO lands, manage bushfire risks and control weeds and feral pests, including investigating available technologies to reduce impacts to non-target species; and
- Undertake seasonal monitoring of in-stream and riparian ecological condition.

LCO will proactively manage existing vegetation communities and recorded occurrences of threatened species as shown on **Plan 1B**. LCO offset areas are shown on **Plan 2** and **Plan 4**.

Biodiversity Related Risks to Rehabilitation

There were four biodiversity related risks to rehabilitation identified in the LCO MOP Risk Assessment (2017). The identified risks and ranking are:

- Failure to achieve the rehabilitation commitments in relation to habitat corridors and connectivity within budget and desired timeframe, low risk;
- Failure to achieve nominated agricultural final land use on the flatter areas of the final landform within budget and desired timeframe, lowrisk;
- Failure to establish suitable habitat for the spotted tailed quoll e.g. log/boulder piles, low risk; and

- Failure to establish key target communities in rehab and offset areas that are consistent with Central Hunter Box Ironbark Woodland within budget and desired timeframe, medium risk;

During this MOP term, LCO will continue to liaise with adjacent sites including Ravensworth and Mount Owen Complex to optimise the compatibility of the proposed final landform, and maximise linkages between proposed habitat corridors.

LCO will continue annual rehabilitation monitoring to identify if key characteristics of rehabilitation areas are trending toward desired outcomes. Key characteristics (indicators) and outcomes (completion criteria) are further discussed in **Section 5** and **Section 6**. Risks of failing to meet desired biodiversity outcomes in rehabilitation areas will be managed by assessing rehabilitation monitoring results to identify if key completion criteria are at risk of not being achieved, and implementing appropriate corrective actions in accordance with a Rehabilitation Trigger Action Response Plan (TARP) (refer to **Section 9.2**). LCO will also review, and where appropriate, refine the nominated completion criteria for biodiversity outcomes based on the results of rehabilitation trials being undertaken by LCO and the broader industry.

Annual ecological monitoring will be undertaken in accordance with the approved Biodiversity Management Plan and Environmental Monitoring Program. The ecological monitoring program is discussed in **Section 8.1.2**. Monitoring results are reported in the AR.

3.3.8 Weeds and Pests

A number of introduced plant species occur within the MOP disturbance area including galenia (*Galenia pubescens*), tiger pear (*Opuntia aurantiaca*), creeping pear (*Opuntia humifusum*) and pampas grass (*Cortaderia selloana*). All species of *Opuntia* are listed as noxious weeds in all local government areas (LGAs) within NSW. Pampas grass (*Cortaderia selloana*) is listed as noxious in the Singleton LGA. Additionally, a number of introduced pest animal species have been detected on lands managed by LCO including wild dogs and foxes, rabbits, hares and pigs.

Weed and pest control measures to be implemented on LCO lands are documented in the Biodiversity Management Plan. Weed and pest control practices to be undertaken in the MOP term include:

- Regular site inspections to identify areas of weed infestation and weed species;
- Development and implementation of an annual weed and pest management plan ;
- Liaising with neighbouring property owners to coordinate weed control in the surrounding area;
- Minimising vegetation disturbance by:
- Reducing the number of access tracks;
- Minimisation clearing associated with civil works;
- Progressive rehabilitation focussed on rapid establishment of groundcover at rehabilitation areas; and
- Conducting control activities in a manner appropriate for the weed type, location in the landscape. This includes using selective herbicides, herbicides safe for aquatic environments and various techniques from foliar spraying through to cut and paint control in sensitive areas;
- A vehicle hygiene process to mitigate the vehicle spread of highly invasive weed species;

Native herbivores, specifically the eastern grey kangaroo, is known to have observable impact to establishing rehabilitation at LCO occurring at pest level populations within the region. LCO monitor rehabilitation areas understand native herbivore impacts. To mitigate the impact of this species on establishing rehabilitation areas, where appropriate LCO estimate the populations and conduct active management to control in consultation with OEH National Parks and Wildlife as per the Biodiversity Conservation Act 2016.

The management of weed and pest control activities are reported in the AR.

3.3.9 Blasting

LCO has developed a Blast Management Plan in accordance with DA 305-11-01. Current blast management procedures include:

- Training all relevant personnel on environmental obligations and the safe handling of explosives, in accordance with the LCO procedure for environmental awareness and training;
- Designing blasts to achieve compliance with vibration and airblast limits, and to minimise the potential of flyrock that may injure people or damage property;
- Operation of a blasting hotline or an alternate system as agreed with the DP&E to enable the public to get up-to-date information on the blasting schedule at LCO;
- Use of adequate stemming, a delay detonation system, and careful drilling and hole loading to achieve required blast design;
- Monitoring blasts at sensitive locations to verify compliance with vibration and airblast limits;
- Review monitoring results and modification of the blast design, if necessary;
- Documentation of the date, location of blasts and quantity of explosive used; and
- Periodic review of blast management practices to evaluate performance and identify potential improvement if required.

A specific Blast Management Strategy for the heritage listed Chain of Ponds Inn and a Blast Management Strategy for the Newdell Zone Substation has also been developed. The scope of the Chain of Ponds Inn Strategy is discussed further in **Section 3.3.12**.

In accordance with DA 305-11-01 LCO will undertake no more than three blasts per day (between the hours of 9 am and 5 pm), and average no more than eight blasts per week in any 12 month period.

Impacts relating to post blast fume will be minimised through the ongoing implementation of LCO's Post Blast Fume Procedure, which was developed in accordance with the *Code of Good Practice: Prevention and Management of Blast Generated NO_x Gases in Surface Blasting* (Australian Explosives Industry and Safety Group Inc., 2011).

This code outlines the industry best practices to manage blasting and minimise impacts, including:

- Selection of appropriate explosive products in consideration of local aspects surrounding the blast location;
- Reviewing geological conditions in the formulation of blast designs;
- Reviewing ground conditions (e.g. presence of clay or loose/broken ground);
- Minimising the time between drilling and loading, and loading and shooting of the blast; and
- Consideration of meteorological conditions in blast scheduling.

Blast events are monitored in accordance with the Environmental Monitoring Program. Blast monitoring results are reported in the AR, as well as on the LCO public website and to the CCC

3.3.10 Noise

Noise management at LCO is undertaken in accordance with the approved Noise Monitoring Program. The main sources of noise at LCO are associated with blasting events, coal and overburden excavation, dump truck movements, coal handling and processing, and rail movements.

Noise management strategies currently employed at LCO include:

- A program of regular sound power screening testing to monitor equipment sound power levels and identify plant items requiring maintenance for noise attenuation packages;
- Verifying that any hire equipment used at LCO meets the linear total sound power levels listed in the Table 4.5 of the Environmental Noise and Blasting Assessment prepared for the MOD 5 EA (Global Acoustics, 2013); and
- A continued program of attended monitoring as outlined in the Noise Monitoring Program to monitor compliance with approved noise criteria.

Real time noise monitoring will be undertaken in the MOP term in proximity to the nearest receptors, providing alerts if mining noise levels are close to the Project Specific Noise Criteria (PSNC). These alerts will prompt adaptive management techniques to allow mining operations to be altered as necessary for noise levels to remain within PSNC. Mitigation measures to address potential exceedances include;

- The review of digging and dumping activities likely to have resulted in any noise exceedance, taking into consideration wind direction and height / proximity of active operations to the continuous noise monitor;
- The relocation of equipment closest to receivers to lower risk areas;
- The temporary reduction in height of operations; and
- The shutting down of mining equipment, as deemed necessary to meet criteria.

The risk of increased noise impacts resulting from rehabilitation works on dump tops was assessed as being a low risk during the LCO MOP Risk Assessment (2017). In addition to the noise controls outlined above, LCO will undertake earthworks at rehabilitation during daytime hours only to minimise noise impacts.

Attended night time noise monitoring at LCO is currently conducted once per month, measuring $LAeq_{(15\ minute)}$ and $LA_{(1minute)}$. Noise monitoring results are reported in the AR as well as on the LCO public website and to the Community Consultative Committee (CCC).

3.3.11 Visual and Lighting

Lighting is managed at LCO in accordance with the Lighting Management Procedure. Visual impacts have been considered in design elements for the project including:

- Design of the overburden emplacement to effectively shield operations from views to the north and northeast, reducing the impact of light on surrounding residences and road users;
- Progressive rehabilitation of disturbance areas as soon as possible following completion of mining activities;
- Installing recommended lighting treatments for specific plant and equipment to reduce light spill to non-operational areas, especially with regard to mobile lighting plants; and
- Incorporating mine infrastructure treatments (such as choice of materials and painted surface colours) to reduce the impact of lighting from fixed light sources.

Throughout the MOP term LCO will continue to employ measures minimise visual related impacts on nearest receptors by:

- Rehabilitating disturbed areas as soon as practical after mining;
- Prioritising rehabilitation works in areas that are most visually prominent at private residences; and
- Orientating lights on site away from sensitive receptors where practical.

The risk of visual impacts from rehabilitation works was assessed as being a low risk during the LCO MOP Risk Assessment (2017). Current controls outlined above are considered adequate to manage any potential impacts from rehabilitation works.

The visual impact of the final landform were assessed in the preparation of the MOD 5 EA. Visual impacts of the final landform will be minimised by:

- Establishing a mix of grazing and native vegetation land uses that are compatible with the surrounding environment; and
- Constructing emplacements with profiles and maximum heights that are consistent with the local topography.
- Features of the final landform are discussed in **Section 4** and **Section 5.**

3.3.12 Heritage (Aboriginal and European)

Aboriginal Heritage

Aboriginal cultural heritage is managed in accordance with the Aboriginal Cultural Heritage Management Plan (ACHMP) (Umwelt 2008).

A number of archaeological items of Aboriginal heritage, including artefact scatters and isolated finds have been identified across the LCO development consent area over the course of the mine life. The majority of the sites have been salvaged in accordance with Section 87 and Section 90 permits.

Previously known artefacts still remaining in-situ in the MOD 5 extension areas, and the newly identified sites, were salvaged prior to disturbance in the extension areas 2015 in accordance with an Aboriginal Heritage Impact Permit (AHIP) granted by the OEH (AHIP number C0000623) and approved ACHMP. All known sites at LCO that are not located in disturbance areas will be managed in-situ in accordance with the Aboriginal Cultural Heritage Management Plan.

Measures to minimise the potential for impacts to known Aboriginal heritage sites are:

- Demarcating all known Aboriginal heritage sites in the field (fencing and signage) and on Ground Disturbance Permits to minimise the potential for unauthorised access or disturbance;
- Implementation of appropriate erosion and sediment controls for all disturbance areas to minimise impacts by sedimentation; and
- Land management including weed and feral animal control and bushfire mitigation will be carried out in a manner that does not impact Aboriginal heritage sites.

The LCO MOP Risk Assessment (2017) identified the risk of disturbing Aboriginal cultural heritage site during operation or rehabilitation activities as being a medium risk. LCO will continue to manage risks of disturbing known sites with the controls outlined above. Potential impacts to previously undiscovered Aboriginal heritage items and sites will be minimised by:

- Providing cultural heritage awareness training to all personnel and contractors engaged at LCO; and
- In the event that any previously unknown item is discovered in the MOP term LCO will advise the Aboriginal Stakeholder Reference Group and works in the vicinity will cease until an appropriate management strategy is developed and endorsed by stakeholders and the OEH.

European Heritage

European heritage was assessed for the MOD 5 EA (OzArk, 2013). There is one heritage site in the vicinity of LCO; being the Chain of Ponds Inn and associated outbuildings. The site is adjacent to LCO on land owned by Coal & Allied (**Plan 1C**), and is listed on both the Register of the National Estate (#001400) and the State Heritage Register (#00242) and assessed as having State Significance. The Chain of Ponds Inn is also noted within the Singleton LEP as being of State Significance.

The buildings and associated structures such as fencing are considered to be in a poor condition and are considered to be vulnerable to impacts associated with blasting in the South Pit extension areas. Long term restoration of the buildings is the responsibility of the landowner being Coal & Allied however LCO has committed to undertaking stabilisation works where required in the MOP term in accordance with the approved Chain of Ponds Inn Blast Management Strategy.

The LCO MOP Risk Assessment has assessed the potential of damage to the Chain of Ponds in to be a medium risk.

In accordance with DA 305-11-01 MOD7 LCO will repair any project related damage to the Chain of Ponds (should any damage occur) within 6 months of the damage occurring and provide an annual report on the condition of the Chain of Ponds Inn to the Heritage Council.

3.3.13 Bushfire

The risk of uncontrolled bushfire damaging rehabilitation is considered a medium risk in the LCO MOP Risks to Rehabilitation Risk Assessment (2017) (**Appendix D**). Bushfire prevention is managed in accordance with the Bushfire Management Plan which is incorporated into the Biodiversity Management Plan.

Additional controls in place to minimise the risk of bushfire on site include:

- Bushfire Management Procedure;
- Quarterly Land Management Inspections;
- Access tracks are maintained to rehabilitation area; and
- Water sources in close proximity to rehabilitation areas are maintained.

The bushfire hazard pertaining to a particular area is assessed by rating two main land based factors of fire, these being vegetation (fuel) and terrain (slope), and their relative contributions to a potential fire. Two land units occur at the Colliery: woodland on slopes ranging from 4 to 13 per cent and native and

improved pasture on slopes ranging from 5 to 18 per cent. Fire burning uphill poses the most significant hazard. Rehabilitated lands are vulnerable to fire, with uphill slope lengths of 170 to 730 metres.

Bushfire ignition sources at LCO include natural occurrences such as lightning strikes, while other occurrences include sparks from powerlines and human ignition sources. Traffic on Antiene Road, Hebden Road, New England Highway and the Main Northern Railway can be considered a fire hazard. Possible on-site ignition sources also include sparks and fire from machinery and fuel storage areas.

Fire bans, as determined by the Rural Fire Service, will be adhered to by all personnel and enforced by the mine management.

Bushfire risk mitigation measures include:

- Providing emergency preparedness training for mine site personnel;
- Regularly inspecting and maintaining established asset protection zones and firebreaks around LCO to prevent the spread of bushfires onto or from adjacent properties;
- Maintaining fire management resources including access roads, water carts equipped with firefighting equipment, dams and water fill points and earthmoving equipment; and
- undertaking fuel reduction works as required to maintain low fuel levels on site;

3.3.14 Mine Subsidence

Mine subsidence associated with historic underground workings at LCO is considered a low risk due to the period of time since active underground mining occurred. There has been an isolated incidence of a sink-hole forming over shallow historic mine workings in the Liddell Seam within the project boundary. An investigation concluded that the sink-hole was the result of inadequate drainage works constructed above the shallow workings. The sink-hole has since been remediated by backfilling and grouting the hole and restoring the function of the diversion drain.

Due to the depth of remaining historic underground workings and their remoteness to any proposed construction or infrastructure further instances of sink-hole development is considered a low risk for rehabilitation (refer to **Appendix D**).

3.3.15 Geology and Geochemistry

The potential for the geology or geochemistry of the site to affect rehabilitation was considered a low risk in the LCO MOP Risks to Rehabilitation Risk Assessment (2017) (**Appendix D**). Currently LCO undertake geochemical testing as part of annual rehabilitation planning, which identifies any potential issues that could affect the success of rehabilitation. LCO will continue to undertake this testing during the MOP term.

3.4 Operational Issues Which Affect Rehabilitation

3.4.1 Tailings Decommissioning and Capping

The failure to achieve appropriate capping of dams within budget and the desired timeframe was assessed as being a medium risk in the LCO MOP Risk Assessment (2017).

During the MOP term LCO will manage risks associated with rehabilitating tailings emplacements by:

- Undertaking Monthly Inspections, Annual inspections and Dam Safety Committee Inspections;
- Maintaining an adequate volume of stockpiled capping material;
- Operational and maintenance manuals for tailings dams; and
- Undertaking decommissioning and rehabilitation works in accordance with approved decommissioning and rehabilitation designs and approvals in accordance with Schedule3, High Risk Activities, Part 5, Clause 27 – Emplacement areas of the Work Health and Safety (Mines) Regulation 2014.

3.4.2 Spontaneous Combustion

The risk of Spontaneous Combustion impeding rehabilitation was ranked as a low risk element in the LCO MOP Risks to Rehabilitation Risk Assessment (2017) (refer **Appendix D**), based in part on the long history of mining operations at LCO over a number of years resulting in a good understanding of the materials on site.

LCO recognises however that spontaneous combustion presents a potential threat to rehabilitation and long term public safety unless appropriate controls are maintained and spontaneous combustion is considered in the final landform design.

Spontaneous combustion management is undertaken in accordance with the approved Spontaneous Combustion Management Plan. The Spontaneous Combustion Management Plan identifies responsible prevention, control and reporting measures for spontaneous combustion. The plan aims to minimise the occurrence of, and manage any instance of heating or spontaneous combustion in mining and coal stockpile areas at LCO.

Additional controls that are currently in place and assisting in effectively controlling the risk of spontaneous combustion include:

- Annual Rehabilitation Inspections; and
- Mine Design Control Inspections.

Spontaneous combustion of coal at LCO is predominately confined to the Liddell Seam. Previously mined underground workings provide an oxygen source to the Liddell Coal seam which has a propensity to heat and spontaneously combust when exposed to oxygen for an extended period.

The hierarchy of controls applied to spontaneous combustion at LCO are:

- **Elimination**
  - Managing water levels in underground workings (where possible) to minimise the exposure time of the Liddell Coal seam.
  - Sealing exposed old workings in interim highwalls utilising clay and overburden material to minimise oxygen ingress into underground workings; and
  - Modify mining and spoil stockpiling design to prevent outbreaks of spontaneous combustion.
- **Separation**
  - Where material has or is showing signs of spontaneous combustion it is stockpiled separate to other inert coals to avoid spreading the heating.
- **Engineering controls**
  - For example, minimise contact with hot materials / equipment or establishing sprinklers/bench flooding to cool material prior to mining.
- **Procedures**
  - LCO has procedures for identification of spontaneous combustion; managing heated materials; provision of protective or first response capacity; and preparing for / cleaning up after spontaneous combustion events;
- **Personnel skills and training**
  - LCO provides training and education on the effects of spontaneous combustion and how to prevent incidents to all personnel and contractors who work in affected areas.
- **PPE**
  - Including gas monitors, masks, respirators and eye protection are required when potentially exposed to spontaneous combustion.

Controls to minimise the risk of spontaneous combustion affecting rehabilitation areas include:

- Encapsulating al carbonaceous material in the final void (highwalls and floor);
- Co-disposing coarse rejects in overburden emplacements at least 5m from the finished surface or toe of the emplacement area; and

- Disposing of any hot material that has produced spontaneous material by block dumping the material in-pit at least 20 m from the rehabilitated surface.

3.4.3 Soils

Availability of adequate volumes of suitable quality soil resources for rehabilitation for the life of mine was considered a medium risk in the LCO MOP Risks to Rehabilitation Risk Assessment (2017) (**Appendix D**).

It is anticipated that the volumes of soil material currently stockpiled, and soil resources available to be salvaged ahead of mining in the South and Entrance Pits will leave a soil deficit for rehabilitation works up till closure. Following completion of the soil balance, to verify volumes of available suitable topsoils, subsoils and capping materials for rehabilitation, LCO will continue to track topsoil placement and utilise suitable soil substitutes such as recycled organics (e.g. OGM currently utilised) or other suitable products for use for as top-dress/incorporation within overburden as seed bed preparation where topsoil shortages are identified.

Currently LCO propose to respread nominally 100 mm of topsoil on rehabilitation areas subject to the Soil Distribution Plan materials balance discussed above or utilise a suitable alternative. LCO will continue to monitor rehabilitation performance of topsoil and alternatives to identify opportunities and ensure the most efficient use of topsoil resources.

3.4.4 Geotechnical Stability

LCO designs and constructs to the approved final landform design which provides for geotechnical stability through minimum standards such as maximum slope grades and provisions for water management. LCO operate in accordance with a Ground or Strata Failure Management plan that details the strata monitoring and designs employed to provide for geotechnical stability.

Mountain Block Slope Stability

When mining at the Mountain Block ceased in 2003 a remnant highwall remained that was approximately 120 m high and 450 m long with slopes between 35 and 45 degrees. Two major slips occurred shortly following cessation of mining. LCO undertook a stability assessment and rehabilitation works between 2004 and 2006 to push material over the top of the highwall to buttress the sections that had failed with soils.

Further failures occurred in May 2006 due to a slide failure of material with moist to wet silty clays with high shrink/swell potential located on the upper western slope of the highwall. Stabilisation works included excavating this material and constructing contour banks on the slope. In 2009 additional shaping works and tree plantings were completed in the western slip section. Since 2009 monitoring has identified significant gullying and tunnel erosion and downward movement of debris.

The risk of not being able to reach closure and relinquishment at LCO associated with instability of the Mountain Block rehabilitation was ranked as a medium risk in the LCO MOP Risk Assessment (2017). A geotechnical monitoring program was established in 2015 to inform a remediation strategy to address the slip areas. Further investigations and the development of the remedial works program is discussed in **Section 9.**

Railway Pillar Stability

The risk of damage to infrastructure resulting from instability of the Railway Pillar was ranked as a medium risk in the LCO MOP Risk Assessment (2017). LCO mitigates this risk through the Ground or Strata Failure Management plan, incorporating a minimum 1.2 factor of safety in design and regular geotechnical monitoring and assessment.

3.4.5 Final Void Water Balance

In accordance with DA 305-11-01 MOD 7 LCO has approval to retain two final voids in the South and Entrance Pits at closure. The voids will be hydraulically connected by remnant underground workings that will link the voids.

A final void water and salt balance was completed for the MOD 5 EA (Gilbert & Associates, 2013) to simulate future conditions. The results indicate that the water level in both final voids would stabilise within approximately 50 years from the end of mining and neither void is predicted to spill. Salinity in

the Entrance Pit is predicted to stabilise at approximately 4,200 mg/L, and is predicted to rise in the South Pit following mining due to the dominance of evaporation in the final void water balance.

Potential for release of hyper saline water from the South Pit void following closure was assessed to be a medium risk to rehabilitation outcomes in the LCO MOP Risks to Rehabilitation Risk Assessment (2017) (**Appendix D**). Factors that may result in a final void discharge event include:

- Final landforms not constructed to achieve the design final void surface water catchments;
- Groundwater inflows exceeding the flows considered in the water balance model;
- Climactic changes resulting in rainfall and evaporation rates significantly different to current predictions.

Current controls to minimise the potential for a release of void water include:

- Designing and constructing the final landform to limit the catchment reporting to the voids, and produce a water equilibrium level (approximately 67 m AHD) that is substantially below the design spill level in the voids (South Pit: 80 m AHD and Entrance Pit: 95 m AHD). The design freeboard provides a significant factor of safety for any variance in climactic conditions or minor alterations to the landform design;
- Substantial baseline groundwater data collected from the current groundwater monitoring program to inform the water balance, as described in **Section 3.3.4**.
- Updating the site water balance annually; and
- Updating the groundwater model every three years.

Prior to completion of mining LCO will develop a detailed final void design to construct the landform with final void catchments that are designed to produce the intended void water equilibrium level.

3.4.6 Final Landuse Integration with Adjacent Operations

LCO are committed to a rehabilitation strategy that complements the proposed rehabilitation at the adjacent Glencore operations Ravensworth Operations and Mount Owen Complex, and meets the final landuse goals for the project including enhancing regional habitat connectivity (refer to **Section 4.2**).

The proposed final landform and landuse for LCO (**Plan 4**) includes woodland habitat corridors that complement the proposed native vegetation rehabilitation at Ravensworth Operations, Mount Owen Complex and the Ravensworth Operations Hillcrest Offset Area. Additionally, habitat enhancement will be undertaken along Bowmans Creek to enhance habitat specifically for the Spotted-tailed Quoll. Regeneration works associated with Bowmans Creek will be documented in the Biodiversity Management Plan.

LCO will continue through the MOP term to liaise with Ravensworth Operations and Mount Owen Complex to ensure native vegetation rehabilitation objectives at the operations are compatible and achieve the desired outcome of habitat connectivity.

4 Post Mining Land Use

4.1 Regulatory Requirements

Regulatory requirements related to post mining land use are listed below in **Table 9**.

Table 9 Regulatory Requirements Relating to Post Mining Land Use and Rehabilitation

Condition	Requirement	Timing
DA 305-11-01		
Schedule 2 Condition 1	In addition to meeting the specific performance criteria established under this consent, the Applicant must implement all reasonable and feasible measures to prevent and/or minimise any harm to the environment that may result from the construction, operation, or rehabilitation of the development.	Life of mine
Schedule 3	Water Management Plan	Life of mine

Condition	Requirement	Timing
Condition23	The Applicant must prepare and implement a Water Management Plan for the development to the satisfaction of the Secretary. This Plan must: (c) this plan must include a: (iii) Surface Water Management Plan, that includes: • … • Design objectives and performance criteria, for the: - design and management of final voids - design and management for sodic and dispersible soils and acid or sulphate generating materials; - reinstatement of drainage lines on the rehabilitated areas of the site; and - control of any potential water pollution from the rehabilitated areas of the site; • … (iv) Groundwater Management Plan • … • design objectives and performance criteria, for the: - … - final voids; • a program to monitor and report on: - … - the seepage/leachate from water storages, emplacements and final voids; - … - impacts of the development on: o … o the seepage/leachate from water storages, emplacements, backfilled voids and final voids; o … - … • …	
Schedule 3 Condition 25	The Applicant must ensure that the offset strategy and/or rehabilitation strategy is focused on the re-establishment of: (a) significant and/or threatened plant communities, including: • Central Hunter Box – Ironbark Woodland EEC; • Narrow-Leaved Ironbark – Spotted Gum Woodland EEC; • Narrow-Leaved Ironbark – Bulloak Open Forest EEC; (b) significant and/or threatened plant species; and (c) habitat for significant and/or threatened animal species including the Spotted-tailed Quoll	Life of Mine
Schedule 3 Condition 28A	The Applicant shall plant and maintain, until established, 10 River Oak trees for every established River Oak tree removed during construction of the tailings pipeline under MOD 6. *Note: an established River Oak tree is considered to be two meters or greater in height.*	
Schedule 3 Condition 29	Biodiversity Management Plan The Applicant must prepare and implement a detailed Biodiversity Management Plan for the site to the satisfaction of the Secretary. This plan must: (a) be prepared in consultation with OEH and be submitted to the Secretary for approval by the end of May 2015, unless otherwise agreed by the Secretary; (b) describe how the implementation of the offset strategy would be integrated with the overall rehabilitation of the site (see below); (c) include: (i) a description of the short, medium and long term measures that would be implemented to:	Life of mine

<table>
<tr><th>Condition</th><th>Requirement</th><th>Timing</th></tr>
<tr><td></td><td>
• implement the offset strategy; and
• manage the remnant vegetation and habitat on the site in the offset areas;
(ii) detailed performance and completion criteria for the implementation of the offset strategy;
(iii) a detailed description of the measures that would be implemented over the next 3 years, including the procedures to be implemented for:
• implementing revegetation and regeneration with the disturbance areas and offset areas, including establishment of canopy, sub-canopy (if relevant), understorey and ground strata;
• protecting vegetation and soil outside the disturbance areas;
• rehabilitating creeks and drainage lines that occur on the site;
• managing salinity;
• conserving and reusing topsoil;
• undertaking pre-clearance surveys;
• managing impacts on fauna;
• collecting and propagating seed;
• salvaging and reusing material from the site for habitat enhancement;
• salvaging, transplanting and/or propagating threatened flora in accordance with the Guidelines for the Translocation of Threatened Plants in Australia (Vallee et at., 2004);
• controlling weeds and feral pests including investigating alternate technologies to reduce poisoning of non-target species;
• managing grazing and agriculture;
• controlling access;
• bushfire management;
• habitat enhancement works;
• seasonal monitoring of in-stream and riparian ecological condition;
• survey of stygofauna in Bowmans Creek alluvial aquifer (prior to predicted drawdown); and
• monitoring of stygofauna populations every 6 months following the occurrence of the predicted drawdown.
(iv) a seasonally-based program to monitor the effectiveness of these measures, and progress against the performance and completion criteria;
(v) a description of the potential risks to successful revegetation, and a description of the contingency measures that would be implemented to mitigate these risks; and
(vi) details of who would be responsible for monitoring, reviewing and implementing the plan.
The applicant must implement the management plan as approved by the Secretary.
</td><td></td></tr>
<tr><td>Schedule 3
Condition 37</td><td>
The Applicant must rehabilitate the site to the satisfaction of Resources Regulator. The rehabilitation must comply with the objectives in Table 8, and be generally consistent with the proposed rehabilitation strategy in the EIS and as shown conceptually in Appendix 3.
<table>
<tr><th>Feature</th><th>Objective</th></tr>
<tr><td>Mine site (as a whole)</td><td>• Safe, stable and non-polluting
• Final landforms designed to incorporate micro-relief and integrate with surrounding natural landforms
• Constructed landforms drain to the natural environment (excluding the final voids)
• Minimise visual impact of final landforms as far as reasonable and feasible
• Ensure there are no adverse flood impacts to privately owned properties.</td></tr>
<tr><td>Final voids</td><td>• Minimise to the greatest extent practicable:
- the size and depth of final voids</td></tr>
</table>
</td><td>Prior to relinquishment</td></tr>
</table>

<table>
<tr><th>Condition</th><th>Requirement</th><th>Timing</th></tr>
<tr><td></td><td>
<table>
<tr><td></td><td>- the drainage catchment of final voids</td></tr>
<tr><td>Surface infrastructure</td><td>• To be decommissioned and removed, unless the Secretary agrees otherwise</td></tr>
<tr><td>Revegetation</td><td>• Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprising of:
- At least 731 hectares of Central Hunter Box-Ironbark Woodland
- habitat for threatened flora and fauna species including habitat connectivity for the Spotted-tailed Quoll
• Maintain, establish and/or restore grassland areas with pockets of native vegetation to support sustainable agricultural activities, as shown conceptually in Appendix 3.
-</td></tr>
<tr><td>Community</td><td>• Ensure public safety
• Minimise the adverse socio-economic effects associated with mine closure</td></tr>
<tr><td>Final land use</td><td>• Restore or maintain land capability generally as described in the EA and as shown conceptually in Appendix 3.</td></tr>
</table>
</td><td></td></tr>
<tr><td>Schedule 3
Condition 38</td><td>Progressive Rehabilitation
The Applicant must carry out rehabilitation progressively, that is, as soon as reasonably, practicable following disturbance. All reasonable and feasible measures must be taken to minimise the total area exposed for dust generation at any time. Interim rehabilitation strategies must be employed when areas prone to dust generation cannot yet be permanently rehabilitated.
Note: It is accepted that parts of the site that are progressively rehabilitated may be subject to further disturbance in the future.</td><td>Life of Mine</td></tr>
<tr><td>Schedule 3
Condition 39</td><td>Rehabilitation Management Plan
The Applicant must prepare and implement a Rehabilitation Management Plan for the development to the satisfaction of DRG, This plan must:
(a) be submitted to DRE for approval by the end of June 2015;
(b) be prepared in consultation with the Department, DoI, OEH, MSC and SSC;
(c) be prepared in accordance with relevant DRE guidelines;
(d) describe how the rehabilitation of the site would be integrated with the implementation of the biodiversity offset strategy;
(e) include a detailed performance and completion criteria for evaluating the performance of the rehabilitation of the site, and triggering remedial action (if necessary);
(f) describe the measures that would be implemented to ensure compliance with the relevant conditions of this consent, and address all aspects of rehabilitation including mine closure, final landform including final voids and final land use;
(g) include interim rehabilitation where necessary to minimise the area exposed for dust generation;
(h) include a program to monitor and report on the effectiveness of the measures, and progress against the detailed performance and completion criteria; and
(i) build to the maximum extent practicable on other management plans required under this consent.
The applicant shall implement the approved management plan as approved from time to time by the Secretary.
The Applicant must implement the management plan as approved by the Secretary.</td><td>To be developed for each MOP term</td></tr>
</table>

Condition	Requirement	Timing
	Note: The Rehabilitation Management Plan may be ombined with a Mining Operations Plan, or similar plan, required under a mining lease granted under the Mining Act 1992 for the development.	
MOD 5 EA Statement of Commitments		
27	Soil and Land Resources Native woodland vegetation will be rehabilitated where possible on the land that will be rendered unsuitable for agricultural enterprises.	Life of mine
30	Visual Amenity Rehabilitation of disturbed areas will take place as soon as practical after mining	Life of mine
31	Planting/seeding of native vegetation (canopy, mid-canopy and groundcover) will be undertaken on the highwall benches to improve long term visual amenity of the void.	Prior to relinquishment
34	Within five years of closure, LCO will prepare a detailed Mine Closure Plan, which will include confirmation of post-mining land uses and final rehabilitation success criteria.	Five years from closure

4.2 Post Mining Land Use Goal

The primary post mining land use goal for LCO is to establish a mix of grasslands capable of supporting sustainable grazing, and native vegetation corridors constructed in the final landform to enhance habitat connectivity

LCO is committed to establishing sustainable post mining land uses that meet the expectations of stakeholders, and support the objectives of key regional strategic land use policies, particularly the:

- *Singleton Local Environment Plan 1996 (Singleton LEP);*
- *Muswellbrook Local Environmental Plan 2009 (Muswellbrook LEP);*
- *Synoptic Plan: Integrated landscapes for Coal Mine Rehabilitation in the Hunter Valley of NSW (Synoptic Plan) (DMR, 1999): and*
- *Strategic Regional Land Use Plan for the Upper Hunter (DP&I, 2012).*

Post mining land use options for LCO were reviewed and assessed for the preparation of the Rehabilitation Strategy included in the MOD 5 EA (Umwelt, 2013), due to the nature of MOD 6 it did not require modification to the strategy. The current approved proposed final landform and final land uses are depicted on **Plan 4** and are outlined in the sections below. Features of the proposed final landform and final land uses are described in the sections following.

Final Landform Future Development

Maintaining a flexible plan is key for any mine approaching the closure phase to enable a cost effective & practical outcome whilst maintaining compliance with approval conditions. Since 2013, changes in economic conditions have prompted a strategic review of the mine plan resulting in a revised mining sequence, particularly affecting the Entrance Pit mining area. Consequently, LCO has determined in consultation with DRG, that the conceptual landform currently approved requires amendment with the changes are summarised below.

The strategic review of the mine plan review completed during 2017 has resulted in the decision to not extract the coal below the Pikes Gully Seam in the southern portions of the Entrance Pit. It was identified that leaving the coal and associated overburden in-situ whilst continuing to extract coal in the mining sequence presented in DA305-11-01 would result in a larger final void than current approved. Additionally, investigation into the calculation of the EA proposed final landform vegetation hectare commitments revealed errors in the quantities of woodland (731ha) and grassland (1247ha) proposed, these errors feature specifically in Condition 37 Table 8.

Deeming the void increase to be an undesirable final landform outcome, LCO completed further design work to refine the Life of Mine Plan, revising both mining sequence and final landform to meet the objectives of DA305-11-01 Sch. 3 Condition 37 and 38. Key features of the revised final landform included differences in the location, size (1.7% area increase) and dimensions (-0.3% capacity decrease) of the voids as well as minor changes to the proposed revegetation distribution. Whilst both woodland and grassland hectare commitments could not be achieved, the requirement to establish self-

sustaining Central Hunter Box Ironbark Woodland was prioritised due to its ecological benefits and is maintained in the revised landform design.

Due to the nature of the changes proposed and the inflexibility of DA305-11-01 Mod 6 Condition 2 Schedule 2 requiring strict compliance with the consent, specifically Appendix 3 Conceptual Final Landform and Condition 37 Table 8; LCO required to obtain a Development Consent Modification to revise the final landform design. An application was made and subsequently approved 12 February 2019, Modification 7.

The period in which mining operations trigger the parameters of the revised final void in Entrance mining area is Q4 2020 (in-pit dumping commences on LPG floor of Bayswater Pit area).

During this MOP term, LCO will continue to comply with the DA305-11-01 final landform design and continue to consult with relevant stakeholders regarding the proposed final landform changes and subsequent development consent modification.

4.2.1 Alternative Final Landuses

Alternative post-mining land use options include potential industrial uses, particularly in consideration of the availability of the rail line and proximity to the New England Highway. Appropriate future use for built infrastructure including the workshop, office complex and ancillary facilities such as lay down storage areas may be explored further by LCO and stakeholders in the detailed mine closure planning phase of the project. Any alternative final land use option considered would be developed in consultation with stakeholders and would be subject to future project approvals.

4.3 Rehabilitation Objectives

The principal rehabilitation objectives at LCO adhere to the fundamental principles below:

1. **Create a stable and non-polluting post-disturbance area** - Disturbed land will be rehabilitated to a condition that is self-sustaining or a condition where maintenance requirements are consistent with an agreed post-mining land use. The quality of surface water and groundwater that leave the mining lease areas will be adequate to maintain environmental values and beneficial uses downstream of the Project Application Area.
2. **Achieve an acceptable post-disturbance land use** - Rehabilitation of disturbed areas will aim to create a land use capability and/or suitability compatible with the pre-mining land use, unless other beneficial land uses are pre-determined and agreed.

The principal rehabilitation objectives for LCO are to:

- Rehabilitate all disturbance areas to be safe, stable and non-polluting;
- Ensure public safety;
- Minimise the adverse socio-economic effects associated with mine closure;
- Decommission and remove all surface infrastructure, unless the RR agrees otherwise;
- Design final landforms to incorporate micro-relief and integrate with surrounding natural landforms. Micro-relief by definition relates to only slight/small irregularities in the final land surface causing minor variations in elevation.
- Restore or maintain land capability generally as described in the EA;
- Construct landforms that drain to the natural environment (excluding final voids);
- Minimise visual impact of the final landforms as far as reasonable and feasible;
- Minimise to the greatest extent practicable:
  - The size and depth of the final voids;
  - The drainage catchment of the final voids;
- Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems that is comprised of at least:
  - 731 hectares of Central Hunter Box-Ironbark Woodland;
  - grassland areas with pockets of native vegetation to support sustainable agricultural activitie; and

- Establish areas of self-sustaining habitat for threatened flora and fauna species including corridor habitat for the Spotted-tailed Quoll.

Specific rehabilitation objectives for each proposed final land use domain are provided in **Section 5.2**.

5 Rehabilitation Planning and Management

The following sections outline the rehabilitation planning processes and objectives/criteria for LCO, in accordance with the requirements of DA 305-11-01 MOD 7 and the *ESG3: Mining Operations Plan (MOP) Guidelines, September 2013* (DRE 2013).

5.1 Domain Selection

In accordance with the ESG3: Mining Operations Plan (MOP) Guidelines, September 2013 (DRE 2013), LCO has been categorised into a series of primary (operational) domains and secondary (post mining land use) domains as outlined in **Table 10**. Primary domains at the commencement of the MOP term are depicted on **Plan 2**.

Primary domains have been defined on the basis of existing land management units within the mine site which have similar operational purposes and therefore similar geophysical characteristics.

Secondary domains have been defined as land management units characterised by similar post mining land use objectives.

Table 10 Primary and Secondary Domains

Primary Domain	Code	Secondary Domain	Code
Active Mining - The footprint of the LCO active mining areas.	1	Final Void – Two voids (South Pit and Entrance Pit) will be retained in the final landform. The voids will hold permanent water bodies (to approximately 67 m AHD) and be vegetated with woodland species on the battered highwalls and lowwalls above the permanent water levels.	A
Water Management -	2	Water Management - Various dams and surface water management structures to be retained in perpetuity.	B
Infrastructure - Existing infrastructure and facilities to be constructed during the MOP term including the LCO CHPP and associated stockpiles and conveyors, administration and amenity facilities, workshops, haul roads and access roads, rail loader and rail loop	3	Rehabilitation Area – Grassland - Areas to be rehabilitated with selected grasses and pasture species. Grassland will be established on rehabilitated tailings emplacements and flatted areas on overburden dumps. Grassland rehabilitation areas will be capable of supporting sustainable grazing, and may include pockets of trees for stock shelter.	C
Overburden Emplacement - The footprint for the LCO out of pit and in-pit emplacement areas.	4	Rehabilitation Area – Woodland - Areas to be rehabilitated with woodland corridors that will integrate with adjacent remnant vegetation and proposed native vegetation corridors at adjacent mining operations (including Ravensworth Operations and Mount Owen Complex). Woodland rehabilitation areas will establish self sustaining ecosystems commensurate with Central Hunter Box - Ironbark Woodland (Peake 2006) and include habitat features suitable for native fauna including the Spotted Quoll.	D

Primary Domain	Code	Secondary Domain	Code
Tailings Storage Area - Includes all current tailings emplacement areas.	5		

5.2 Domain Rehabilitation Objectives

Rehabilitation domains require specific management objectives to realise the desired final land use outcome due to the distinct geophysical features associated with the current land function. The rehabilitation objectives for the domains identified in **Section 5.1** are defined in **Table 11**.

Table 11 Domain Rehabilitation Objectives

Domain	Rehabilitation Objectives
Primary Domains	
Domain 1 – Active Mining	• All appropriate rehabilitation resources including topsoils, subsoils and habitat resources will be identified and salvaged ahead of mining; • Vegetation and soils will be progressively disturbed ahead of mining to minimise total disturbance areas and period for soil stockpiling; • Open cut pit areas will be progressively backfilled and rehabilitated as soon as practical following the completion of mining; • Active mining areas will generally be rehabilitated to a mixture of grassland and woodland final land-uses.
Domain 2 – Water Management	• Clean water will be diverted around operational areas prior to disturbance where practical; • Dirty water and mine water will be captured and diverted to mine water and dirty water dams; • Mine water and dirty water will preferentially be used for operational uses including coal processing and dust suppression; • Dirty water dams and mine water dams will be managed to maintain design capacity in accordance with the EPL and Water Management Plan; and • Operational water management structures will be retained and maintained until the associated catchment is considered rehabilitated and discharge water quality meets the relevant rehabilitation completion criteria.
Domain 3 – Infrastructure	• All built surface infrastructure will be decommissioned and removed from site (unless agreed otherwise with regulators and stakeholders); • All hazardous materials and contaminated materials will be identified and removed from site or remediated in accordance with legislation; • All open bore holes (including underground dewatering bores and monitoring wells) and mine entries will be sealed and rehabilitated in accordance with regulatory guidelines; • Infrastructure areas will generally be rehabilitated to a mixture of grassland and woodland final land uses. • Infrastructure areas will be rehabilitated to meet all completion criteria for the intended final landuse.

Domain	Rehabilitation Objectives
Domain 4 – Overburden Emplacement	• Overburden emplacement areas will be predominantly rehabilitated to grassland (Rural Land Capability Classes IV, V and VI), with woodland habitat corridors established on slopes; • Overburden emplacement shaping will produce a generally free draining land form with slopes generally 10 degrees or less and not exceeding 18 degrees unless agreed by regulators; • Overburden emplacements will be shaped with generally informal profiles and maximum heights that complement the local topography; • Overburden emplacements will include swales and berms and be graded to direct runoff away from the two final voids; and • Co-disposed coarse rejects are covered with at least 5 m inert cover to minimise the risk of spontaneous combustion; • Overburden emplacements will generally be rehabilitated to Domain C – Grassland and Domain D – Woodland on slopes; and • Overburden emplacement areas will be rehabilitated to meet all completion criteria for the intended final landuse.
Domain 5 – Tailings Emplacement Area	• All tailings pumping infrastructure will be decommissioned and removed prior to closure; • Tailings emplacement areas will be capped and rehabilitated in accordance with an approved capping design and Section 101 approval; • Rehabilitated tailings emplacements will be capped and shaped to produce free draining landforms; and • Tailings emplacements will be rehabilitated to meet all completion criteria for Domain C – Grassland.
Secondary Domains	
Domain A – Final Void	• Two final voids retained in the final landform will be constructed in accordance with an approved final void design; • The South Pit and Entrance Pit final voids will be designed and constructed to produce non-spilling permanent water storage bodies; • The depth, surface area, and total catchment of the final voids will be constructed to produce an equilibrium water level of approximately 67 m AHD, • Final voids will be made safe by: o Constructing highwalls and battering back lowwalls to be geotechnically stable; and o Constructing perimeter fencing and safety bunds to restrict public access; and • Highwall benches and low walls (above the predicted permanent water body level) will be vegetated with woodland species to enhance visual amenity.
Domain B – Water Management	• The final landform drainage will be constructed in accordance with an approved final landform drainage design; • Final landform drainage will integrate with the surrounding catchments; • Surface water management structures will be designed and constructed in accordance with the Blue Book to minimise erosion and enhance stability; • Surface water runoff from the final landform will be non-polluting; • Clean water dams will be preserved in the final landform to provide water resources for native fauna and grazing stock.
Domain C – Rehabilitation Area - Grassland	• At least 1247 ha of grassland will be established that can be demonstrated to be capable of supporting sustainable grazing by: o Having a pasture species mix representative of the district o Providing a mix of land capability suitable for agriculture (Rural Land Capability Class IV, V and VI); o having a carrying capacity comparable to suitable analogue sites; and o Requiring management inputs comparable to suitable analogue sites ; and • Soils (or soil substitutes) will be reinstated on rehabilitation areas with characteristics that are appropriate for the final landuse.

Domain	Rehabilitation Objectives
Domain D – Rehabilitation Area - Woodland	• At least 731 ha of woodland will be established on areas disturbed by mining including the slopes of overburden emplacement areas; • Woodland rehabilitation corridors will connect with remnant vegetation and rehabilitation at adjacent operations including Ravensworth Operations and Mount Owen Complex, to enhance habitat connectivity; • Soils (or soil substitutes) will be reinstated on rehabilitation areas with characteristics that are appropriate for the final landuse; • Woodland rehabilitation areas will provide habitat augmentation features (such as rock piles and felled logs and woody debris) for target native species including the Spotted Quoll; • Vegetation compositions in woodland rehabilitation areas will be comparable with analogue vegetation communities, including areas representative of Central Hunter Box – Ironbark Woodland, specifically adjacent to rehabilitation areas at Ravensworth Operations and Mount Owen Complex; • Woodland rehabilitation areas will be self-sustaining and require ongoing management inputs that are appropriate for the final land use.

5.3 Rehabilitation Phases

The ultimate rehabilitation objective for LCO is to create stable, non-polluting post mining landforms that are cognisant of site constraints and allow the achievement of the agreed post mining land uses.

This will be achieved by demonstrating completion of a series of conceptual phases of rehabilitation which are described as:

1. **Decommissioning – decommissioning of all on-site infrastructure, including the CHPP, administration** buildings and train loading facilities; removal of haul road, rail crossings and hard stand areas, the completion of contamination studies for relevant areas and subsequent decontamination where required, removal of hazardous materials;
2. **Landform Establishment –** incorporates slope, aspect, drainage, substrate material characterisation and morphology;
3. **Growth Medium Development** – incorporates physical, chemical and biological components of the growing media and ameliorants that are used to optimise the potential of the media in terms of the preferred vegetative cover;
4. **Ecosystem and Land Use Establishment –** incorporates revegetated lands and habitat augmentation, species selection, species presence and growth together with weed and pest animal control /management and establishment of flora;
5. **Ecosystem and Land Use Sustainability** – incorporates components of floristic structure, nutrient cycling recruitment and recovery, community structure and function which are the key elements of a sustainable landscape; and
6. **Land Relinquishment –** completion criteria for rehabilitation are met and the land is determined to be suitable to be relinquished from the mining tenement.

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

Domain / Rehabilitation Phase	Active Mining	Water Management	Infrastructure	Overburden Emplacement	Tailings Storage Area
Active	✓	✓	✓	✓	✓

Decommissioning	x	x	x	✓	x
Landform Establishment	x	x	x	✓	x
Growth Medium Development	x	x	x	✓	x
Ecosystem and Land Use Establishment	x	x	x	✓	x
Ecosystem and Land Use Sustainability	x	x	x	✓	x
Relinquished Lands	x	x	x	x	x

6 Performance Indicators, and Completion Criteria / Relinquishment Criteria

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

Completion criteria have been developed considering site specific issues and objectives, Glencore's standards and the outcomes of the 2005 ACARP study entitled 'Development of Rehabilitation Completion Criteria for Native Ecosystem Establishment on the Coal Mines in the Hunter Valley'.

These completion criteria are consistent with the previous approved MOP, which may be subject to refinement as the Project progresses, including through consultation with the relevant stakeholders, will be utilised to demonstrate achievement of rehabilitation objectives. During the MOP Term, LCO intend to continue consultation with DRG and relevant stakeholders to refine the completion criteria with the aim to have clearer/measureable appropriate to the post mining land use. The achievement (or otherwise) of the completion criteria will be monitored and reported within the annual reports to be submitted to relevant government agencies.

Table 13 Decommissioning Phase

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Key Element	Progress at start of MOP
Domain 1 – Active Mining						
No decommissioning activities in Domain 1						
Domain 2 – Water Management						
Mine water dams and sediment dams are decontaminated prior to conversion to clean water dams in the final landform.	Dam Sediments	Sediments accumulated in mine water and sediment dams are removed and disposed of in accordance with legislation, supported by site record forms (CAA HSEC PER 004 – Ground Disturbance Permit)..	Water Management Plan	No	na	Not commenced
All infrastructure removed, unless otherwise agreed with relevant stakeholders	Pumping Infrastructure	Pumps and associated infrastructure is decommissioned and removed from site	EA Section 7.16.7	No	na	Not commenced
Domain 3 – Infrastructure						
All built infrastructure will be decommissioned and removed from site (unless otherwise agreed with regulators and stakeholders)	Site services	All site electricity and telecommunication services have been disconnected and removed (supported by records).	EA Section 7.16.7	No	na	Not commenced
	Demolition of infrastructure	All surface infrastructure that is not required for the post-mining land use has been demolished (or dismantled) and removed from the site, supported by demolition certificates.	EA Section 7.16.7 and 7.16.9	No	na	Not commenced
		Records verify that all demolition work has been carried out in accordance with *AS2601-2001: The Demolition of Structures* or its latest version.	*AS2604 – 2001* This MOP	No	na	Not commenced
	Foundations and pavements	Records verify that all concrete footings, foundation pads and pavements have been removed.	EA Section 7.16.7	No	na	Not commenced
All hazardous materials and contaminated materials will be identified and removed from site.	Carbonaceous Material	Carbonaceous material has been removed from the footprint of haul roads, conveyors and the ROM pad and disposed of in the void, supported by visual monitoring.	This MOP	No	na	Not commenced
	Hydrocarbons	Records verify that hydrocarbons have been transported from site to an appropriately licensed disposal facility, as per EPA waste tracking record form.	EA Section 7.16.7 and 7.16.9	No	na	Not commenced
	Chemicals and explosives	Records verify that chemicals and explosives have been transported from site to an appropriately licensed disposal facility, as per EPA waste tracking record form.	EA Section 7.16.7	No	na	Not commenced

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Key Element	Progress at start of MOP
	Contaminated soils	Records verify that contaminated soils have been identified and remediated or removed in accordance with legislation; as per EPA waste tracking record form or in accordance with LCO SD PRO 0079 – Waste Management Bioremediation Area.	This MOP	No	na	Not commenced
All open bore holes (including underground dewatering bores and monitoring wells) and mine entries will be sealed and rehabilitated in accordance with regulatory guidelines.	Open bores	All open bore holes (including exploration boreholes, underground dewatering bores and monitoring wells), have been backfilled and sealed in accordance with EDG01 – Borehole Sealing Requirements on Land (supported by records).	*EDG01 – Borehole Sealing Requirements on Land*	No	na	Not commenced
	Underground entries.	All underground entries have been sealed as per DPI standards (*Guideline for the Permanent Filling and Capping of Surface Entries to Coal Seams*) (supported by records).	ML1597, ML1313, CCL 708	No	na	Not commenced
Domain 4 – Overburden Emplacement						
No proposed decommissioning activities in the Overburden Emplacement area						
Domain 5 – Tailings Storage Area						
All tailings pumping infrastructure will be decommissioned and removed prior to closure	Pumping Infrastructure	All tailings pumping infrastructure is decommissioned and demolished or dismantled and removed from site	EA Section 7.16.7	No	na	Not commenced
Tailings emplacement areas will be capped and rehabilitated in accordance with an approved capping design and Section 101 approval;	Capping Design	A detailed tailings capping design and Section 101 application are developed and approved for the Antiene, Reservoir, Durham and South Pit tailings emplacements prior to decommissioning.	Coal Mine Health and Safety Act 2002 Section 101	No	na	Not commenced

Table 14 Landform Establishment Phase

Domain Objective	Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Key Element	Progress at start of MOP
All Domains						
Post mining landforms will be safe, stable and non-polluting	Slopes	Survey confirms rehabilitated slopes are generally 10 degrees and less than 18 degrees (unless otherwise approved) ; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form..	EA Section 3.15 & Section 7.16.9	No	1, 2	Not complete
	Surface rock density	Visual inspections confirm surface spoils are (generally) rock free and provide a friable substrate. Large rocks are removed and placed into habitat piles on rehabilitated areas; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	EA Section 3.15	No	n/a	Not complete
	Free draining landforms	Landforms are graded to be generally free draining; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	EA Section 7.16.9	No	4	Not complete
	Stability	Visual inspections confirm rehabilitated landforms exhibit an absence of slumping; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	This MOP	No	1	Not complete
	Spontaneous Combustion	Visual monitoring indicates no evidence of spontaneous combustion; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	This MOP	No	6	Not complete
	Dispersive Spoils	Testing confirm dispersive spoils are not present in the surface layer or are appropriately ameliorated; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	This MOP	No	7	Not complete
	ESC	Suitable erosion control measures (e.g. silt fences, mulches etc.) are installed in rehabilitation areas in accordance the Blue Book to minimise soil loss from areas undergoing rehabilitation; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	DECC 2008 EA Section 3.15 & 7.16.9	No	na	Not complete

Domain Objective	Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Key Element	Progress at start of MOP
	Gullying	Monitoring demonstrates there are no areas of active gully erosion; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	This MOP	No	3	Not complete
	Rilling	Visual inspections confirm rill erosion is limited to isolated areas of minor rilling up to 200mm deep; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	This MOP	No	3	Not complete
Domain 2 – Water Management Area						
Surface water management structures will be designed and constructed in accordance with the Blue Book to minimise erosion and enhance stability	Final landform drainage	Final landform drainage structures including drains, banks, drop structures and dams have been constructed in accordance with Blue Book requirements; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	DECC 2008	No	4	Not commenced
	Geomorphic stability	Drainage structures are assessed to be stable with no evidence of overtopping or significant scouring, loss of freeboard or channel capacity; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	DECC 2008	No	4	Not commenced
Surface water runoff from the final landform will be non-polluting	Discharge water quality	Dirty water is captured and discharged in accordance with the EPL. Analytes measured in accordance with EPL 2094 include; conductivity, pH and TSS.	EPL 2094 Water Management Plan	No	5	Not complete
	Runoff water quality	Runoff water quality from rehabilitation areas is within the range of water quality data recorded from analogue sites and does not pose a threat to downstream water quality; as supported by monitoring results undertaken in accordance with LCO SD PLN 0032 - Environmental Monitoring Program. Analytes measured include pH, TSS, TDS and Conductivity.	EA Section 7.16.9	No	5	Not complete
Domain 4 – Overburden Emplacement						
Overburden emplacements will be shaped with generally informal profiles and maximum heights that complement the local topography	Landform compatibility	Landforms are assessed to be generally compatible with the surrounding landscape, as shown on MOP Plan 4.	EA Section 7.16.9	No	na	Not complete
	Height	Survey confirms the South Pit emplacement is no higher than RL 195 m.	EA Section 4.11	No	na	Not complete

Domain Objective	Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Key Element	Progress at start of MOP
	Informal undulations	Elements such as drainage paths, contour drains, ridgelines, and emplacements are shaped into undulating informal profiles in keeping with natural landforms of the surrounding environment and allowing for a greater diversity of plant species over time	EA Section 3.15	No	na	Not complete
Domain 5 – Tailings Storage Area						
Rehabilitated tailings emplacements will be capped and shaped to produce free draining landforms.	Capping	Tailings will be capped with at least 3 m of inert material including select inert overburden, subsoils and topsoils.	Sect 100 Report EA Section 7.16.9	No	16	Not complete
	Ponding	Tailings emplacement areas will be shaped to be free draining and exhibit an absence of ponding.	Sect 100 Report EA Section 7.16.9	No	4	Not complete
Domain A – Final Void						
The South Pit and Entrance Pit final voids will be designed and constructed to produce non-spilling permanent water storage bodies.	Water Balance	The water balance confirms the final voids have been designed and constructed to produce an equilibrium water level of approximately 67 m AHD in both voids.	EA Section 7.3.4	No	17	Operations ongoing
Final voids will be made safe by: • Constructing highwalls and battering back lowwalls to be geotechnically stable; and • Constructing perimeter fencing and safety bunds to restrict public access	Carbonaceous materials	All coal and carbonaceous material is capped with a minimum of 5 metres of inert overburden.	This MOP	No	na	Operations ongoing
	Stability	Highwalls and lowwalls have been assessed by a qualified geotechnical engineer to validate long term stability.	EA Section 7.16.9	No	2	Operations ongoing
	Safety	Safety features (e.g. safety berm and fence) are installed at the crest of highwalls to restrict public access.	This MOP	No	na	Operations ongoing

Table 15 Growth Medium Development Phase

Domain Objective	Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Key Element	Progress at end of MOP
All Domains						
Soils (or soil substitutes) will be reinstated on rehabilitation areas with characteristics that are appropriate for the final landuse.	Soil Depth	Topsoil and/or subsoils are spread uniformly at the depth of 100mm; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	This MOP	No	8	Not complete
	Compaction	Soils are ripped to produce a friable surface prior topsoil spreading; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	This MOP	No	na	Not complete
	Ameliorants	Ameliorants (such as gypsum, organics and fertilisers) are spread at the recommended rate per hectare; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	This MOP	No	7	Not complete
	Temporary ESC	Temporary ESCs are installed prior to topsoil re-spreading. Temporary ESCs will be installed in accordance with the Bluebook such as silt fences, catch drains and sediment basins down slope of rehabilitation areas.	DECC 2008	No	3	Not complete
		Topsoiled rehabilitation areas are sown with a non-persistent cover crop at the recommended sowing rate per hectare.	DECC 2008	No	na	Not complete
Domain D – Rehabilitation Area – Woodland						
Woodland rehabilitation areas will provide habitat augmentation features (such as rock piles and felled logs and woody debris) for target native species including the Spotted Quoll	Habitat features	Rehabilitation monitoring confirms habitat features are incorporated into woodland rehabilitation areas (including rock piles, felled hollow bearing logs and coarse woody debris).	This MOP EA Section 3.15	No	14	Not complete
		Habitat features include structure suitable for Spotted-tailed Quoll den making.	EA Section 4.11 and 7.4.6	No	14	Not complete

Table 16 Ecosystem Establishment Phase

Domain Objective	Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	Link to TARP	Progress at end of MOP
All Domains						
Enhance the productivity and ecological function of rehabilitation areas by effectively managing risks from bushfire, weeds and feral animals.	Weed presence	The density of weeds in rehabilitated areas is no worse than analogue sites. All measurements will be undertaken in accordance with the Department of Agriculture, Fisheries and Forestry (2008) *Field Manual for surveying and Mapping Nationally Significant Weeds*..	EA Section 7.16.9	No	11	Not complete
	Feral animal density	Feral animal pests are controlled in accordance with legislation and the MOP.	EA Section 7.16.9 This MOP	No	No	Not complete
	Fuel loads	Fuel loads are assessed and managed as required including, maintaining fire-breaks.	EA Section 7.16.9	No	15	Ongoing
	Access	Firefighting access across rehabilitation areas and water sources (dams) is maintained in accordance with the Bushfire Management Plan.	EA Section 7.16.9	No	15	Ongoing
Domain B – Water Management						
Surface water runoff from the final landform will be non-polluting.	Discharge water quality	Water quality testing confirms discharge water quality meets EPL requirements. Analytes measured in accordance with EPL 2094 include; conductivity, pH and TSS.	EPL 2094	No	Yes	Not complete
Domain C – Rehabilitation Area – Grassland						
At least 1247 ha of grassland will be established that can be demonstrated to be capable of supporting sustainable grazing.	Hectares	Survey confirms that a minimum of 1247 ha of Grassland has been established.	DA 305-11-01 Schedule 3 Condition 37	No	na	Not Complete

Domain Objective	Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	Link to TARP	Progress at end of MOP
	Soil Quality	Soil testing indicates that soil pH, ESP and EC are trending toward the range of analogue sites after 5 years.	LCO Rehabilitation Monitoring Strategy (GSSE)	No	7	Not complete
	Species composition	Pasture species to consist of grasses and legumes appropriate to the district and recognised as suitable for beef cattle grazing.	LCO Rehabilitation Monitoring Strategy (GSSE)	No	12, 13	Not complete
	Ground cover	Rehabilitation survey confirms at least 80% vegetative cover over a minimum of 95% of areas treated after one year.	LCO Rehabilitation Monitoring Strategy (GSSE)	No	na	Not complete
Domain D – Rehabilitation Area - Woodland						
At least 731 ha of woodland will be established on areas disturbed by mining including the slopes of overburden emplacement areas	Hectares	Survey confirms that a minimum of 731 ha of Woodland have been established.	DA 305-11-01 Schedule 3 Condition 37	No	na	Not Complete
Woodland rehabilitation areas will be self-sustaining and require ongoing management inputs that are appropriate for the final land use	Surface cover	Rehabilitation survey confirms ground cover (vegetation, leaf litter, mulch) greater than 70% by Year 5.	This MOP	No	9	Not complete
	Soil Quality	Soil testing indicates soil characteristics (pH, EC, ESP) vary by no more than 20% from relevant analogue site after 5 years.	LCO Rehabilitation Monitoring Strategy (GSSE) EA Section 7.16.9	No	7	Not complete
	Vegetation health	More than 75 per cent of trees are healthy and growing as indicated by long term rehabilitation monitoring.	EA Section 7.16.9	No	na	Not complete
		Rehabilitation monitoring confirms canopy cover is in the range of 10 per cent to 30 per cent.	EA Section 7.16.9	No	na	Not complete

Domain Objective	Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	Link to TARP	Progress at end of MOP
Vegetation compositions in woodland rehabilitation areas will be comparable with analogue vegetation communities, including areas representative of Central Hunter Box – Ironbark Woodland, specifically adjacent to rehabilitation areas at Ravensworth Operations and Mount Owen Complex	Species presence	Revegetation areas contain flora species assemblages characteristic of each strata for the desired native vegetation communities.	EA Section 7.16.9	No	12	Not complete
		Rehabilitation monitoring confirms the presence of at least two overstorey and two understorey species at all ages.	LCO Rehabilitation Monitoring Strategy (GSSE)	No	12	Not complete
	Stem density	Minimum total tree/shrub densities for seeded areas to be: Year 1 – 1,000 stems/ha Year 5 – 500 stems/ha Year 10 – 400 stems/ha As confirmed by rehabilitation monitoring.	LCO Rehabilitation Monitoring Strategy (GSSE)	No	na	Not complete

Table 17 Ecosystem Sustainability Phase

Domain Objective	Indicator	Completion Criteria	Justification/Source	Complete (Yes/No)	Link to TARP	Progress at end of MOP
All Secondary Domains						
Enhance the productivity and ecological value of rehabilitation areas by effectively managing risks from bushfire, weeds and feral animals	Firefighting resources	Adequate access and water resources for firefighting are retained in the final landform for relinquishment.	EA Section 7.16.9	No	15	Ongoing
	Weed presence	There are no significant weed infestations that are identified as a risk to rehabilitation.	EA Section 7.16.9	No	11	Ongoing
	Feral animal density	Feral animal pests are controlled in accordance with legislation and do not present a risk to biodiversity.	EA Section 7.16.9	No	na	Ongoing
Soils (or soil substitutes) will be reinstated on rehabilitation areas with characteristics that are appropriate for the final landuse	Soil chemistry	Soil testing indicates soil N, P, K and S levels are within 20% of levels of analogue site after 10 years.	LCO Rehabilitation Monitoring Strategy (GSSE)	No	7	Not complete
	Organic carbon	Soil testing indicates soil total organic carbon is no less than 20% of levels in adjacent analogue site after 10 years.	LCO Rehabilitation Monitoring Strategy (GSSE)	No	7	Not complete
	Soil profile development	Soil cores demonstrate a developing A and B horizon.	This MOP	No	na	Not complete
Domain A – Water Management Area						
Surface water runoff from the final landform will be non-polluting	EPL Extinguishment	Water quality monitoring for rehabilitated catchments support EPL extinguishment. Analytes measured include; conductivity, pH and TSS.	EPL 2094	No	5	Not complete
Domain B – Rehabilitation Area – Grassland						
	Species composition	At least 75% of species surveyed consist of grasses and legumes appropriate to the district and recognised as species suitable for grazing.	EA Section 7.16.9	No	10	Not complete

Domain Objective	Indicator	Completion Criteria	Justification/Source	Complete (Yes/No)	Link to TARP	Progress at end of MOP
At least 1247 ha of grassland will be established that can be demonstrated to be capable of supporting sustainable grazing by: • Having a pasture species mix representative of the district • Providing a mix of land capability suitable for agriculture (Rural Land Capability Class IV, V and VI); • having a carrying capacity comparable to suitable analogue sites; and Requiring management inputs comparable to suitable analogue sites	Natural regeneration	Evidence of second generation pasture plants present during rehabilitation monitoring.	LCO Rehabilitation Monitoring Strategy (GSSE)	No	na	Not complete
	Fertiliser and ameliorants	Fertiliser and amelioration are no longer required.	This MOP	No	na	Not complete
	Weed and pest management	Weed and pest management inputs are no more than those of analogue sites.	This MOP EA Section	No	na	Not complete
	Yields	Pasture production is comparable to similarly managed analogue site yields within 5 years. .	This MOP EA Section 7.16.9	No	na	Not complete
	Stock water availability	Water storage and access to water are suitable to support low intensity grazing activities.	This MOP	No	na	Not complete
	Carrying capacity	Demonstrated carrying capacity for a specified head of stock per hectare is within 20% of analogue sites.	This MOP	No	na	Not complete
Domain C – Rehabilitation Area - Woodland						
Woodland rehabilitation areas will be self-sustaining and require ongoing management inputs that are appropriate for the final land use	Nutrient recycling	Inspections confirm evidence of nutrient recycling (e.g. presence of fungi).	This MOP	No	na	Not complete
	Surface cover	Rehabilitation monitoring confirms ground cover (vegetation, leaf litter, mulch) is in the range of analogue sites at Year 10.	This MOP	No	9	Not complete
	Vegetation health	More than 75 per cent of trees are healthy and growing as indicated by long term rehabilitation monitoring.	EA Section 7.16.9	No	na	Not complete
	Species composition	Revegetation areas contain flora species assemblages characteristic of the desired native vegetation communities.	This MOP EA Section 7.16.9	No	12	Not complete

Domain Objective	Indicator	Completion Criteria	Justification/Source	Complete (Yes/No)	Link to TARP	Progress at end of MOP
	Reproduction	Rehabilitation monitoring confirms second generation tree seedlings are present or likely to be (e.g. presence of flowering).	EA Section 7.16.9	No	na	Not complete
	Structure	Rehabilitation monitoring confirms rehabilitated areas provide a range of vegetation structural habitats (e.g. eucalypts, shrubs, ground cover, developing litter layer, etc.) to encourage use by native fauna species.	EA Section 7.16.9	No	14	Not complete
	Native fauna presence	Rehabilitation monitoring confirms target native fauna species are recorded utilising rehabilitation areas.	This MOP	No	na	Not complete
Woodland rehabilitation corridors will connect with remnant vegetation and rehabilitation at adjacent operations including Ravensworth Operations and Mount Owen Complex, to enhance habitat connectivity	Connectivity	Habitat corridors are shown to be successfully established and consistent with desired vegetation community compositions.	This MOP	No	14	Not complete
		Woodland corridors are assessed to provide contiguous structural habitat.	EA Section 7.16.9	No	14	Not complete

7 Rehabilitation Implementation

7.1 Status at MOP Commencement

The status of each Primary and Secondary Domain at the commencement of the MOP is shown on **Plan 2** and summarised in **Table 18** below.

Table 18 Status of Primary and Secondary Domains at MOP Commencement

Domain	Status at MOP Commencement
Primary Domains	
Domain 1 – Active Mining	This domain is currently active and subject to ongoing operations.
Domain 2 – Water Management	This domain is active and subject to on-going operations.
Domain 3 – Infrastructure	This domain is active, and subject to on-going operations.
Domain 4 – Overburden Emplacement	This domain is currently active and subject to ongoing operations
Domain 5 – Tailings Storage Area	This domain is active, and subject to on-going operations.
Secondary Domains	
Domain A – Final Void	Mining has not progressed to the location of the final voids at MOP commencement.
Domain B – Water Management	Final landform drainage structures and associated dams have been constructed for rehabilitation areas on overburden dumps as shown on Plan 2.
Domain C – Rehabilitation Area – Grassland	Ongoing establishment of grassland rehabilitation.
Domain D – Rehabilitation Area – Woodland	Ongoing establishment of grassland rehabilitation.

7.2 Proposed Rehabilitation Activities during the MOP Term

Short to medium term mining and rehabilitation progression for the MOP term are shown on **Plans 3A – 3C**. **Table 19** summarises the forecast total disturbance and rehabilitation areas at LCO for each year of the MOP term.

Table 19 Rehabilitation and Disturbance Rates during the MOP Term

Year	Disturbance (ha)	Rehabilitation (ha)	Cumulative Rehabilitation (ha)	Comments/Explanation
2018	40	68.3	865	Rehabilitation of South Cut centre (30 Ha), Entrance centre (38 Ha). Disturbance of Entrance Pit 40ha.
2019	11	48.8	914	Rehabilitation of South Cut 49ha. Disturbance of Entrance Pit 11ha.
2020	10	69.7	984	Rehabilitation of Entrance Pit 58ha, South Cut 12ha. Disturbance of remaining Entrance Pit.

Rhodes Grass Management

Rhodes grass was historically used in the pasture seed mix at LCO and has since been removed from the seed mix. Rhodes grass at LCO is an historic management practice and where rehab areas are becoming a monoculture of Rhodes grass it is managed through grazing and slashing where appropriate and complimented by reseeding to supplement other pasture species present. **Table 20** summarises the proposed rehabilitation activities in the MOP term for each domain. Rehabilitation methodologies for the proposed activities are described in **Sections 7.3**.

Table 20 Proposed Rehabilitation Activities during the MOP Term

Domain	Proposed Rehabilitation Activities
Primary Domains	
Domain 1 – Active Mining	Mined out areas in-pit are progressively backfilled with overburden and rehabilitated as depicted on Plans 3A to 3C.
Domain 2 – Water Management	This domain will remain active in the MOP term. No operational dams are proposed to be decommissioned or converted to clean water dams for post mining land use in the MOP term.
Domain 3 – Infrastructure	This domain will remain active in the MOP term.
Domain 4 – Overburden Emplacement	Domain 4 will be progressively rehabilitated during the MOP term as emplacement areas are dumped to the final height. Landform Establishment activities include grading batter slopes to (generally) 10 degrees or less, grading informal undulations on the top of dumps where appropriate, constructing surface water drainage structures and ameliorating the substrate (where required). Methodologies are described in Section 7.3. Remedial works will be undertaken at the previously rehabilitated Mountain Block as described in Section 3.4.4.
Domain 5 – Tailings Storage Area	The Antiene tailings dam will be decommissioned and commence rehabilitation in the MOP term. Remaining tailings emplacement areas will remain active and subject to on-going operations.
Secondary Domains	
Domain A – Final Void	Mining will not progress to the location of the final voids
Domain B – Water Management	This domain refers to the surface water management structures (dams) that will be retained in the final landform following mine closure. This domain is active and subject to on-going operations. The locality of these structures that will retained in the final landform have been shown on Plan 4 (refer to Appendix A).
Domain C – Rehabilitation Area – Grassland	Grassland rehabilitation will be established in the MOP term to the approved final landform design.
Domain D – Rehabilitation Area – Woodland	Woodland rehabilitation will be established in the MOP term to the approved final landform design.

7.3 Rehabilitation Methodologies for Activities in the MOP Term

7.3.1 Decommissioning Phase

Primary Domains 1 – 4

There will be no built infrastructure decommissioned in the MOP term in Primary Domains 1 – 4.

Primary Domain 5

LCO will continue decommissioning and rehabilitation of the Antiene Tailings Emplacement Facility (Primary Domain 5) in the MOP term. As outlined in **Section 2.3.10** LCO have developed a detailed capping and rehabilitation design for the Antiene dam and will obtain RR approval to discontinue the use of the tailings dam in accordance with Section 101 of the *Coal Mines Health and Safety Act (2002)*. Capping activities on the Reservoir Tailings Emplacement areas will commence during the MOP term, 2019, after detailed design, consultation and approvals.

Decommissioning activities to be completed in the MOP term include removal of all tailings pumping infrastructure (including pumps, pipelines, and foundation pads).The Antiene Dam has been undergoing initial consolidation since 2009. LCO will continue monitoring and material testing to assess the likely magnitude of further settlement and the surface strengths achieved prior to the commencing capping operations.

7.3.2 Landform Establishment Phase

Primary Domains 1 – 3

There will be no landform establishment activities in Primary Domains 1 – 3 in the MOP term.

Primary Domain 4

Landform establishment activities in Primary Domain 4 are associated with:

- Ongoing progressive earthworks to shape backfilled areas of the open cut pits; and
- Maintenance earthworks at the Mountain Block (refer to **Section 3.4.4**).

As outlined in **Section 3.4.4** remedial maintenance will be undertaken at the previously rehabilitated Mountain Block in the MOP term to address instability issues and repair existing slip faces and gullying. The proposed initial methodology includes removing contour banks (where possible) to minimise concentrated flows and regrading steep slopes in accordance with geotechnical advice. A detailed design for remedial works is currently in development as discussed in **Section 9.1.2**.

Shaping works to be completed at in-pit overburden dumps include re-grading and trimming dump slopes using dozers. Slopes will generally be graded to 10 degrees or less. Slopes will be no more than 18 degrees.

Overburden emplacements will generally be graded to produce free draining landforms. The final landform will be constructed to achieve the design catchments and generally direct flows away from the direction of the final void locations. The final landform will also be constructed to include informal, minor undulations to enhance the visual amenity of the constructed landform.

The final landform design is shown on **Plan 4**.

Primary Domain 5

Landform establishment activities in Domain 5 are associated with earthworks to cap the Antiene Dam and Reservoir Tailings Emplacement. In summary, where the tailings crust material has adequate shear strength to bear equipment and capping layer. Construction of the capping layer will be completed in accordance with the High Risk Works Activity for each tailings dam. This typically involves staging the increase in capping depth; firstly a 0.5m layer is placed then a 1m layer is placed and so on till the minimum approved depth is achieved.

Current status capping activities have commenced on the Antiene Dam and the southern proportions of the dam have the initial capping layers constructed whilst the northern proportions are undergoing improved drainage and water management to facilitate drying and subsequent strengthening of the tailings crust.

Cover material will be sourced from existing spoil stockpiles located immediately adjacent the Antiene and Reservoir tailings dams.

The final landform to be developed is a broad valley with a gentle slope to the northern end. Runoff from the northern end will be directed to a series of sedimentation ponds in the remnant Pikes Gully Void prior to discharge to the natural stream system

Secondary Domain B

Landform establishment activities associated with Secondary Domain B include construction of final landform drainage structures including dams, rock drop structures and contour banks.

In the MOP term drainage structures will be constructed on shaped overburden dumps prior to establishing vegetation. Drainage structures (contour banks, drains and rock drop structures) will be constructed in accordance with Blue Book requirements and the principles below:

- Diversion drains and banks will be constructed to convey a minimum 1 in 20 year Average Recurrence Interval (ARI) storm event, with side batters no steeper than 1V:2H;

- Contour banks will be constructed with a maximum 1 – 2 % grade and (typical) maximum slope length of 70 – 100 m. Contour bank spacing will be appropriate for the slope gradient and constructed in accordance with the detailed design;
- Rock lined drop structures will be constructed to convey a minimum 1 in 50 year ARI. Channel base width and batters will be constructed in accordance with design specifications appropriate for the design catchment and peak flows.

The conceptual final landform drainage design is shown on **Plan 4**.

7.3.3 Growth Media Development Phase

The growth media development phase incorporates surface preparation activities to produce the initial growth media to establish the desired vegetation communities for the intended final landuse.

Substrate Preparation

Surface preparation activities for rehabilitated areas are commenced as soon as possible following the completion of landform establishment activities. A general overview of surface preparation activities undertaken at LCO include: Prior to revegetation activities, spoils and topsoils will be characterised to determine the type and application rate of any ameliorants required such as gypsum, fertiliser, biosolids and organic composts. Spoil samples will be analysed for pH, electrical conductivity (EC) and exchangeable sodium percent (ESP).

Following material characterisation, substrates will be treated by:

- Incorporating appropriate soil ameliorants at the recommended rate per hectare ;
- Deep ripping shaped surfaces parallel with the contour prior (where direct tree seeding is planned) or shallow ripping/tilling across the contour (where grasslands are to be established) to provide for an adequate seed bed;
- Rock raking to remove large rocks in Grassland rehabilitation areas.

Suitable erosion control measures (e.g. silt fences) will be installed to minimise soil loss prior to spreading soils.

7.3.3.1 Soil Amelioration

Prior to respreading soils, sampling will be undertaken (either from stockpiles or in-situ soils) to determine appropriate ameliorant application. Soils will be ameliorated in accordance with recommendations from the soil assessment immediately following soil spreading. Repeat applications of ameliorants may be required to maintain nutrient levels to rapidly establish an effective ground cover and sustain plant growth prior to evidence of nutrient recycling. It is anticipated that rehabilitation areas will required repeated application of fertilisers at least the following season after seed application. Grazing rehabilitation areas may require ongoing repeat application of ameliorants until the land capability completion criteria are met.

Soil Spreading

Topsoil and/or subsoil will generally be spread over the prepared substrate to a depth of 100 mm. The depth of topsoil will depend on the outcome of the topsoil balance review (refer to **Section 3.4.3**) and outcomes of the direct seeding trials (**Section 8.2**). Where appropriate, LCO will substitute topsoils and subsoils with alternatives such as OGM.

Soils will be spread when slightly most whenever possible to minimise structural damage. Soils and ameliorants will be spread evenly along the contour, commencing at the top of slopes and working downwards.

Following application of soils and required ameliorants, the rehabilitation area is re-ripped along the contour. This allows for the partial mixing of topsoil, ameliorants and overburden, and provides surface roughness to improve infiltration and seed/soil contact.

7.3.3.2 Habitat Augmentation

Prior to revegetation habitat features are installed in Domain D – Woodland rehabilitation areas. Where appropriate and practical, salvaged tree hollows and logs will be incorporated into the final landform to

augment the habitat value of proposed habitat corridors or riparian habitat. Large rocks will be placed into habitat piles where appropriate.

In addition to installation of habitat features on rehabilitation areas nest boxes will be established adjacent to rehabilitation areas in nearby remnant vegetation to compensate for the loss of hollows in habitat trees. The number and designs of nest boxes required will be determined following assessment of the number and type of tree hollows removed during clearing.

7.3.4 Ecosystem Establishment

Methodologies to establish appropriate vegetation communities for the intended final landuse are outlined in the sections below.

Species Selection and Native Seed Collection

Due low native seed resource onsite, rehabilitation seed will be sourced from commercial suppliers, targeting 90% native seed being sourced from local provenance. The seed mixes for Domain C – Grassland (**Table 21**) and Domain D – Woodland (**Table 22**) rehabilitation incorporate species represented in appropriate control (analogue) sites that are representative of the desired final landuse. Seed mixes may be subject to variation due to seasonal seed availability. Where suitable local resource is identified from monitoring programs, local native seed will be collected and utilised to maintain the genetic integrity of rehabilitation areas if possible.

Timing

After surface soil amelioration and tillage is completed for any given area, revegetation will commence as soon as practicable. LCO plans rehabilitation campaigns to time seeding in spring and autumn when possible. Opportunistic sowing may occur in summer and winter if areas become available and weather conditions are predicted to be favourable for germination.

Domain C – Grassland

Areas to be rehabilitated to grasslands will generally include, but not necessarily limited to, the species in **Table 21.**The seed mix and sowing rates may vary dependent upon the conditions and species availability.

Table 21 Species and Sowing Rates for Grassland Rehabilitation

Species	Rate (kg/ha)	
	Spring / Summer	Autumn / Winter
Japanese Millet	15	0
Oats	0	25
Green Panic	3	2
Premier Digit Grass	5	3
Setaria	2	1
Kikuyu	5	3
Couch Grass	5	3
Tall Fescue	2	5
Cocksfoot	0	2
Wimmera Ryegrass	2	6
Lucerne (Aurora)	6	8
White Clover (Haifa)	2	2
Medic (Sephi)	0	5
Chicory	2	2
Plantain (Tonic)	1	3
Woolly Pod Vetch (Namoi)	0	5
TOTAL	50	75

Domain D – Woodland

Woodland rehabilitation areas will focus on establishing flora species assemblage's characteristic of Central Hunter Box – Ironbark Woodland with the species selected from the recommended species list appended to the Biodiversity Management Plan. Woodland will be established to contribute to habitat corridors as depicted on **Plan 4** and integrate with adjacent remnant native vegetation and woodland rehabilitation at neighbouring mining operations. **Table 22** summarises a typical species mix used.

Table 22 Typical Species for Woodland Rehabilitation

Scientific Name	Common Name
Upper Storey	
Angophora floribunda	Rough-barked apple
Eucalyptus crebra	Narrow-leaved ironbark
Eucalyptus molucanna	Grey box
Mid Storey	
Allocasuarina luehmannii	Bulloak
Brachychiton populneum	Kurrajong
Notelaea macrocarpa var. macrocarpa	Velvet mock olive
Ground Cover	
Aristida ramose	purple wiregrass
Austrostipa scabra	speargrass
Cymbopogon refractus	Barbed wire grass
Brunoniella australis	Blue trumpet
Calocephalus citreus	Lemond bueauty-heads
Einadia nutans subsp. Nutans	Climbing saltbush
Eremophila debilis	Winter apple
Lomandra multiflora subsp. Multiflora	Many-flowered mat-rush

Tree and shrub seed will be applied at a rate determined appropriate to site conditions this will generally be a total of approximately 7kg/ha. Where required, seed will be appropriately pre-treated to provide for germination and will be evenly mixed and spread.

The majority of revegetation will involve sowing of pasture species and direct seeding of native tree species. A range of other techniques may also be utilised where appropriate over isolated areas associated with steep slopes.

7.3.5 Ecosystem Sustainability Phase

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

- Weeds and pest animal control;
- Managing bushfire risks;
- Minor earthworks to remediate any significant erosion features;
- Infill planting and/or seeding to meet vegetation community requirements; and
- Maintaining erosion and sediment controls.

LCO have developed a formal rehabilitation monitoring program to assess the progress of rehabilitation areas toward the nominated completion criterial. Rehabilitation monitoring will be undertaken throughout the ecosystem sustainability phase until it can be demonstrated that rehabilitation areas have met all conditions for relinquishment. Rehabilitation monitoring for the MOP term is discussed in **Section 8**.

7.4 Summary of Rehabilitation Progress during the MOP Term

Table 23 details the progress of rehabilitation in each domain during the MOP term, as depicted on **Plan 3A** to **Plan 3C**.

Table 23 Data Summary of Rehabilitation Proposed during the MOP Period

Primary Domain	Secondary Domain	Code	Rehabilitation Phase	Total Area at MOP start (ha)	Total Area at MOP end (ha)
Active Mining (1)	Final Void (A)	1A	Active	34.8	43.5
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	0	0
			Ecosystem and Land Use Sustainability	0	0
			Relinquished Lands	0	0
			Total	**34.8**	**43.5**
Active Mining (1)	Water Management (B)	1B	Active	123.8	128.8
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	0	0
			Ecosystem and Land Use Sustainability	0	0
			Relinquished Lands	0	0
			Total	**123.8**	**128.8**
Active Mining (1)	Rehabilitation Area – Grassland (C)	1C	Active	44.1	6.7
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	0	0
			Ecosystem and Land Use Sustainability	0	0
			Relinquished Lands	0	0
			Total	**44.1**	**6.7**
Active Mining (1)	Rehabilitation Area – Woodland (D)	1D	Active	49.6	32.0
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	0	0
			Ecosystem and Land Use Sustainability	0	0

Primary Domain	Secondary Domain	Code	Rehabilitation Phase	Total Area at MOP start (ha)	Total Area at MOP end (ha)
			Relinquished Lands	0	0
			Total	**49.6**	**32.0**
Active Mining Total				**252.3**	**211.0**
Water Management (2)	Water Management (B)	2B	Active	28.1	28.1
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	0	0
			Ecosystem and Land Use Sustainability	0	0
			Relinquished Lands	0	0
			Total	**28.1**	**28.1**
Water Management (2)	Rehabilitation Area – Grassland (C)	2C	Active	6.2	6.2
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	0	0
			Ecosystem and Land Use Sustainability	0	0
			Relinquished Lands	0	0
			Total	**6.2**	**6.2**
Water Management (2)	Rehabilitation Area – Woodland (D)	2D	Active	0.3	0.3
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	0	0
			Ecosystem and Land Use Sustainability	0	0
			Relinquished Lands	0	0
			Total	**0.3**	**0.3**
Water Management Total				**34.3**	**34.3**
Infrastructure (3)	Rehabilitation Area – Grassland (C)	3C	Active	88.8	87.8
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0.4	1.0
			Ecosystem and Land Use Establishment	0	0.4
			Ecosystem and Land Use Sustainability	0	0
			Relinquished Lands	0	0
			Total	**89.2**	**89.2**
		3D	Active	18.8	10.1

Primary Domain	Secondary Domain	Code	Rehabilitation Phase	Total Area at MOP start (ha)	Total Area at MOP end (ha)
Infrastructure (3)	Rehabilitation Area – Woodland (D)		Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0.7
			Ecosystem and Land Use Establishment	0	0
			Ecosystem and Land Use Sustainability	0	0
			Relinquished Lands	0	0
			Total	**18.8**	**10.8**
Infrastructure Total				**108.0**	**100.0**
Overburden Emplacement (4)	Rehabilitation Area – Grassland (C)	4C	Active	87.0	74.7
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	44.9	47.4
			Ecosystem and Land Use Establishment	565.0	611.7
			Ecosystem and Land Use Sustainability	0	0
			Relinquished Lands	0	0
			Total	**696.9**	**733.8**
Overburden Emplacement (4)	Rehabilitation Area – Woodland (D)	4D	Active	126.1	80.1
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	25.1	23.9
			Ecosystem and Land Use Establishment	294.8	366.5
			Ecosystem and Land Use Sustainability	0	0
			Relinquished Lands	0	0
			Total	**446.3**	**470.5**
Overburden Total				**1143.2**	**1204.3**
Tailings Storage Area (5)	Rehabilitation Area – Grassland (C)	5C	Active	50.8	50.8
			Decommissioning	20.7	20.7
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	0	0
			Ecosystem and Land Use Sustainability	0	0
			Relinquished Lands	0	0
			Total	**71.5**	**71.5**
Tailings Storage Area Total				**71.5**	**71.5**

7.5 Relinquishment Phase achieved during MOP Period

Despite the age of some rehabilitation areas, no areas are anticipated to be relinquished during the current MOP period. This reflects changes in final land uses and subsequently completion criteria to for large proportions of rehabilitation that require further time to achieve completion criteria.

8 Rehabilitation Monitoring and Research

8.1 Rehabilitation Monitoring Program

In accordance with the *GCAA Standard for Closure Criteria Development and Rehabilitation Monitoring*, LCO have developed a rehabilitation monitoring program. The program assesses progress toward completion criteria (**Section 6**) and the need for any intervention.

The objectives of the program are to:

- Assess the long term stability and functioning of rehabilitation areas;
- Assess rehabilitation performance against the closure criteria; and
- Facilitate continuous improvement in rehabilitation practices.

During the MOP term, LCO will commence a new rehabilitation monitoring management system, the Rehabilitation Report Card. This system is being implemented to improve the transparency and accuracy of rehabilitation monitoring to ensure the program is informative, providing for the adaptive improvement of rehabilitation and progress rehabilitated areas from early stages towards relinquishment. The aim of this process is to ensure that rehabilitation areas are being monitored for the right parameters at the appropriate lifecycle stage of the rehabilitation and has been designed in a way that if a critical failure is identified that the rehabilitation area will not process onto the next stage of monitoring until it has been addressed. Further, in this manner each rehabilitation area will demonstrate with monitoring results achievement of each rehabilitation phase's completion criteria before progressing.

The approach taken is generally quantitative and focuses on a range of indicators that reflect compositional, structural and functional aspects of ecological communities. Field monitoring is focused on sustainability and appropriateness to post mine land use. Once it is determined landform related rework is no longer required, and historic rehabilitated areas are stable permanent ground transects can be used to inform future maintenance activities and eventual progressive rehabilitation sign-off.

Through the use of a data workbook, a rehabilitation calculator, GIS data and rehabilitation monitoring data, the report card can be completed. The report card is then used to summarise and track rehabilitation trajectory performance as well as remediation/maintenance required and facilitate the annual rehabilitation planning process. **Table 24** identifies the rehabilitation status results summary that LCO will use to inform the annual rehabilitation planning process.

Table 24 Rehabilitation Report Card Result Summary

Rehabilitation Status	Criteria
Rework	Does not meet completion criteria. Extensive rework required that would not typically form part of a rehabilitation maintenance program (e.g. slopes do not comply with approval requirements, bare areas >0.1ha, large erosion gullies).
Maintenance	Does not meet completion criteria. Routine rehabilitation maintenance works required (e.g. weed control, infill seeding/plantings, repair of minor erosion, fertiliser application).
Monitor	Trajecting towards completion criteria but does not meet all criteria. No intervention required but continue to monitor (e.g. ecologically young areas, variable results).
Acceptable	Meets all completion criteria and ready for sign off by stakeholders. Continue to manage and monitor to maintain status until relinquishment off is sought.

The new monitoring system will build upon the existing program to ensure continuity in rehabilitation performance tracking.

Aspects of the rehabilitation monitoring program are discussed in the sections below.

8.1.1 Rehabilitation Records

LCO records the details of each rehabilitation campaign so that they are available for later interpretation to inform the continual improvement process and (where required) revise rehabilitation methodologies.

Rehabilitation methodology records are documented for each rehabilitation area including:

- Landform design verification including:
  - Survey to confirm final topography, maximum elevation and maximum slope
  - Aspect of the rehabilitation area;
- Geotechnical assessment for highwall and lowwall stability and integrity
- Drainage design and 'as constructed' survey records to verify contour banks:
  - Are spaced in accordance with design;
  - Have maximum 1% (average) longitudinal grades and trapezoidal profile; and
  - Are run onto level natural ground, or if not, have appropriate scour control;
- Substrate characterisation records including:
- Soil chemistry analysis, visual assessment of physical characteristics (e.g. rockiness);
  - Spoil amelioration records; and
  - Depth of capping materials and sources;
- Site preparation records including:
  - Soil spreading depth, rate and type of fertiliser and ameliorants,
  - Depth of ripping;
  - Erosion controls installed including mulches, sediment fences, and meshing;
  - Weed control;
- Seeding campaign records including:
- Time of sowing, seed mix and rate per hectare;
- Weather conditions (records of 6 months leading up to planting and rainfall in 48hrs prior to planting);
- Photographic records; and
- Follow-up care and maintenance works (including watering and weed management).

8.1.2 Annual Ecological Monitoring Program

Suitably qualified and experienced ecologists undertake flora and fauna monitoring annually for all rehabilitation areas, offset areas and remnant vegetation areas. This monitoring program is detailed in the LCO Biodiversity Management Plan and LCO Biodiversity Offset Management Plan.

The ecological monitoring program includes monitoring for rehabilitation monitoring plots and control sites (analogue sites) for woodland and grazing rehabilitation areas. As rehabilitation progresses, additional monitoring plots will be added to the program.

Current elements of the ecological monitoring program include:

- Flora Monitoring
- Habitat Assessment
- Photo Monitoring
- Fauna Monitoring including diurnal woodland birds, targeted bird surveys, micro bat, spot lighting, baited camera traps (spotted tail quolls), waterbird monitoring and nest box monitoring
- Landscape function analysis
- Stygofauna monitoring
- Instream riparian ecological condition monitoring
- Tiger orchid monitoring

8.2 Research, Trials and Use of Analogue Sites

8.2.1 Rehabilitation Trials

EEC Biodiversity Rehabilitation Trial

In order to determine the most appropriate method of reinstating Endangered Ecological Communities (EEC's) LCO has commenced trials aimed at establishing two EEC's, being Central Hunter Grey Box – Ironbark Woodland and Central Hunter Ironbark – Spotted Gum Grey Box Forest on overburden emplacement. The species selected were representative of communities found in proximity to LCO and consisted of the following species.

Table 25 Seed Mix for EEC Biodiversity Rehabilitation Trial

Grey Box – Ironbark Woodland Forest Community		**Ironbark – Spotted Gum Forest Community**	
Species	**Application Rate**	**Species**	**Application Rate**
Acacia pendula	0.3 kg/ha	*Acacia falcata*	0.3 kg/ha
Allocasuarina luehmannii	0.3 kg/ha	*Acacia parvipinnula*	0.2 kg/ha
Angophora floribunda	0.3 kg/ha	*Allocasuarina luehmanii*	0.2 kg/ha
Austrostipa scabra	1.0 kg/ha	*Bursaria spinosa subsp. Spinosa*	0.5 kg/ha
Bothriochloa decipiens	0.3 kg/ha	*Corymbia maculaae*	1.0 kg/ha
Brachychiton populneus subsp. Populneus	0.3 kg/ha	*Daviesia ulicifolia subsp. ulicifolia*	2500 seeds total
Bursaria spinosa subsp. Spinosa	0.4 kg/ha	*Dianella revoluta var. revoluta*	3000 seeds total
Calotis lappulacea	0.3 kg/ha	*Eremophila debilis*	2000 seeds total
Callitris endlicheri	0.3 kg/ha	*Eucalyptus crebra*	1.0 kg/ha
Cassinia quinquefaria	0.3 kg/ha	*Eucalyptus fibrosa*	0.4 kg/ha
Chrysocephalum apiculatum	0.3 kg/ha	*Eucalyptus tereticornis*	0.8 kg/ha
Cyperus gracilis	0.3 kg/ha	*Eucalyptus moluccana*	1.0 kg/ha
Dodonaea viscosa	0.3 kg/ha	*Hakea sericea*	100 g/ha
Eragrostis leptostachya	0.4 kg/ha	*Microlaena stipoides var. stipoides*	0.4 kg/ha
Einadia nutans	0.4 kg/ha	*Paspalidium distans*	0.4 kg/ha
Eremophila debilis	3000 seeds total	*Pultenaea spinosa*	0.2 kg/ha
Eucalyptus crebra	1.0 kg/ha	*Themeda australis*	0.4 kg/ha
Eucalyptus moluccana	1.0 kg/ha		
Glycine tabacina	0.4 kg/ha		
Microlaena stipoides var. stipoides	0.4 kg/ha		

Monitoring of the two ecological community trial areas has been conducted in annually since 2012 and included:

- Total species counts in monitoring quadrats; and
- Landscape Function Analysis (LFA) conducted along LFA transects, in accordance with the methodology established by Tongway and Hindley (1996).

Monitoring at the trial areas will continue in the MOP period to assess the success of establishing key species representative of the target community for woodland rehabilitation at LCO (Central Hunter Box Ironbark Community).

Cattle Grazing Trial

The Liddell grazing trial commenced in late 2012 and aimed to investigate the ability of rehabilitated mine land to support cattle grazing on a sustainable basis. The project aimed to assist Glencore to identify gaps in knowledge and identify opportunities for further trials or research.

The specific objectives of the trail are to:

- Assess and compare performance of a rehabilitation grazing site against an adjoining un-mined grazing site across a range of soil, vegetation and livestock parameters;
- Develop guidance material for Glencore sites relating to completion criteria for grazing rehabilitation areas and management of grazing on rehabilitation areas; and
- Demonstrate viability of cattle grazing as a sustainable post-mining land use option to stakeholders.

The trial utilised beef cattle of similar breed and age to reduce variation between cattle and the cattle are placed randomly in rehabilitation paddocks and natural (un-mined) paddocks. The trail involved monitoring of soils, water, pastures and livestock performance across both the rehabilitation and natural pastures. The trial was completed in 2018 with the following key outcomes/findings informing rehabilitation practices and outlined below;

- Growth rates of cattle grazing pastures sown on land rehabilitated after mining have been above (trials 1, 3 & 4) or equal (Trial 2) cattle grazing adjacent natural pastures on undisturbed land.
- The stocking rates have been maintained at the high end of district average to ensure pastures are subject to the kind of grazing pressure common in the area.
- Trace element levels were satisfactory in both rehabilitated and undisturbed soils and blood test of the cattle showed no contamination of cattle with heavy metals or excess minerals.
- Feed quality was a major factor in the increased performance of the cattle grazing rehabilitated pastures compared to unmined pastures
- Groundcover levels has been maintained above 70% across the sits during the studies.
- The pasture species sown on rehabilitated land comprises mostly tropical grasses (dominated by Rhodes Grass). The unmined pastures area a diverse mix of native and exotic species.
- During the MOP term, LCO will commence rotational grazing practices on suitable areas of pasture rehabilitation in the South Cut. These areas will be monitored to inform maintenance activities to support the pasture development.

9 Intervention and Adaptive Management

9.1 Threats to Rehabilitation

A Risk to Rehabilitation Risk Assessment was undertaken during preparation of this MOP to assess the key issues that may affect successful mine closure (**Appendix E**). The objectives of the risk assessment were to:

- Identify issues and assess risk of preventing or delaying timely and cost effective relinquishment of mining tenements;
- Identify key controls and management actions to manage and reduce risks; and
- Determine knowledge gaps.

Operational issues with the potential to impact rehabilitation are discussed in **Section 3.4**.

Key threats to rehabilitation, and threat reduction actions that will be implemented and/or developed at LCO during the MOP term, and the relevant MOP section, are summarised in

Table 26. A particular threat to the rehabilitation is the stability of the Mountain Block Slope which is detailed below.

Table 26 Key Threats to Rehabilitation

Aspect	Mitigation Measures in MOP Term	Section in the MOP
Landform Stability (Mountain Block) and Erosion of overburden emplacements	Prepare and implement the Mountain Block Remediation Strategy, including (possible) removal of diversion banks to create a landform with non-concentrating drainage Spoil characterisation and amelioration of substrate in rehabilitation areas	Section 3.4.4 Section 7.3.2 Section 9.1.2
Topsoil Resource (quantity and quality)	Undertake the soil balance review Investigate soil substitute options	Section 3.4.3 Section 3.4.3
Revegetation failure due to drought	Amelioration of spoils and soils to improve infiltration and water holding capacity Selection of drought tolerant species Appropriate timing of seeding campaigns	Section 7.3.4
Revegetation failure due to bushfire	Maintenance of bushfire mitigation controls	Section 3.3.13

Following completion of the works LCO will undertake monitoring to verify the effectiveness of the rehabilitation strategy. In the event that monitoring indicates there are potential instability issues LCO will undertake additional investigations and remedial works in accordance with the Rehabilitation Trigger Action Response Plan (TARP) (**Section 9.2**).

9.1.2 Mt Block Remediation

The previous MOP included a strategy and timeline for rehabilitation remediation works at the Mt Block area to address landform stability issues and erosion impacts.

The original schedule can be summarised into three key tasks:

- Development and implementation of a geotechnical investigation program;
- Completion of detailed remediation design; an
- Tender, contract award and commencement of works.

In acknowledgement that the issue needs to be addressed and progress made to address this rehabilitation legacy, LCO has commissioned external expertise to finalise a detailed design ready for tender. The proposed work includes the following components:

- Obtaining bulk soil samples for flume testing in the laboratory, in order to quantify the materials erosion risk of the material to be used in the outer slopes;
- Analysis of the materials, using the Water Erosion Prediction Project (WEPP) analysis software to determine sustainable flow lengths and slopes;
- Updating the conceptual designs of the final landform by incorporating “Applied Geofluv™” and Geographic Information Systems (GIS) erosion risk analysis, to optimise the conceptual design. It will include a constructability analysis in 3D for consultation and initial costing;
- Final design for the final landform, incorporating issues raised from the conceptual landform reviews;
- Analysis of the proposed final landform, using the SIBERIA erosion model to quantify the short and long term erosion risk (with and without vegetation);
- Providing engineering details for tender that include construction drawings, together with a Bill of Quantities and technical specifications; and
- Final reporting to summarise the design details and any residual risks.

Throughout the remediation planning process, outlined in Addendum 1, LCO required approvals to be modified (hence Development Consent MOD 7) and additional approvals to be granted, Ancillary Mining Approval.

To progress the remediation of the area, LCO progressed with the design, tender and engagement phases prior to receiving the AMA approval required and provided an update to DRG in November 2019. A summary of the current project status is as follows:

- Detailed design and methodology has been confirmed through peer review and workshops
- Rehabilitation methodology options analysis was used assess the potential benefits, constraints & limitations of a number of methods to determine the most appropriate (considering constructability) and successful option
- Success criteria along with a detailed plan of preferred rehabilitation outcomes (pasture, woodland, rock scree) developed. Quality assurance process to inform achievement.
- Construction contract awarded with mobilisation and construction commenced in December where approved.

During this MOP term, works in the Mountain Block area will include

1. General – Including Mobilisation, Establishment, inductions & appropriate training
2. Preliminaries – Including construction & maintenance of access tracks and hardstands, allowance for survey, provision & sorting of rock for works & clearing required for works.
3. Bulk Shaping – commence shaping to developed final landform based on principles of Geofluv, intended to be a less erodible landform and to provide drainage lines and structures to carry concentrated flows.
4. Soil Amelioration – Incorporation of gypsum and lime to improve the condition of the soil to as close to optimum conditions for the desired vegetation outcome. The ability to establish and sustain vegetation growth is essential for effective stabilisation of the Mountain Block.
5. Rock Drains – the construction of rock drains for surface run-off is concentrated to prevent erosion.
6. Revegetation - revegetation as per design recommendations from modelled erosion risk & areas nominated in MOP as woodland or pasture/grazing
7. Surface Erosion Protection - to provide protection to all or part of the sown surface as required to maintain erosion protection until vegetation can provide adequate protection from erosion
8. Maintenance - following the execution of the revegetation works, maintenance will ensure that germination & establishment of seed is not compromised while maintaining adequate erosion protection in all rehabilitated areas.

9.2 Trigger Action Response Plan

To achieve the final land use outcomes and rehabilitation objectives detailed in Section 4 in a timely manner, LCO acknowledge that ongoing rehabilitation and maintenance activities will be required as each discrete area develops. To inform rehabilitation establishment progress and identify appropriate maintenance activities, monitoring is completed annually as per Section 8. The following TARP for rehabilitation has been developed to detail the typical required management actions in the event of impacts to rehabilitation have occurred (such as damage or excessive erosion), or where rehabilitation development progress is not being achieved or likely to be achieved in an acceptable timeframe. The intent of the TARP is to document standard rehabilitation maintenance activities required to be implemented from time to time. Each rehabilitation domain/area is assessed individually and where monitoring results identify TARP activation (status requiring intervention); it is noted in the Annual Rehabilitation Monitoring Report for the relevant domain and reported in the Annual Review.

Where necessary, rehabilitation procedures will be amended as required with the aim of continually improving rehabilitation standards. LCO will notify the RR and other relevant stakeholders of any incident resulting in major impacts to rehabilitation.

The responses specified within the TARP have been based upon the rehabilitation completion criteria developed during the preparation of the EIS (Umwelt 2013a) and the current rehabilitation monitoring program.

The TARP is provided as **Table 27** below, and will be reviewed and may be revised as conditions at LCO change or new threats to rehabilitation are identified.

Table 27 Trigger Action Response Plan

Aspect/ Category	Key Element	Element Number	Trigger Response	Condition Green	Condition Amber	Condition Red
Landform stability	Slope gradient	1	Trigger	Rehabilitated overburden areas have slopes that are generally <10˚.	Rehabilitated overburden areas have slopes >10° but <14˚.	Rehabilitated overburden areas have slopes >15°.
			Response	No response required. Continue monitoring program.	Undertake regrading and revegetation of the area, if it is not designed to be >10° <14˚.	Undertake a review of the landform design, including survey if required. Undertake regrading and revegetation of the area, if required.
		2	Trigger	Rehabilitation areas have no signs of slumping or movement.	Rehabilitation areas exhibit some minor slumping or movement.	Rehabilitation areas exhibit significant slumping or mass movement.
			Response	No response required. Continue monitoring program.	Monitor and assess stability of area. Undertake regrading and revegetation of the area, if required.	Undertake a review of the landform design, including survey if required. Undertake regrading and revegetation of the area, if required.
	Erosion control	3	Trigger	No gully or tunnel erosion. No active rilling present >200mm deep	Minor gully or tunnel erosion present and/or active rilling >200 mm deep.	Significant gully or tunnel erosion present and/or rilling >600 mm deep.
			Response	No response required. Continue monitoring program.	A suitably trained person to inspect the site. Investigate opportunities to install water management infrastructure to address erosion. Remediate as appropriate.	Undertake a review of the drainage of the area and provide recommendations to appropriately remediate the erosion. Remediate as soon as practicable.
	Drainage Condition	4	Trigger	Drainage condition is in accordance with the design criteria established within this document.	Landforms exhibiting minor drainage issues but does not threaten to cause rehabilitation failure.	Landforms exhibiting significant drainage issues, threatening or causing rehabilitation failure.
			Response	No response required. Continue monitoring program.	A suitably trained person to inspect the site. Investigate opportunities to address issues. Remediate as appropriate.	Undertake a review of the drainage design and provide recommendations to appropriately remediate the area. Remediate as soon as practicable.

Aspect/ Category	Key Element	Element Number	Trigger Response	Condition Green	Condition Amber	Condition Red
Water Quality	Monitoring parameters	5	Trigger	Surface water quality of runoff from rehabilitation areas is within EPL criteria and rehabilitation performance criteria established within this document.	Water quality exceeds EPL or performance criteria but does not indicate a long-term rehabilitation issue.	Water quality exceeds criteria, indicating a long term rehabilitation liability.
			Response	No response required. Continue monitoring program.	Review and investigation of water quality monitoring and management where appropriate. Implement relevant remedial measures where required.	Reporting as per PIRMP and all statutory reporting requirements. Implement relevant responses and undertake immediate review to determine source of issues and implement remediation measures identified as soon as practicable.
Spontaneous Combustion	Evidence of Spontaneous Combustion	6	Trigger	No evidence of spontaneous combustion in rehabilitation areas.	Isolated incidence of heating in rehabilitation areas.	Widespread or repeated incidences of ignition in rehabilitation areas.
			Response	No response required. Continue monitoring program.	Investigate sources of potential ignition. Excavate material with propensity for spon com in proximity to rehabilitated surface. Review overburden / coarse reject emplacement practices.	Consult with regulators to develop remediation plan to mitigate spon com such as increased capping. Review Spon Com Management Plan and material emplacement practices.
Soil/spoil Quality	Monitoring parameters	7	Trigger	Properties of soil/spoil are not limiting the plant establishment.	Rehabilitation vegetation underperforming, i.e. limited establishment/diversity of vegetation present over areas >400m^2	Rehabilitation vegetation underperforming, i.e. bare areas of rehabilitation greater than >400m^2
			Response	No response required. Continue monitoring program.	Investigate application of additional soil, and/or use of appropriate soil ameliorants or management options to address soil/spoil quality if deemed necessary.	Consultant to be engaged to assist with recommendations to appropriately remediate soil/spoil quality and depth. Remediate as soon as practicable.

Aspect/ Category	Key Element	Element Number	Trigger Response	Condition Green	Condition Amber	Condition Red
Topsoil Availability	Topsoil quantity	8	Trigger	Sufficient topsoil identified for rehabilitation over the MOP term and for the Life of the Mine.	Topsoil balance indicates a deficiency in topsoil available for rehabilitation over the Life of the Mine.	Deficiency significant enough to delay rehab progression the MOP term
			Response	No response required.	Investigate options and alternatives (e.g. OGM) to be able to meet future topsoil requirements Continue direct seeding on spoil where possible and approved.	Source and budget for purchasing topsoil for use in rehabilitation. Investigate use of alternatives such as OGM.
Vegetation	Ground cover	9	Trigger	Vegetation is on a timely trajectory developing groundcover of diversity and density consistent with final landform and completion criteria.	Vegetation is not on a timely trajectory of developing groundcover of diversity or density consistent with final landform and/or completion criteria.	No target groundcover present.
			Response	No response required. Continue monitoring program.	Review procedures where required to increase vegetation cover.	A suitably trained person to inspect the site. Investigate use of appropriate management options to remediate. Remediate as appropriate.
	Weed presence	10	Trigger	Weed presence is within range found at analogue sites and does not present a risk to rehabilitation.	Weeds present a risk to the establishment of rehabilitation areas.	Weeds are limiting the establishment of rehabilitation significantly.
			Response	No response required. Continue monitoring program.	Engage weed management contractor to remove introduced species from the site.	Engage weed management contractor to remove introduced species from the site as soon as practicable. Investigate management measures to assist native plant establishment including use of ameliorants and implement as appropriate.

Aspect/ Category	Key Element	Element Number	Trigger Response	Condition Green	Condition Amber	Condition Red
	Species composition	11	Trigger	Woodland vegetation is on a timely trajectory developing groundcover of native tree and shrub species consistent with final landform and completion criteria.	Woodland vegetation is not on a timely trajectory of developing native tree and shrub species composition consistent with final landform and/or completion criteria.	Woodland vegetation is not developing or has significant maintenance required to achieve composition consistent with final landform and/or completion criteria.
			Response	No response required. Continue monitoring program.	Review native seed mix and amend accordingly. Consider remedial actions such as tubestock planting, reseeding or other management practices to achieve required species composition.	An inspection of the site will be undertaken by a suitably trained person. Investigate remedial options to achieve required species composition.
		12	Trigger	Pasture vegetation is on a timely trajectory developing grass and legumes species consistent with final landform and completion criteria, appropriate to the district and suitable for cattle grazing.	Pasture vegetation is not a timely trajectory developing grass and legumes species consistent with final landform and completion criteria, appropriate to the district and suitable for cattle grazing.	Pasture vegetation is not developing or has significant maintenance required to achieve composition consistent with completion criteria, appropriate to the district and suitable for cattle grazing.
			Response	No response required. Continue monitoring program.	Investigate additional weeding and re-seeding where required and ensure seed mix utilised is consistent with desired species composition.	An inspection of the site will be undertaken by a suitably trained person. Investigate remedial options to achieve required species composition.
Biodiversity	Habitat Corridors	13	Trigger	Monitoring indicates corridors are successfully established and consistent with the desired vegetation community composition and being utilised for fauna species movement.	Habitat corridors are successfully established and consistent with the desired vegetation community composition however are not being utilised for fauna species movement.	Monitoring indicates that vegetation corridors do not contain the desired vegetation community composition and are not being utilised for the movement of fauna species.

Aspect/ Category	Key Element	Element Number	Trigger Response	Condition Green	Condition Amber	Condition Red
			Response	No response required. Continue monitoring program.	Investigate whether sufficient habitat features (rock piles, felled hollow bearing trees, nest boxes etc.) are available and have been incorporated into the corridors.	Engage ecologist to recommend remedial rehabilitation works such as additional planting or seeding, soil amelioration, or weed reduction. Ensure sufficient habitat features are available for fauna.
Bushfire	Fuel Load	14	Trigger	Fuel loads are assessed and managed as required and the Bushfire Management Plan is being implemented.	Bushfire Management Plan is not being implemented increasing the risk of bushfire impact to rehabilitation.	A fire on site damages rehabilitated areas.
			Response	No response required. Continue monitoring program.	Reduce fuel loads and ensure access tracks are cleared. Inspect water sources are and ensure sufficient water is available.	Review and update (if required) the Bushfire Management Plan to ensure monitoring and maintenance is completed for fuel loads, access tracks, and water bodies.
Tailings	Inadequate capping	15	Trigger	The capped tailings landform is constructed in accordance with the approved capping design and is free-draining and no ponding is present.	Inspections indicate some temporary ponding on the tailings landform, however settlement is within the range considered in the detailed capping design.	Landform is exhibiting permanent or significant ponding issues.
			Response	No response required. Continue monitoring program.	A suitably trained person to inspect the site. Investigate opportunities to improve landform drainage. Remediate as appropriate.	Undertake a review of the capping and drainage design and provide recommendations to appropriately remediate the area. Remediate as soon as practicable.

Aspect/ Category	Key Element	Element Number	Trigger Response	Condition Green	Condition Amber	Condition Red
Groundwater	Void water balance	16	Trigger	Water balance and groundwater monitoring indicate void water balance is correct	Groundwater monitoring indicates that inflows into the void may be higher than the water balance assumptions which in combination with high surface runoff could result in the voids filling higher than predicted.	Groundwater inflows are significantly higher than predicted in the water balance and in combination with high surface runoff could result in overtopping of the voids.
			Response	No response required. Continue monitoring program.	Undertake additional groundwater monitoring and review water balance	Engage a qualified groundwater specialists and engineers and consider amending the final void design.

10 Reporting

The Annual Review, which is submitted to relevant government agencies and made publically available on the LCO website (www.liddellcoal.com.au), reports on the following information relating to rehabilitation:

- An overview of rehabilitation undertaken each year;
- Results of annual rehabilitation inspections;
- Outcomes of the annual ecological monitoring; and
- Progress against the projected rehabilitation in the approved MOP.

11 Plans

LCO is classified as a Level 1 Mine as defined by *ESG3 Mining Operations Plan (MOP) Guideline* (DRE, 2013). Accordingly, the following plans have been prepared:

- **Plans 1A, 1B and 1C** show the location and pre-mining natural and physical environment of LCO;
- **Plan 2** shows the mine domains and mining features at commencement of the MOP term;
- **Plan 3A – 3C** are a series of Plans which show the annual sequence of mining and rehabilitation activities over the MOP term;
- Plan **4** shows the proposed post mining land use and landform five years after closure(2032); and
- Plan **5** shows vertical and longitudinal cross sections.

Note, Plan 3C and Plan 4 have been revised following AMA modification to ML1597 to reflect the works occurring in Mountain Block remediation project as per Section 9.1.2. These Plans are contained in **Appendix A**.

12 Review and Implementation of the MOP

12.1 MOP Review Protocol

This section provides the protocol for periodic review of this MOP. Reviews are conducted to assess the effectiveness of the procedures against the objectives of MOP. The MOP may be reviewed, and if necessary revised, following the submission of the following:

- Annual Review;
- Incident report;
- Audit; or
- Any modification to the conditions of the Development Consent.
- This MOP may also be revised due to:
- Deficiencies being identified;
- Results from the monitoring and review program;
- Recommendations resulting from the monitoring and review program;
- Changing environmental requirements;
- Improvements in knowledge or technology become available;
- Change in legislation;
- Where a risk assessment identifies the requirement to alter the MOP; and
- Change in the activities or operations associated with LCO.

Any major amendments to the MOP that affect its application will be undertaken in consultation with the appropriate regulatory authorities and stakeholders. Any amendments would be completed in accordance with the latest MOP guidelines

12.2 Implementation

Table 28 defines the personnel who are responsible for the monitoring, review and implementation of this MOP.

Table 28 Responsibilities for Implementation of this MOP

Title	Responsibility
Operations Manager	• Implement the procedures referenced in this MOP; • Undertake training in relevant Management Plans and procedures as required; • Provide resources required to support and implement these procedures; • Provide adequate resources for the completion of rehabilitation activities; and • Approve this document and any subsequent reviews/amendments.
Manager Mining Engineering	• Integrate mine rehabilitation into the short and long term mine planning process to provide that it is effectively implemented. • Construct landforms in accordance with this MOP;

Title	Responsibility
Environment & Community Manager	• Prepare the relevant Management Plans; • Implement, monitor and review the programs and procedures linked to this MOP; • Consult with regulatory authorities as required; • Provide measures for continual improvement to this MOP and procedures; • Ensure all personnel undertaking works in relation to this MOP are trained and competent; • Report the progress of any rehabilitation and monitoring of biodiversity in the AEMR; • Undertake site based actions to implement this MOP in cooperation with relevant site departments; • Coordinate the development of Annual Rehabilitation Plans to guide rehabilitation activities; • Coordinate the completion of rehabilitation activities in accordance with this document; • Coordinate the development of the site rehabilitation objectives and closure criteria in consultation with key stakeholders; • Coordinate the rehabilitation monitoring program and an annual review of monitoring results to provide a continual improvement process for rehabilitation; and • Coordinate biodiversity and land management baseline studies, participate in risk assessments, contribute to the development of management strategies in consultation with affected parties and co-ordinate their implementation as part of the site EMS. • Review and analyse rehabilitation monitoring data and assess progress against mine closure objective and criteria. • Develop and implement care and maintenance programs to progress rehabilitation areas towards meeting the closure criteria in a timely manner. • Review rehabilitation methodologies based on the outcomes of monitoring programs to facilitate continual improvement. • Complete reporting requirements relating to rehabilitation in the Annual Environmental Management Report and MOP. • Provide that all relevant records are effectively maintained on site.
Technical Services Manager	• Schedule rehabilitation activities as per this MOP. • Implement the procedures referenced in this MOP; • Undertake training in relevant Management Plans and procedures as required; • Provide resources required to implement these procedures; • Provision of landform construction survey control • Develop mine plans and dumping strategies to allow for progressive rehabilitation of mined land; and • Liaise with the Environment and Community Department to ensure that regulatory commitments relating to rehabilitation are considered during mine planning processes. • Coordinate updates to the MOP as required including information on mine rehabilitation.
Commercial Manager	• Provide that adequate provisions are available for mine closure by implementing and updating an accrual system over the life of the mine.

Title	Responsibility
Environment & Community Officer	• Have a sound understanding of the MOP. • Implement, monitor and review programs, systems and procedures linked to the MOP. • Monitor and review the data that is being collected for the MOP. • Monitor, document and communicate progress against MOP objectives and targets. • Undertake monitoring as required; • Undertake maintenance as required; • Monitor all firefighting equipment and ensure hose connections to suit the Rural Fire service are available.

13 Reference Information

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Standards Australia (1989), AS 1289 - Methods of testing soil for engineering purposes - Part B - Soil moisture content tests - Establishment of correlation between a subsidiary method of moisture content determination and the standard method AS 1289.B1.1

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Standards Australia (1998), AS 5667.11 – 1998 Water Quality Sampling – Guidance on Sampling of Groundwaters

Standards Australia (2003), AS 3580.10.1 Methods for Sampling and Analysis of Ambient Air – Determination of Particulate Matter – Deposited Matter – Gravimetric Method

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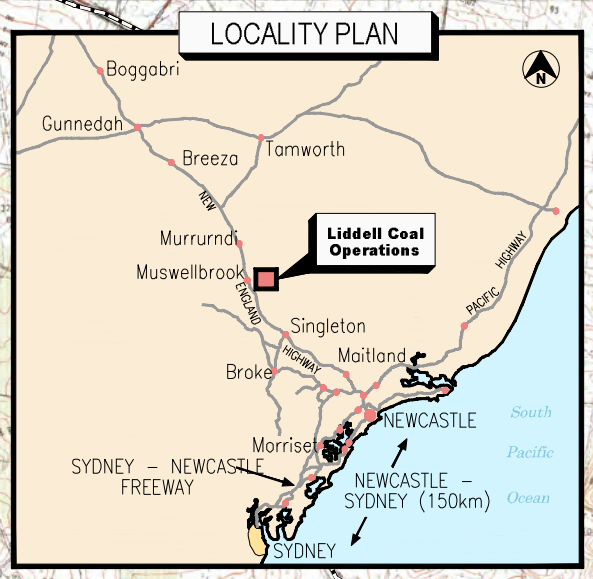
Appendix A - MOP Plans



Antiene

Rail Spur

Main Northern Railway

Lake Liddell

Muswellbrook LGA

Singleton LGA

ML1313

ML1597

ML1552

Bowmans Creek

Pikes Gully Road

New England Highway

Old New England Highway

Hebden Road

Main Northern Railway

HERSCHELL

SAVOY

RAVENSWORTH

LIDDELL

I, Daniel Brogan, Representative of Liddell Coal Operations Pty. Ltd (the Operator of Liddell Open Cut), and holder of Mine Manager's Certificate of Competency No. 159, certify that this plan is a true representation of the proposed operations.

.....
Daniel Brogan

I, David Rolph, Surveyor for Liddell Coal Operations Pty Ltd, holder of Mine Surveyor's Certificate of Competency No. 8680, certify that to the best of my knowledge and belief, this plan conforms to the accuracy standards required by the Department of Mineral Resources, NSW.

.....
David Rolph

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LEGEND

- Disturbance Boundary
- Proposed Extraction Boundary
- Liddell Mining Tenements
- Other Mining Tenements
- Local Government Area Boundary
- Railway Line
- Roads
- Creeks and Rivers

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LIDDELL COAL OPERATIONS

Mining Operations Plan
PLAN 1A - Pre-Mining Environment - Project Locality
Application Date: October 2017

Dwg No:	Plan No:	Rev:
10424	APP-345	A

Date:	Scale:	Drawn:	Checked:	Approved:	Sheet:
06.10.2017	1 :20,000	T.Berry	J.Young	D.Rolph	A0

LAND CLASSIFICATION AND SOIL CONSERVATION PRACTICES			INTERPRETATIONS AND IMPLICATIONS
SUITABLE FOR REGULAR CULTIVATION	I	No Special soil conservation works or practices.	Land suitable for a wide variety of uses. Where soils are fertile, this is land with the highest potential for agriculture and may be cultivated for vegetable and fruit production, cereal and other grain crops, energy crops, fodder and forage crops and sugar cane in specific areas. Includes "prime agricultural land".
	II	Soil conservation practices such as strip cropping, conservation tillage and adequate crop rotation.	Usually gently sloping land suitable for a wide variety of agricultural uses. Has a high potential for production of crops on fertile soils similar to Class I but increasing limitations to production due to site conditions. Includes "prime agricultural land".
	III	Structural soil conservation works such as graded banks, waterways and diversion banks, together with soil conservation practices such as conservation tillage and adequate crop rotation.	Sloping land suitable for cropping on a rotational basis. Generally used for the production of the same type of crops as listed for Class I, although productivity will vary depending upon soil fertility. Individual yield may be the same as for Classes I and II, but increasing restrictions due to the erosion hazard will reduce the total yield over time. Soil erosion problems are often severe. Generally fair to good agricultural land.
SUITABLE GRAZING (Occasional Cultivation)	IV	Soil conservation practices such as pasture improvement, stock control, application of fertiliser and minimal cultivation for the establishment or re-establishment of permanent pasture.	Land not suitable for cultivation on a regular basis owing to limitations of slope gradient, soil erosion, shallowness or rockiness, climate, or a combination of these factors. Comprises the better classes of grazing land of the State and can be cultivated for an occasional crop, particularly a fodder crop or for pasture renewal. Not suited to the range of agricultural uses listed for Classes I to III. If used for "hobby farms", adequate provision should be made for water supply, effluent disposal and selection of safe building sites and access roads.
	V	Structural soil conservation works such as absorption banks, diversion banks and contour ripping, together with the practices as in Class IV.	Land not suitable for cultivation on a regular basis owing to considerable limitations of slope gradient, soil erosion, shallowness or rockiness, climate, or a combination of these factors. Soil erosion problems are often severe. Production is generally lower than for grazing lands in Class IV. Can be cultivated for an occasional crop, particularly a fodder crop or for pasture renewal. Not suited to the range of agricultural uses listed for Classes I to III. If used for "hobby farms", adequate provision should be made for water supply, effluent disposal and selection of safe building sites and access roads.
SUITABLE GRAZING (No Cultivation)	VI	Soil conservation practices including limitation of stock, broadcasting of seed and fertiliser, prevention of fire and destruction of vermin. May include some isolated structural works.	Productivity will vary due to the soil depth and the soil fertility. Comprises the less productive grazing lands. If used for "hobby farms", adequate provision should be made for water supply, effluent disposal and selection of safe building sites and access roads.
OTHER	VII	Land best protected by green timber.	Generally comprises areas of steep slopes, shallow soils and/or rock outcrop. Adequate ground protection must be maintained by limiting grazing and minimising damage by fire. Destruction of trees is not generally recommended, but partial clearing for grazing purposes under strict management controls can be practised on small areas of low erosion hazard. Where clearing of these lands has occurred in the past, unstable soil and terrain sites should be returned to timber cover.
	VIII	Cliffs, lakes or swamps and other lands unsuitable for agricultural and pastoral production.	Land unusable for agricultural or pastoral uses. Recommended uses are those compatible with the preservation of the natural vegetation, namely: water supply catchments, wildlife refuges, national and state parks and scenic areas.
	U	Urban areas	CLASS SUBSCRIPTS: c — SPECIAL USES: Terrain developed for a specific crop (capability class range IV to VII) as a result of the combination of particular soil, terrain, climatic and economic conditions. The class includes such crops as grapes, bananas, avocados and pineapples.
	M	Mining and quarrying areas.	CLASS SUBSCRIPTS: d — SPECIAL USES: Terrain developed for intensive agricultural production and associated with flood irrigation. The class includes land developed for cotton and rice production.

ML1597 ML1313 ML1552

Lake Liddell

LAKE LIDDELL NOTIFICATION AREA

Main Northern Railway

Bowmans Creek

Pikes Gully Road

New England Highway

Old New England Highway

Lemington Road

N W E S

0 200 400 600 800 1000m

LEGEND

- Disturbance Boundary
- Proposed Extraction Boundary
- Liddell Mining Tenements
- Railway Line
- Roads
- Creeks and Rivers
- Liddell Dam Notification Area
- 70 Contours 5m Interval
- IV Land Capability Classification

VEGETATION COMMUNITIES

- Aquatic or Riparian Vegatation
- Central Hunter Box Ironbark Woodlands
- Central Hunter Bulloak Forest Regeneration
- Central Hunter Swamp Oak Forest
- Derived Grassland
- Hunter Valley River Oak Forest
- Narrow-leaved Ironbark - Bulloak Open Forest
- Narrow-leaved Ironbark - Spotted Gum Woodland
- Rusty Fig Dry Rainforest
- Undifferentiated Woodlands

I, Daniel Brogan, Representative of Liddell Coal Operations Pty. Ltd (the Operator of Liddell Open Cut), and holder of Mine Manager's Certificate of Competency No. 159, certify that this plan is a true representation of the proposed operations.

.....
Daniel Brogan

I, David Rolph, Surveyor for Liddell Coal Operations Pty Ltd, holder of Mine Surveyor's Certificate of Competency No. 8680, certify that to the best of my knowledge and belief, this plan conforms to the accuracy standards required by the Department of Mineral Resources, NSW.

.....
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LIDDELL COAL OPERATIONS

Mining Operations Plan
PLAN 1B - Pre-Mining Environment - Natural
Application Date: October 2017

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LIDDELL COAL OPERATIONS

Mining Operations Plan
PLAN 1C - Pre-Mining Environment - Built
Application Date: October 2017

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Plan No: APP-347
Rev: A
Sheet: A0

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David Rolph

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0 200 400 600 800 1000m

LEGEND

- Disturbance Boundary
- Proposed Extraction Boundary
- Liddell Mining Tenements
- Local Government Area Boundary
- Railway Line
- Roads
- Creeks and Rivers
- Pipelines
- Powerlines
- 70 Contours 5m Interval

LAND OWNERS

- Crown
- GCAA Offset
- Glendell
- Liddell
- Mac Gen
- Mt Owen
- Non Glencore Mines
- Private Owner
- Ravensworth Operations
- Ravensworth Underground
- Private Residence
- Mine Owned Residence
- Chain Of Ponds Hotel

ARCHAEOLOGICAL SITES

- Archaeological Site
- Archaeological Site - Destroyed
- PAD

LIDDELL COLLIERY U/G WORKINGS:

- Liddell Seam
- Upper Liddell Seam
- Middle Liddell Seam

FOYBROOK COLLIERY U/G WORKINGS:

- Liddell Seam
- Upper Liddell Seam
- Pikes Gully Seam

Muswellbrook LGA
Singleton LGA
ML1597
ML1313
ML1552
Main Northern Railway
Bowmans Creek
Lake Liddell
Pikes Gully Road
New England Highway
Old New England Highway
Lemington Road
GOAL & ALLIED LOADING FACILITY
RAVENSWORTH UNDERGROUND MINE SURFACE FACILITIES
CHAIN OF PONDS HOTEL

ML1597

ML1313

ML1597

ML1313

ML1597

ML1552

Main Northern Railway

Bowmans Creek

Lake Liddell

Pikes Gully Road

New England Highway

Old New England Highway

Lemington Road

RESERVOIR NORTH

RESERVOIR WEST TAILINGS

DURHAM TAILINGS

DECANT DAM

RESERVOIR SOUTH TAILINGS

ANTIENE TAILINGS DAM

ANTIENE EAST AREA

ROM

COAL PREPARATION PLANT

SOUTH PORTAL

PROTOCOL STOCKPILE AREA

DEPP SETTLING POND

FUEL FARM

COAL & ALLIED

HUNTER VALLEY COAL LOADING FACILITY

LIDDELL WORKSHOPS

OFFICES

N 6 420 000

N 6 419 000

N 6 418 000

N 6 417 000

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LEGEND

- Disturbance Boundary
- Proposed Extraction Boundary
- Liddell Mining Tenements
- Railway Line
- Roads
- Cadastral
- 70 Contours 5m Interval
- Creeks and Rivers
- Existing Dam
- A A' Section Location
- Pipelines
- Powerlines
- Conveyor
- Buildings
- Decommissioning
- Ecosystem Establishment

Primary Domains

- Active Mining
- Water Management
- Infrastructure
- Overburden Emplacement
- Tailings Storage Area

Secondary Domains

- Final Void
- Water Management
- Rehabilitation Area - Grassland
- Rehabilitation Area - Woodland

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Daniel Brogan

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LIDDELL COAL OPERATIONS

Mining Operations Plan
PLAN 2 - Mine Domains and Operations
Application Date: October 2017

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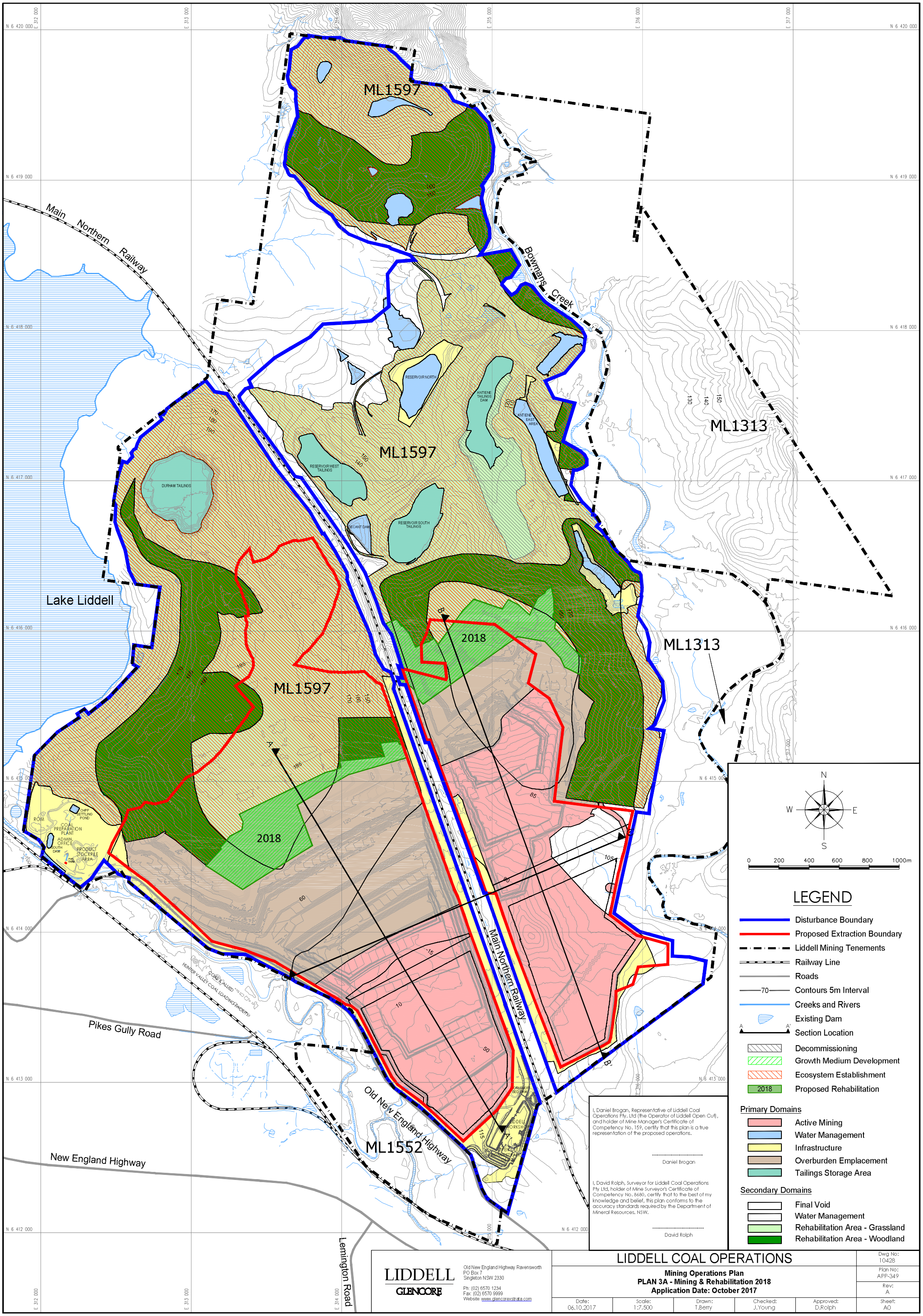
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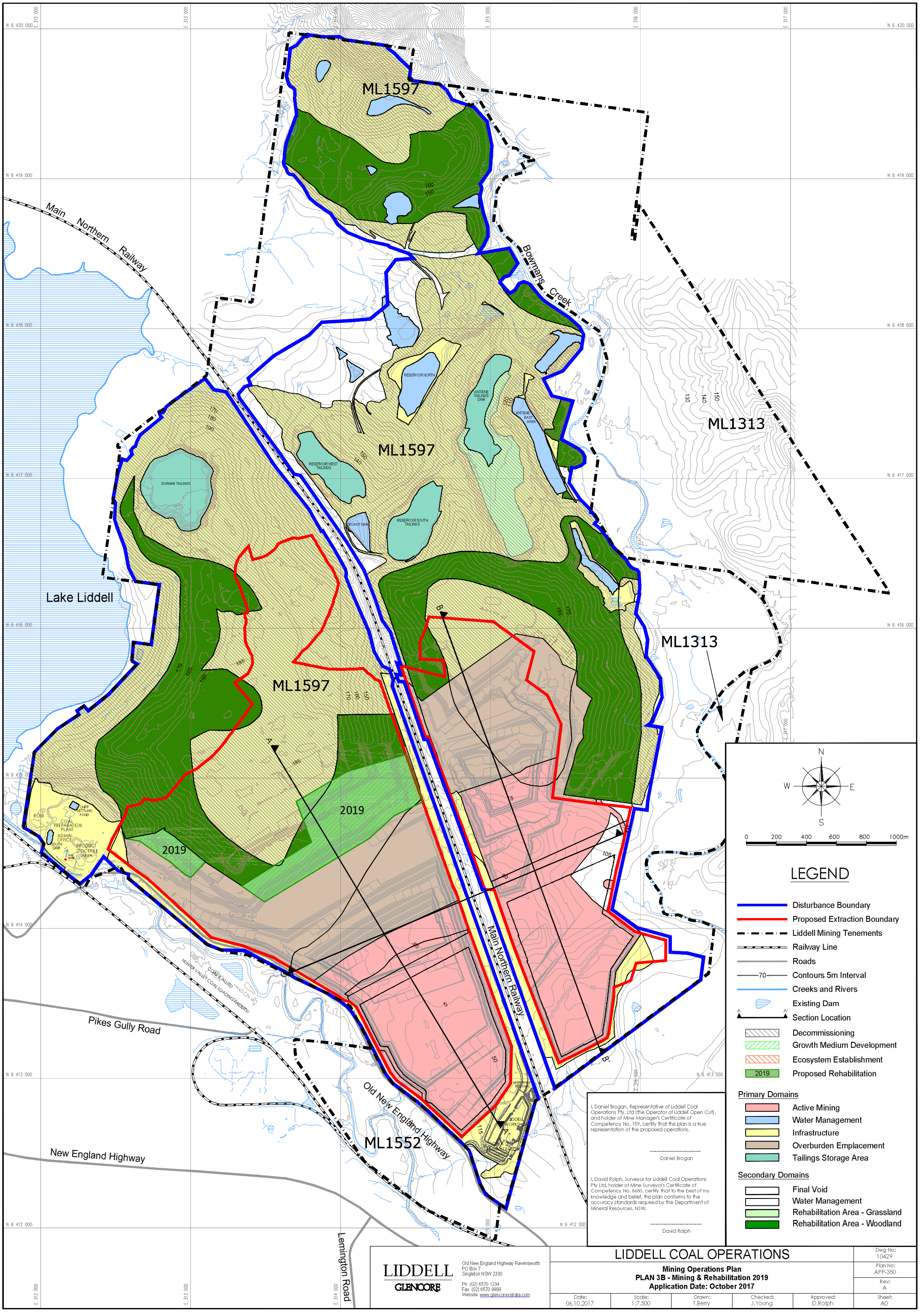
Pikes Gully Road
New England Highway
Old New England Highway
Lemington Road
RESERVOIR NORTH
ANTIENE TAILINGS DAM
ANTIENE EAST AREA
RESERVOIR WEST TAILINGS
DURHAM TAILINGS
DECANT DAM
RESERVOIR SOUTH TAILINGS
ROM
COAL PREPARATION PLANT
ADMIN OFFICE
PRODUCT STOCKPILE AREA
CHPP SETTLING POND
SOUTH DAM
HUNTER VALLEY COAL LOADING FACILITY
COAL & ALLIED
LIDDELL WORKSHOP
N
W
E
S
0 200 400 600 800 1000m
LEGEND
Disturbance Boundary
Proposed Extraction Boundary
Liddell Mining Tenements
Railway Line
Roads
70 Contours 5m Interval
Creeks and Rivers
Existing Dam
A A' Section Location
Decommissioning
Growth Medium Development
Ecosystem Establishment
2018 Proposed Rehabilitation
Primary Domains
Active Mining
Water Management
Infrastructure
Overburden Emplacement
Tailings Storage Area
Secondary Domains
Final Void
Water Management
Rehabilitation Area - Grassland
Rehabilitation Area - Woodland
I, Daniel Brogan, Representative of Liddell Coal Operations Pty. Ltd (the Operator of Liddell Open Cut), and holder of Mine Manager's Certificate of Competency No. 159, certify that this plan is a true representation of the proposed operations.
Daniel Brogan
I, David Rolph, Surveyor for Liddell Coal Operations Pty Ltd, holder of Mine Surveyor's Certificate of Competency No. 8680, certify that to the best of my knowledge and belief, this plan conforms to the accuracy standards required by the Department of Mineral Resources. NSW.
David Rolph
LIDDELL
GLENCORE
Old New England Highway Ravensworth
PO Box 7
Singleton NSW 2330
Ph: (02) 6570 1234
Fax: (02) 6570 9999
Website: www.glencorexstrata.com
LIDDELL COAL OPERATIONS
Mining Operations Plan
PLAN 3A - Mining & Rehabilitation 2018
Application Date: October 2017
Dwg No: 10428
Plan No: APP-349
Rev: A
Date: 06.10.2017
Scale: 1:7,500
Drawn: T.Berry
Checked: J.Young
Approved: D.Rolph
Sheet: A0



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LIDDELL COAL OPERATIONS

Mining Operations Plan
PLAN 3B - Mining & Rehabilitation 2019
Application Date: October 2017

Dwg No:	Plan No:	Rev:
10429	APP-350	A

Date:	Scale:	Drawn:	Checked:	Approved:	Sheet:
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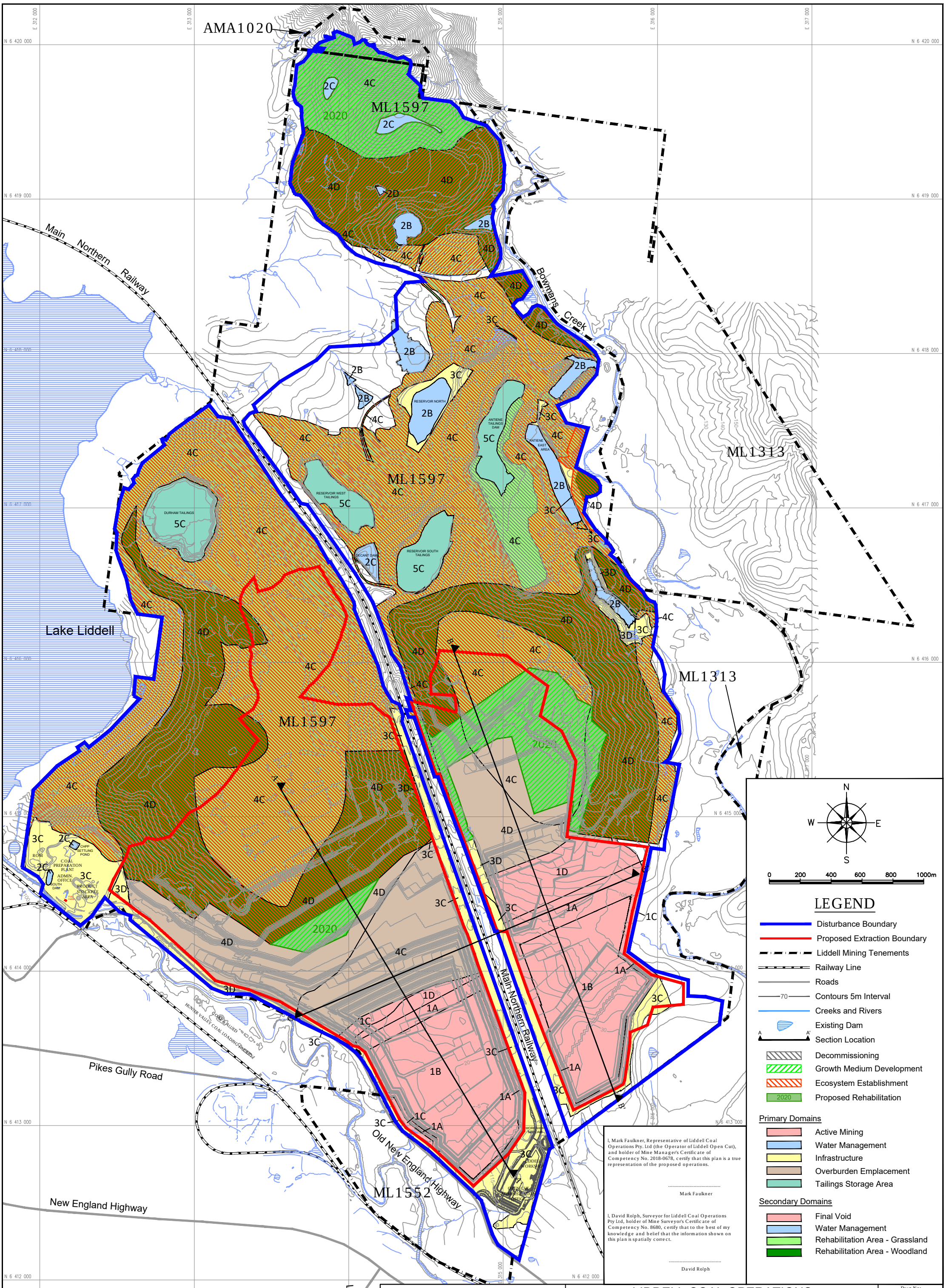

I, Mark Faulkner, Representative of Liddell Coal Operations Pty. Ltd (the Operator of Liddell Open Cut), and holder of Mine Manager's Certificate of Competency No. 2018-0678, certify that this plan is a true representation of the proposed operations.

.....
Mark Faulkner

I, David Rolph, Surveyor for Liddell Coal Operations Pty Ltd, holder of Mine Surveyor's Certificate of Competency No. 8680, certify that to the best of my knowledge and belief that the information shown on this plan is spatially correct.

.....
David Rolph

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LIDDELL COAL OPERATIONS

Mining Operations Plan
PLAN 3C - Mining & Rehabilitation 2020
Application Date: February 2020

Dwg No:	Plan No:	Rev:
10430	APP-351	B

Date:	Scale:	Drawn:	Checked:	Approved:	Sheet:
05.02.2020	1:7,500	J. Gray	J.Young	D.Rolph	A0

AMA1020

ML1597

ML1313

ML1552

Main Northern Railway

Bowmans Creek

Lake Liddell

Pikes Gully Road

New England Highway

Old New England Highway

Main Northern Railway

Lemington Road

E 312 000 E 313 000 E 314 000 E 315 000 E 316 000 E 317 000

N 6 420 000 N 6 419 000 N 6 418 000 N 6 417 000 N 6 416 000 N 6 415 000 N 6 414 000 N 6 413 000 N 6 412 000

LEGEND

- Disturbance Boundary
- Proposed Extraction Boundary
- Liddell Mining Tenements
- Railway Line
- Roads
- 70 Contours 5m Interval
- Proposed Water Management
- Proposed Drop Structure
- Creeks and Rivers
- Existing Dam
- A A' Section Location
- V Proposed Land Capability

Secondary Domains

- Final Void
- Water Management
- Rehabilitation Area - Grassland
- Rehabilitation Area - Woodland
- Conservation and Biodiversity Offset Area

0 200 400 600 800 1000m

I, Mark Faulkner, Representative of Liddell Coal Operations Pty. Ltd (the Operator of Liddell Open Cut), and holder of Mine Manager's Certificate of Competency No. 2018-0678, certify that this plan is a true representation of the proposed operations.

.....
Mark Faulkner

I, David Rolph, Surveyor for Liddell Coal Operations Pty Ltd, holder of Mine Surveyor's Certificate of Competency No. 8680, certify that to the best of my knowledge and belief that the information shown on this plan is spatially correct.

.....
David Rolph

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Fax: (02) 6570 9999
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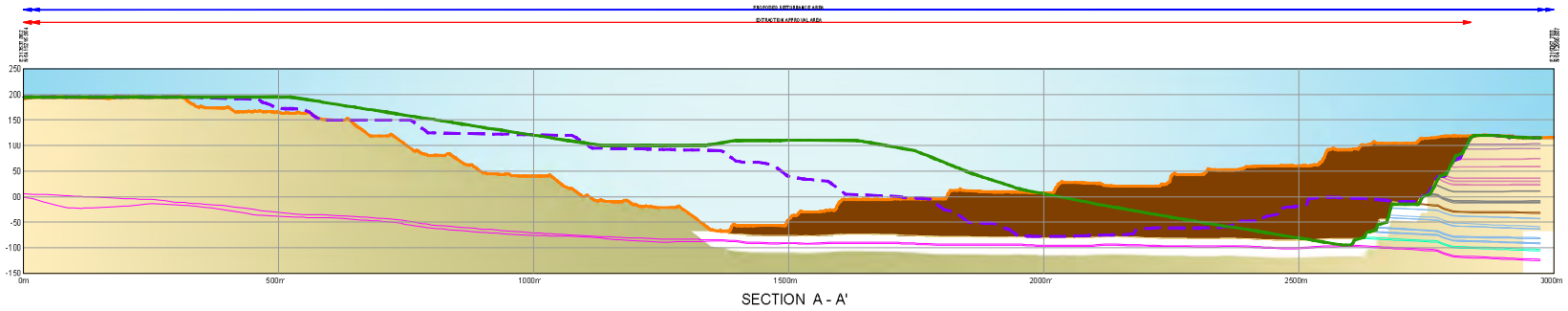
LIDDELL COAL OPERATIONS

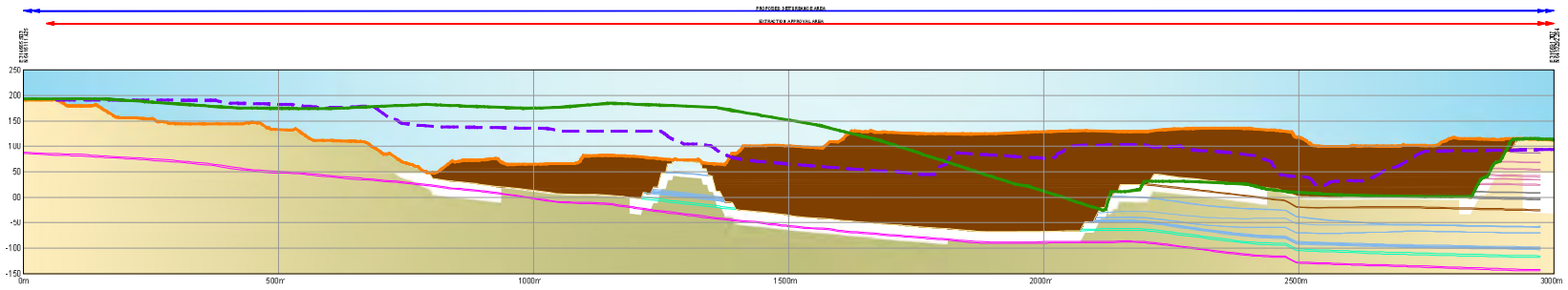
Mining Operations Plan
PLAN 4 - Final Rehabilitation & Post Mining Land Use
Application Date: February 2020

Dwg No:	Plan No:	Rev:
10431	APP-352	B

Date:	Scale:	Drawn:	Checked:	Approved:	Sheet:
05.02.2020	1:7,500	J. Gray	J.Young	D.Rolph	A0



SECTION A - A'



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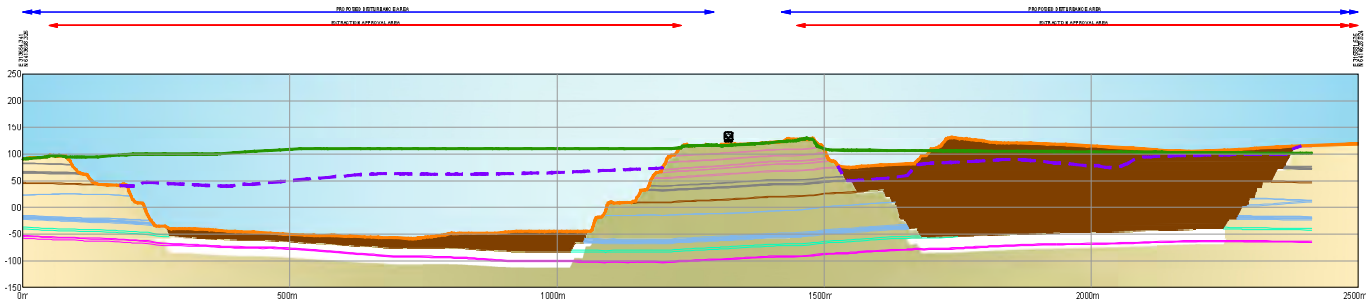

SECTION C - C'

0 100 200 300 400 500m

LEGEND

- Disturbance Boundary
- Proposed Extraction Boundary
- Sky
- Existing Mining Surface (Overburden)
- In-situ Ground
- Current Mining Surface 2017
- Conceptual Mining Surface 2020
- Conceptual Final Rehabilitation Surface
- Railway Line

COAL SEAM LEGEND

- Bayswater Seams
- Lemington Seams
- Pikes Gully Seams
- Arties Seams
- Liddell Seams
- Barrett Seams
- Hebden Seams

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Daniel Brogan

I, David Rolph, Surveyor for Liddell Coal Operations Pty Ltd, holder of Mine Surveyor's Certificate of Competency No. 8680, certify that to the best of my knowledge and belief, this plan conforms to the accuracy standards required by the Department of Mineral Resources, NSW.

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LIDDELL COAL OPERATIONS

Mining Operations Plan
PLAN 5 - Cross Sections
Application Date: October 2017

Date:	Scale:	Drawn:	Checked:	Approved:
06.10.2017	1:5,000	T.Berry	J.Young	D.Rolph

Dwg No: 10432
Plan No: APP-353
Rev: A
Sheet: A0

Appendix B - DA 305-11-01 MOD 6

ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

INTEGRATED STATE SIGNIFICANT DEVELOPMENT

DETERMINATION OF DEVELOPMENT APPLICATION
PURSUANT TO SECTIONS 76(A)9 & 80

I, the Minister for Planning, pursuant to Sections 76(A)9 & 80 of the Environmental Planning and Assessment Act, 1979 ("the Act") determine the development application ("the application") referred to in Schedule 1 by granting consent to the application subject to the conditions set out in Schedule 2.

The reasons for the imposition of the conditions are to:

(i) minimise the adverse impact the development may cause through water and air pollution, noise, and visual disturbance;

(ii) provide for environmental monitoring and reporting; and

(iii) set requirements for mine infrastructure provision.

Andrew Refshauge MP
Minister for Planning

Sydney, 2002 File No. S00/01703

Red type represents July 2007 modification.
Blue type represents the May 2008 modification
Green type represents the October 2009 modification
Orange type represents the December 2014 modification
Purple type represents the February 2016 modification
Light Blue type represents the January 2019 modification

Schedule 1

Application made by:	Liddell Coal Operations Pty Limited ("the Applicant").
To:	The Minister for Planning (DA 305-11-01)
In respect of:	Land described in Appendix "1".
For the following:	Continued open cut coal mining at the Liddell Colliery and associated surface facilities and infrastructure ("the development").

BCA Classification:

Structure	BCA Classification
Office	Class 5
Amenities	Class 8

NOTE:

1) To ascertain the date upon which the consent becomes effective, refer to section 83 of the Act.

2) To ascertain the date upon which the consent is liable to lapse, refer to section 95 of the Act.

3) Section 97 of the Act confers on an Applicant who is dissatisfied with the determination of a consent authority a right of appeal to the Land and Environment Court exercisable within 12 months after receipt of notice.

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APPENDIX 9: GENERAL TERMS FOR THE PLANNING AGREEMENT WITH MUSWELLBROOK COUNCIL

DEFINITIONS

Annual review	The review required by condition 3 of schedule 5
Applicant	Liddell Coal Operations Pty Limited, or its successor
BCA	Building Code of Australia
Biodiversity offset strategy	The conservation and enhancement strategy described in the EA, and depicted conceptually in the figures in Appendix 7
Blast misfire	The failure of one or more holes in a blast pattern to initiate
CCC	Community Consultative Committee
Chain of Ponds Inn	Refers to the State-heritage listed Chain of Ponds Inn Complex
CHPP	Coal Handling & Preparation Plant
Councils	Muswellbrook Shire Council & Singleton Council
DA	Development Application
Day	The period from 7 am to 6 pm on Monday to Saturday, and from 8 am to 6 pm on Sundays and Public Holidays
Department	Department of Planning & Environment
DoI	Division of Land and Water within the Department of Industry
DRG	Division of Resources and Geoscience within the Department
EIS	Development application 305-11-2001 and accompanying documents titled *Liddell Colliery Continued Operations Environmental Impact Statement*, dated October 2001; *Response to NPWS Request for Further Information in Relation to the Archaeological Assessment*, *Liddell EIS*, dated February 2002; correspondence submitted to the Departments and SC, dated 20 December 2001; *Response to Submissions Liddell Colliery Environmental Impact Statement*, dated March 2002; *Continued Operations of Liddell Colliery – Revised Development Application Area*, dated 13 March 2002; and additional air quality contours provided to the Department, dated 7 May 2002
EEC	Endangered ecological community, as defined under the *Threatened Species Conservation Act 1995*
EPA	Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000*
EPL	Environment Protection Licence issued under the POEO Act
Evening	The period from 6 pm to 10 pm
Feasible	Feasible relates to engineering considerations and what is practical to build or to implement
Ha	Hectare
Heritage Council	Heritage Council of NSW
Heritage item	An item as defined under the Heritage Act 1977 and/or an Aboriginal object or place as defined under the National Parks and Wildlife Act 1974
Incident	An occurrence or set of circumstances that causes or threatens to cause material harm and which may or may not be or cause a non-compliance
Land	Land means the whole of a lot, or contiguous lots owned by the same landowner, in a current plan registered at the Land Titles Office at the date of this consent
Material Harm	Is harm that: • involves actual or potential harm to the health or safety of human beings or to the environment that is not trivial, or • results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding $10,000 (such loss includes the reasonable costs and expenses that would be incurred in taking all reasonable and practicable measures to prevent, mitigate or make good harm to the environment) This definition excludes "harm" that is authorised under either this consent or any other statutory approval
Mining operations	Includes the removal and emplacement of overburden and extraction, processing, handling, storage and transport of coal on site
Minister	Minister for Planning, or delegate
Minor	Not very large, important or serious
Mitigation	Activities associated with reducing the impacts of the development
MOD 1 EA	Modification application 305-11-01 MOD 1 and accompanying Schedule of Lands
MOD 2 EA	Modification application 305-11-01 MOD 2 and accompanying documents titled *Liddell Colliery Modification to Development Consent Environmental Assessment*, dated December 2006; *Response to Submissions Environmental Assessment for Liddell Colliery Modification to Development Consent*, dated March 2007; *Response to Submissions*

	from the Roads and Traffic Authority and the Hunter Regional Development Committee Environmental Assessment for Liddell Colliery Modification to Development Consent, dated April 2007; and *Revised Statement of Commitments for the Liddell Development Consent Modification*, dated July 2007
MOD 3 EA	Modification application 305-11-01 MOD 3 and accompanying documents titled *Liddell Coal Operations Pty Limited Statement of Environmental Effects for Liddell Colliery Modification to Development Consent*, dated February 2008
MOD 4 EA	Modification application 305-11-01 MOD 4 and accompanying document and site plans, dated 7 October 2009 and prepared by Umwelt Australia Pty Limited
MOD 5 EA	Modification application 305-11-01 MOD 5 and accompanying document and site plans, dated September 2013 and prepared by SLR
MOD 6 EA	Modification application 305-11-01 MOD 6 and accompanying documents titled *Greater Ravensworth Area Tailing Pipeline Modification Environmental Assessment* dated November 2015, including the response to submissions dated December 2015
MOD 7 EA	Modification application 305- 11- 01 MOD 7 and accompanying documents titled *Liddell Coal Operations Environmental Assessment Modification 7 to DA 305-11-01* dated August 2018 and prepared by Hansen Bailey, including the response to submissions dated November 2018
MSC	Muswellbrook Shire Council
Negligible	Small and unimportant, such as to be not worth considering
Night	The periods from 10 pm to 7 am on Monday to Saturday, and 10 pm to 8 am on Sundays and Public Holidays
Non-compliance	An occurrence, set of circumstances or development that is a breach of this consent
OEH	Office of Environment and Heritage
POEO Act	Protection of the Environment Operations Act 1997
Privately owned land	Land that is not owned by a public agency, or a mining company or its subsidiary, and which is not subject to a negotiated agreement between the Applicant and the applicable landowner
Public infrastructure	Infrastructure that provides services to the general public, such as roads, railways, water supply, drainage, sewerage, gas supply, electricity, telephone, telecommunications, etc.
Reasonable	Reasonable relates to the application of judgement in arriving at a decision, taking into account; mitigation benefits, cost of mitigation versus benefits provided, community views and the nature and extent of potential improvements
Receiver	As defined in the *NSW Industrial Noise Policy* (EPA 2000)
Rehabilitation	The restoration of land disturbed by the development to a good condition to ensure it is safe, stable and non-polluting
Resources Regulator	NSW Resources Regulator
ROM	Run of Mine
RMS	Roads and Maritime Services
SA NSW	Subsidence Advisory NSW
Secretary	Planning Secretary under the EP&A Act, or nominee
Site	Land to which the Consent applies (see Appendix 1 and Appendix 2)
SC	Singleton Council

SCHEDULE 2
ADMINISTRATIVE CONDITIONS

Obligation to Minimise Harm to the Environment

1. In addition to meeting the specific performance criteria established under this consent, the Applicant must implement all reasonable and feasible measures to prevent and/or minimise any harm to the environment that may result from the construction, operation, or rehabilitation of the development.

Terms of Consent

2. The Applicant must:
   (a) carry out the development generally in accordance with the EIS, MOD 1 EA, MOD 2 EA, MOD 3 EA, MOD 4 EA, MOD 5 EA, MOD 6 EA, MOD 7 EA and the Development Layout Plans; and
   (b) comply with the conditions of this consent.

   Notes: The Development Layout Plans are shown in Appendix 2.

3. If there is any inconsistency between the documents in condition 2(a), the most recent documents must prevail to the extent of the inconsistency. The conditions of this consent must prevail over documents in condition 2(a) to the extent of any inconsistency.

4. The Applicant must comply with any reasonable requirement/s of the Secretary arising from the Department's assessment of:
   (c) any strategies, programs, reviews, audits, reports, plans or correspondence that are submitted in accordance with this consent;
   (d) any reports, reviews or audits commissioned by the Department regarding compliance with this consent; and
   (e) the implementation of any actions or measures contained in these reports, plans or correspondence.

Mining, Processing and Transport Limits on Consent

5. Mining operations may take place on the site until 31 December 2028.

   Note: Under this consent, the Applicant is required to rehabilitate the site. Consequently this consent will continue to apply in all other respects other than the right to conduct mining operations until the site has been rehabilitated to a satisfactory standard.

6. The Applicant must not:
   (a) extract more than 8 million tonnes of ROM coal per annum from the site; or
   (b) process more than 8 million tonnes of ROM coal per annum at the Liddell CHPP, including up to 2 million tonnes per year of ROM coal from Mt Owen; or
   (c) transport more than 1.5 million tonnes of ROM coal per annum to Ravensworth Central Coal Processing Facility for processing; or
   (d) extract more than 0.5 million tonnes of coal tailings per annum with residual energy content from the site for transport to Liddell and Bayswater Power Stations.

7. The Applicant must ensure that all product coal from the site is transported by rail.

Structural Adequacy

8. The Applicant must ensure that all new buildings and structures, and any alterations or additions to existing buildings and structures, are constructed in accordance with:
   (a) the relevant requirements of the BCA;
   (b) the relevant requirements of *AS3959-2009 Construction of buildings in bushfire-prone areas*; and
   (c) any additional requirements of the SA NSW.

   Notes:
   - *Under Part 4A of the EP&A Act, the Applicant is required to obtain construction and occupation certificates for the proposed building works.*
   - *Part 8 of the EP&A Regulation sets out the requirements for the certification of development.*

Demolition

9. The Applicant must ensure that all demolition work is carried out in accordance with *Australian Standard AS 2601-2001: The Demolition of Structures*, or its latest version.

Operation of Plant and Equipment

10. The Applicant must ensure that all plant and equipment used at the site, and equipment used off-site to monitor the performance of the project is:
    (a) maintained in a proper and efficient condition; and
    (b) operated in a proper and efficient manner.

Protection of Public Infrastructure

11. Unless the Applicant and the applicable authority agree otherwise, the Applicant must:
    (a) repair, or pay the full costs associated with repairing, any public infrastructure that is damaged by the development; and
    (b) relocate, or pay the full costs associated with relocating, any public infrastructure that needs to be relocated as a result of the development,

    however this condition does not apply where the Applicant has entered into an agreement with the owner of such public infrastructure that covers the repair and/or maintenance of the infrastructure.

Updating and Staging of Strategies, Plans or Programs

12. With the approval of the Secretary, the Applicant may submit any strategies, plans or programs required by this consent on a progressive basis.

    To ensure the strategies, plans or programs under the conditions of this consent are updated on a regular basis, the Applicant may at any time submit revised strategies, plans or programs to the Secretary for approval.

    With the agreement of the Secretary, the Applicant may prepare any revised strategy, plan or program without undertaking consultation with all parties under the applicable condition of this consent.

    Notes:
    - *While any strategy, plan or program may be submitted on a progressive basis, the Applicant must ensure that the existing operations on site are covered by suitable strategies, plans or programs at all times; and*
    - *If the submission of any strategy, plan or program is to be staged, then the relevant strategy, plan or program must clearly describe the specific stage to which the strategy, plan or program applies, the relationship of this stage to any future stages, and the trigger for updating the strategy, plan or program.*

Planning Agreements

13. By the end of May 2015, or as otherwise agreed by the Secretary, the Applicant must enter into a planning agreement with Singleton Council (SC) in accordance with the general terms in Appendix 8.

14. By the end of May 2015, or as otherwise agreed by the Secretary, the Applicant must enter into a planning agreement with Muswellbrook Shire Council (MSC) in accordance with the general terms in Appendix 9.

Evidence of Consultation

15. Where conditions of this consent require consultation with an identified party, the Applicant must:
    (a) consult with the relevant party prior to submitting the subject document; and
    (b) provide details of the consultation undertaken including:
        (i) the outcome of that consultation, matters resolved and unresolved; and
        (ii) details of any disagreement remaining between the party consulted and the Applicant and how the Applicant has addressed the matters not resolved.

Compliance

16. The Applicant must ensure that all of its employees, contractors (and their sub-contractors) are made aware of, and are instructed to comply with, the conditions of this consent relevant to activities they carry out in respect of the development.

Applicability of Guidelines

17. References in the conditions of this consent to any guideline, protocol, Australian Standard or policy are to such guidelines, protocols, Standards or policies in the form they are in as at the date of this consent.

18. However, consistent with the conditions of this consent and without altering any limits or criteria in this consent, the Planning Secretary may, when issuing directions under this consent in respect of ongoing monitoring and management obligations, require compliance with an updated or revised version of such a guideline, protocol, Standard or policy, or a replacement of them.

SCHEDULE 3
SPECIFIC ENVIRONMENTAL CONDITIONS

NOISE

Impact Assessment Criteria

1. The Applicant must ensure that the noise generated by the development does not exceed the noise impact assessment criteria in Table 1 at any residence.

Table 1: Noise impact assessment criteria dB(A)

Assigned residential location number	Day ($L_{Aeq\ (15min)}$)	Evening ($L_{Aeq\ (15min)}$)	Night ($L_{Aeq\ (15min)}$)	Night ($L_{A\ (1min)}$)
1,5,6,7,8,9,10,11,12,14	35	35	35	45
2	35	35	36	45
3	36	35	37	45
4	36	35	36	45
All other privately-owned land	35	35	35	45

Note: To interpret the locations referred to in Table 1, see Appendix 5

Noise generated at the development is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 6 sets out the meteorological conditions under which these criteria apply and the requirements for evaluating compliance with these criteria.

However, these criteria do not apply if the Applicant has an agreement with the owner(s) of the relevant residence or land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Operating Conditions

2. The Applicant must:
   (a) implement all reasonable and feasible measures to minimise the construction, operational, road and rail noise of the development;
   (b) operate a noise management system on site that uses attended noise monitoring data to ensure compliance with the relevant conditions of consent;
   (c) evaluate the effectiveness of the noise management system;
   (d) minimise the noise impacts of the development during meteorological conditions when the noise criteria in this consent does not apply (see Appendix 6); and
   (e) monitor and report on compliance with the relevant noise conditions of this consent,

   to the satisfaction of the Secretary.

Monitoring Program

3. The Applicant must update and subsequently implement the Noise Monitoring Program for the development to the satisfaction of the Secretary. This program must be submitted to the Secretary by the end of May 2015, and must include regular attended monitoring in accordance with Appendix 6, and a noise monitoring protocol for evaluating compliance with the noise impact assessment criteria in this consent.

BLASTING AND VIBRATION

Impact Assessment Criteria

4. The Applicant must ensure that blasts on site do not exceed the criteria in Table 2.

Table 2: Blasting impact assessment criteria

Location	Airblast overpressure level (dB(Lin Peak))	Ground vibration (mm/s)	Allowable exceedance
Residence on privately-owned land	115	5	5% of the total number of blasts over a period of 12 months
	120	10	0%
Newdell zone substation	-	20 (interim)	10% of the total number of blasts over a period of 12 months
	-	25 (interim)	0%
Other public infrastructure	-	50	0%

However these criteria do not apply if the Applicant has:

(a) a written agreement with the relevant owner to exceed these criteria, and has advised the Department in writing of the terms of this agreement; or

(b) in the event that the Applicant is unable to secure a written agreement with an infrastructure owner, demonstrated to the satisfaction of the Secretary that blasting can be carried out at levels in excess of the criteria without causing any damage to the infrastructure.

Notes:

- *The interim criteria for the Newdell zone substation are based on consultation with the substation owner (Ausgrid). It is acknowledged that alternative criteria may be agreed as part of the blast management strategy for the substation (see condition 15A).*
- *An alternate limit for public infrastructure may be agreed to by the Secretary if it can be justified in accordance with the structural design methodology in AS2187.2-2006, or another methodology agreed to by the Secretary.*

Chain of Ponds Inn

5. The Applicant must ensure that blasting at the development does not cause any exceedances of the following performance measures at the Chain of Ponds Inn, to the satisfaction of the Secretary:

(a) negligible loss of heritage value; and

(b) negligible impact on structural integrity of the internal and external fabric of the Inn, having regard to the existing condition and structural integrity of the Inn at November 2014.

Notes:

a) The Applicant will be required to define more detailed performance indicators (including impact assessment criteria) in the Blast Management Plan.

b) Measurement and/or monitoring of compliance with performance measures and indicators is to be undertaken using generally accepted methods that are appropriate for the heritage item. These methods are to be fully described in the Blast Management Plan.

c) The requirements of this condition only apply to the impacts and consequences of mining operations undertaken following the date that consent is granted to DA 305-11-01 MOD 5.

6. DELETED.

7. DELETED.

8. DELETED.

Blasting Hours

9. The Applicant must carry out blasting at the development only between 9 am and 5 pm Monday to Saturday inclusive. No blasting is allowed on Sundays, public holidays, or at any other time without the written approval of the Secretary.

Blasting Frequency

10. The Applicant may carry out a maximum of:

(a) 3 blasts a day; and

(b) 8 blasts a week, average over a calendar year on the site.

This condition does not apply to blasts that generate ground vibration of 0.5mm/s or less at any residence on privately-owned land, blast misfires or blasts required to ensure the safety of the mine, its workers or the general public.

Note: For the purposes of this condition, a blast refers to a single blast event, which may involve a number of individual blasts fired in quick succession in a discrete area of the mine.

Operating Conditions

11. During mining operations, the Applicant must:
    (a) implement all reasonable and feasible management measures to:
        - protect the safety of people and livestock in the area surrounding blasting operations;
        - protect public or private infrastructure/property in the area surrounding blasting operations from blasting damage; and
        - minimise the dust and fume emissions from blasting at the mine;
    (b) operate a suitable system to enable the public to get up-to-date information on the proposed blasting schedule on site; and
    (c) monitor and report on compliance with the relevant blasting conditions in this consent,
    to the satisfaction of the Secretary.

11A. The Applicant must not undertake blasting on site within 500 metres of any public road or any land outside the site that is not owned by the Applicant unless the Applicant has:
    (a) demonstrated to the satisfaction of the Secretary that the blasting can be carried out closer to the infrastructure or land without comprising the safety of people or livestock or damaging the infrastructure and/or other buildings and structures; and
    (b) updated the Blast Management Plan to include specific measures that would be implemented while blasting is being carried out within 500 metres of infrastructure or land; or
    (c) a written agreement with the relevant landowner to allow blasting to be carried out closer to the infrastructure or land, and the Applicant has advised the Department in writing of the terms of this agreement.

Public Notice

12. By the end of February 2015, the Applicant must:
    (a) re-notify the landowner/occupier of any residence within 2 km of the development that they are entitled to register an interest in being notified of the blasting schedule of the mine; and
    (b) re-notify the landowner/occupier of any residence within 2 km of the development of the blasting schedule at the mine, if that landowner/occupier registers an interest in being so notified;
    to the satisfaction of the Secretary.

Property Inspections

13. By the end of February 2015, the Applicant must advise all landowners of privately-owned land within 2 km of the development that they are entitled to a structural property inspection.

14. If the Applicant receives a written request for a structural property inspection from any landowner of privately-owned land within 2 km of the development, the Applicant must within 3 months of receiving this request:
    (a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Secretary, to inspect the condition of any building or structure on the land, and recommend measures to mitigate any potential blasting impacts; and
    (b) give the landowner a copy of the property inspection report.

Property Investigations

15. If any landowner of privately-owned land within 2 km of the site claims that buildings and/or structures on his/her land have been damaged as a result of blasting at the development, the Applicant **must** within 3 months of receiving this request:
    (a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Secretary, to investigate the claim; and
    (b) give the landowner a copy of the property investigation report.

    If this independent property investigation confirms the landowner's claim, and both parties agree with these findings, then the Applicant must repair the damages to the satisfaction of the Secretary.

If the Applicant or landowner disagrees with the findings of the independent property investigation, then either party may refer the matter to the Secretary for resolution.

Blast Management Plan

15A. The Applicant must prepare a Blast Management Plan for the development to the satisfaction of the Secretary, this plan must:

(a) be submitted to the Secretary for approval by the end of May 2015, unless otherwise agreed by the Secretary;

(b) describe the measures that would be implemented to ensure compliance with the blasting criteria and operating conditions of this consent;

(c) propose and justify any alternative ground vibration limits for any public infrastructure in the vicinity of the site (if required);

(d) include a monitoring program for evaluating and reporting on compliance with the blasting criteria and operating conditions;

(e) include a specific *Blast Management Strategy for the Chain of Ponds Inn*. This Strategy must:

- be prepared in consultation with the Heritage Council and Coal & Allied, and endorsed by the Heritage Council;
- incorporate the recommendations of the *Former Chain of Ponds Inn Buildings – Investigation of Blast Vibration and Vulnerability Report* (Bill Jordan and Associates, 2013) and *Blast Management Strategy* (Enviro Strata, 2013);
- provide details on the management of potential flyrock impacts on the Chain of Ponds Inn;
- provide details on how the stabilisation measures will be implemented and a timetable for implementation;
- provide details of the ongoing monitoring and maintenance procedures for the Chain of Ponds Inn;
- repair any damage to the Chain of Ponds (should any damage occur) within 6 months of the damage occurring;
- provide and submit an annual report on the condition of the Chain of Ponds Inn to the Heritage Council; and

(f) include a specific *Blast Management Strategy for the Newdell Zone Substation*. This Strategy must:

- be prepared in consultation with the owner of the substation;
- if alternative criteria to those in Table 2 are proposed, include detailed justification for the criteria based on investigations by a suitably qualified expert(s) whose appointment has been endorsed by the Secretary in consultation with the owner of the substation;
- provide details on the management of potential ground vibration and flyrock impacts to ensure that blasting does not affect the structural integrity or serviceability of the substation;
- include a monitoring program for blast vibration and structural integrity at the substation; and
- include a protocol for repairing any damage to the substation in the event that this occurs.

The Applicant must implement the management plan as approved by the Secretary.

AIR QUALITY

Impact Assessment Criteria

16. The Applicant must ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate emissions generated by the development do not exceed the air quality impact assessment criteria listed in Tables 3, 4, and 5 at any residence on privately-owned land.

Table 3: Long term impact assessment criteria for particulate matter

Pollutant	Averaging period	[d]Criterion
Total suspended particulate (TSP) matter	Annual	[a]90 µg/m^3
Particulate matter < 10 µm (PM_{10})	Annual	[a]30 µg/m^3

Table 4: Short term impact assessment criterion for particulate matter

Pollutant	Averaging period	[d]Criterion
Particulate matter < 10 µm (PM_{10})	24 hour	[b]50 µg/m^3

Table 5: Long term impact assessment criteria for deposited dust

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
[c]Deposited dust	Annual	[b]2 g/m^2/month	[a]4 g/m^2/month

Notes to Tables 3-5:

a Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources;

b Incremental impact (i.e. incremental increase in concentrations due to the development on its own);

c Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS3580.10:2003: Methods for Sampling and Analysis of Ambient Air Determination of Particulate Matter – Deposited Matter – Gravimetric Method; and

d Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Secretary.

17. DELETED.

Operating Conditions

18. The Applicant must:
    (a) implement all reasonable and feasible air quality management measures to minimise odour, fume and dust emissions from the development;
    (b) implement all reasonable and feasible measures to minimise the release of greenhouse gas emissions from the site;
    (c) minimise any visible air pollution generated by development;
    (d) minimise surface disturbance on the site;
    (e) operate an air quality management system that uses a combination of high volume samplers and dust deposition gauges to ensure compliance with the relevant conditions of consent; and
    (f) minimise the air quality impacts of the development during adverse meteorological conditions and extraordinary events
    to the satisfaction of the Secretary.

Air Quality Monitoring

19. The Applicant must update and subsequently implement the Air Quality Monitoring Program for the development to the satisfaction of the Secretary. This program must be submitted to the Secretary by the end of May 2015, and must include a combination of real-time air quality monitors and supplementary monitors to monitor the dust emissions of the development; and an air quality monitoring protocol for evaluating compliance with the air quality impact assessment criteria in this consent.

METEOROLOGICAL MONITORING

20. The Applicant must ensure that there is a suitable meteorological station operating in the vicinity of the development in accordance with the requirements in *Approved Methods for Sampling of Air Pollutants in New South Wales*; and to the satisfaction of the EPA and Secretary.

SURFACE AND GROUND WATER

Water Supply

21. The Applicant must ensure that it has sufficient water for all stages of the development, and if necessary, adjust the scale of mining operations to match its available water supply, to the satisfaction of the Secretary.

    Note: The Applicant is required to obtain all necessary water licences and approvals for the development under the Water Act 1912 and/or Water Management Act 2000.

Water Pollution

21A. Unless an EPL or the EPA authorises otherwise, the Applicant must comply with Section 120 of the POEO Act and the *Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002*.

21B. The Applicant must ensure that treated effluent from the wastewater treatment plant does not exceed the discharge limits in Table 6, unless otherwise agreed by the EPA.

21C. The Applicant must monitor the quality of treated effluent to be discharged from the wastewater treatment plant (by sampling and obtaining results by analysis) as specified in Table 6, or as otherwise agreed by the EPA.

Table 6: Wastewater treatment plant discharge limits

Pollutant	Units of Measure	Frequency	Sampling Method	Concentration Limit (100 percentile)
E.coli	Colony forming units per 100 millilitres	Monthly	Representative sample	100

Desalination Unit

22. Prior to the construction of the desalination unit, the Applicant must conduct investigations and identify options concerning the most appropriate method for the treatment and/or disposal of brine, to the satisfaction of the Secretary, DoI and EPA.

Water Management Plan

23. The Applicant must prepare a Water Management Plan for the development to the satisfaction of the Secretary. This Plan must:
    (a) be prepared in consultation with DoI and EPA by suitably qualified and experienced persons whose appointment has been approved by the Secretary;
    (b) be submitted to the Secretary for approval by the end of May 2015, unless the Secretary agrees otherwise;
    (c) this plan must include a:
        (i) Site Water Balance that:
            - includes details of:
                - sources and security of water supply, including contingency planning for future reporting periods;
                - water use and management on site;
                - reporting procedures, including the preparation of a site water balance for each calendar year;
            - describes the measures that would be implemented to minimise clean water use on site;
        (ii) Erosion and Sediment Control Plan that:
            - is consistent with the requirements of *Managing Urban Stormwater: Soils and Construction, Volume 1, 4th Edition, 2004* (Landcom), or its latest version;
            - identifies activities that could cause soil erosion, generate sediment or effect flooding;
            - describes measures to minimise soil erosion and the potential for the transport of sediment to downstream waters, and manage flood risk; and
            - describe what measures would be implemented to maintain the structures over time;
        (iii) Surface Water Management Plan, that includes:
            - reference to detailed baseline data on water flows and quality contained in the EA;
            - a detailed description of the water management system on site;
            - design objectives and performance criteria for the:
                - design and management of final voids;
                - design and management for sodic and dispersible soils and acid or sulphate generating materials;
                - reinstatement of drainage lines on the rehabilitated areas of the site; and
                - control of any potential water pollution from the rehabilitated areas of the site;

- surface water assessment criteria, including trigger levels for investigating any potentially adverse impacts for the following:
  - the water management system, including mine water storages and sediment dams;
  - downstream surface water quality; and
  - stream and riparian vegetation health;
- a program to monitor and report on:
  - the effectiveness of the water management system;
  - surface water flows and quality, stream and riparian vegetation health in the watercourses that could be affected by the development; and
  - stream health and channel stability;
- reporting procedures for the results of the monitoring program;
- a plan to respond to any exceedances of the performance criteria, and mitigate any adverse surface water impacts of the development including:
  - a protocol for the investigation, notification and mitigation of any exceedances;
  - measures to mitigate and/or compensate potentially affected landowners for the loss of surface flows in Bowmans Creek downstream of the development resulting from the development; and
  - the procedures that would be followed if any unforeseen impacts are detected during the development.

(iv) Groundwater Management Plan, that includes:

- reference to baseline data on groundwater levels, yield and quality contained in the EA;
- a detailed description of the groundwater management system on site;
- design objectives and performance criteria, for the:
  - emplacement areas for tailings, acid forming and potentially acid forming materials, and saline and sodic materials;
  - final voids;
- groundwater assessment criteria, including trigger levels for investigating any potentially adverse groundwater impacts beyond those predicted in the EA for Mod 5;
- measures to minimise, prevent or offset groundwater leakage from the Bowmans Creek alluvial aquifer in excess of the drawdown predicted in the EA for Mod 5;
- measures to mitigate any direct hydraulic connection between the backfilled open cuts and the Bowmans Creek alluvium if the potential for adverse impacts is detected;
- a program to monitor and report on:
  - groundwater inflows to the mining operations;
  - the seepage/leachate from water storages, emplacements and final voids;
  - background changes in groundwater yield/quality against mine-induced changes;
  - impacts of the development on:
    - regional and local (including alluvial) aquifers;
    - groundwater dependent ecosystems and riparian vegetation;
    - the seepage/leachate from water storages, emplacements, backfilled voids and final voids;
    - impacts on the Bowmans Creek alluvial aquifer;
- procedures for the verification of the groundwater model;
- a review of existing network to identify additional monitoring locations for the alluvial system focusing on areas where additional drawdown is predicted;
- reporting procedures for the results of the monitoring program and model verification;
- a plan to respond to any exceedances of the predicted groundwater impacts, and mitigation of any unpredicted adverse groundwater impacts of the development;

(v) a program to validate the water balance and groundwater model for the development every 3 years, and compare monitoring results with modelled predictions; and

(vi) a protocol that has been prepared in consultation with the owners of any nearby mines to:

- minimise cumulative water quantity and quality impacts;
- review opportunities of water sharing between the mines;
- share water monitoring data where practicable;

- undertake joint investigations/studies in relation to complaints/exceedances of trigger levels where cumulative impacts are considered likely; and
- where practicable, co-ordinate modelling programs for validation, re-calibration and re-running of water models.

The Applicant must implement the management plan as approved by the Secretary.

BIODIVERSITY

Biodiversity Offset Strategy

24. The Applicant must implement the biodiversity offset strategy described in the EA, summarised in Table 7 and conceptually shown in Appendix 7.

Table 7: Summary of the Biodiversity Offset Strategy

Area	Offset Type	Minimum Size (ha)
Mountain Block Offset	Existing vegetation and vegetation to be established	168
Bowmans Creek Riparian Corridor	Existing vegetation and vegetation to be established	185
Total		**353**

Note: To identify the areas referred to in Table 7 refer to the applicable figures in Appendix 7.

25. The Applicant must ensure that the offset strategy and/or rehabilitation strategy is focused on the re-establishment of:
    (a) significant and/or threatened plant communities, including:
        - Central Hunter Box – Ironbark Woodland EEC;
        - Narrow-Leaved Ironbark – Spotted Gum Woodland EEC;
        - Narrow-Leaved Ironbark – Bulloak Open Forest EEC;
    (b) significant and/or threatened plant species; and
    (c) habitat for significant and/or threatened animal species including the Spotted-tailed Quoll.

Spotted-Tailed Quoll Contribution

26. The Applicant must contribute $200,000 over 5 years towards the implementation of recovery actions under OEH's *Saving Our Species Action Statement* and/or *Final Draft National Recovery Plan for the Spotted-tailed Quoll 2008* for the Spotted-tailed Quoll. The initial payment of at least $50,000 must be made by the end of June 2015, unless otherwise agreed by the Secretary. The timing and quantum of the subsequent payments is to be determined in consultation with OEH.

Long Term Security of Offsets

27. By the end of December 2015, unless the Secretary agrees otherwise, the Applicant must make suitable arrangements to provide appropriate long term security for the land within the biodiversity offset strategy identified in Table 7, to the satisfaction of the Secretary.

Waterbird Habitat

28. Prior to the construction of Dam 13B, the Applicant must undertake habitat enhancement measures to Dam 3 to increase habitat for water birds to the satisfaction of OEH and the Secretary. The Applicant must in addition establish a dam in the Mountain Block area to provide habitat for waterbird species to the satisfaction of OEH and the Secretary. Where achievable, the habitat enhancement measures for each dam must include:
    (a) a maximum water depth of 5 metres over at least half the surface area;
    (b) gently sloping banks (apart from the dam wall) of less than 10 degrees;
    (c) areas of shallow back waters around the dams;
    (d) appropriate levels of vegetation; and
    (e) appropriate fencing and signposting.

Compensatory Planting

28A. The Applicant must plant and maintain, until established, 10 River Oak trees for every established River Oak tree removed during construction of the tailings pipeline under MOD 6.

Note: An established River Oak tree is considered to be two metres or greater in height.

Biodiversity Management Plan

29. The Applicant must prepare a detailed Biodiversity Management Plan for the site to the satisfaction of the Secretary. This plan must:
    (a) be prepared in consultation with OEH and be submitted to the Secretary for approval by the end of May 2015, unless otherwise agreed by the Secretary;
    (b) describe how the implementation of the offset strategy would be integrated with the overall rehabilitation of the site (see below);
    (c) include:
        (i) a description of the short, medium and long term measures that would be implemented to:
            - implement the offset strategy; and
            - manage the remnant vegetation and habitat on the site in the offset areas;
        (ii) detailed performance and completion criteria for the implementation of the offset strategy;
        (iii) a detailed description of the measures that would be implemented over the next 3 years, including the procedures to be implemented for:
            - implementing revegetation and regeneration with the disturbance areas and offset areas, including establishment of canopy, sub-canopy (if relevant), understorey and ground strata;
            - protecting vegetation and soil outside the disturbance areas;
            - rehabilitating creeks and drainage lines that occur on the site;
            - managing salinity;
            - conserving and reusing topsoil;
            - undertaking pre-clearance surveys;
            - managing impacts on fauna;
            - collecting and propagating seed;
            - salvaging and reusing material from the site for habitat enhancement;
            - salvaging, transplanting and/or propagating threatened flora in accordance with the Guidelines for the Translocation of Threatened Plants in Australia (Vallee et at., 2004);
            - controlling weeds and feral pests including investigating alternate technologies to reduce poisoning of non-target species;
            - managing grazing and agriculture;
            - controlling access;
            - bushfire management;
            - habitat enhancement works;
            - seasonal monitoring of in-stream and riparian ecological condition;
            - survey of stygofauna in Bowmans Creek alluvial aquifer (prior to predicted drawdown); and
            - monitoring of stygofauna populations every 6 months following the occurrence of the predicted drawdown;
        (iv) a seasonally-based program to monitor the effectiveness of these measures, and progress against the performance and completion criteria;
        (v) a description of the potential risks to successful revegetation, and a description of the contingency measures that would be implemented to mitigate these risks; and
        (vi) details of who would be responsible for monitoring, reviewing and implementing the plan.

    The Applicant must implement the management plan as approved by the Secretary.

Conservation Bond

30. Within 6 months of the approval of the Biodiversity Management Plan, the Applicant must lodge a conservation and biodiversity bond with the Department to ensure that the biodiversity offset strategy is implemented in accordance with the performance and completion criteria of the Biodiversity Management Plan. The sum of the bond must be determined by:
    (a) calculating the full cost of implementing the biodiversity offset strategy (other than land acquisition costs); and
    (b) employing a suitably qualified consultant to verify the calculated costs,
    to the satisfaction of the Secretary.

    The calculation of the Conservation Bond must be submitted to the Department for approval at least 1 month prior to lodgement of the final bond.

    If the offset strategy is completed generally in accordance with the completion criteria in the Biodiversity Management Plan to the satisfaction of the Secretary, the Secretary will release the bond.

If the offset strategy is not completed generally in accordance with the completion criteria in the Biodiversity Management Plan, the Secretary will call in all, or part of the conservation bond, and arrange for the satisfactory completion of the relevant works.

Notes:

- *Alternative funding arrangements for long term management of the biodiversity offset strategy, such as provision of capital and management funding as agreed by OEH as part of a Biobanking Agreement or transfer to conservation reserve estate can be used to reduce the liability if the conservation bond.*
- *The sum of the bond may be reviewed in conjunction with any revision to the biodiversity offset strategy or completion of major milestones within the approved plan.*

ABORIGINAL CULTURAL HERITAGE

Heritage Management Measures

31. By the end of May 2015, the Applicant must revise and subsequently implement its Aboriginal Cultural Heritage Management Plan to include management measures as identified in Table 7.16 of the EIS, in consultation with relevant Aboriginal stakeholders and OEH and to the satisfaction of the Secretary.

TRAFFIC AND TRANSPORT

Road Transport

32. The Applicant must:
    (a) ensure that transport of:
        - coal tailings by truck along the New England Highway is restricted to old tailings with residual energy content and at a rate of no more than 114 truck movements per day (i.e 57 loaded trucks), 5 days per week; and
        - transport of ROM coal to and from Ravensworth Central Coal Processing Facility is restricted to internal mine haul roads, Pikes Gully Road and Liddell Station Road.

    (b) use its reasonable endeavours to close Liddell Station Road as a public road to the satisfaction of SC, by the end of December 2015 unless otherwise agreed by the Secretary.

Monitoring of Coal Transport

33. The Applicant must:
    (a) keep records of the:
        - amount of coal transported from the site each year; and
        - number of coal haulage train movements generated by the development (on a daily basis); and

    (b) include these records in the Annual Review.

VISUAL IMPACT

Visual Amenity and Lighting

34. The Applicant must:
    (a) implement all reasonable and feasible measures to mitigate visual and off-site lighting impacts from the development;
    (b) ensure no outdoor lights shine above the horizontal;
    (c) undertake screen plantings along the western boundary of the proposed office and workshop area to further minimise potential visual impacts on the New England Highway; and
    (d) ensure that all external lighting associated with the development complies with *Australian Standard AS4282 (INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting,*

    to the satisfaction of the Secretary.

WASTE MINIMISATION

35. The Applicant must:
    (a) monitor the amount of waste generated by the development;
    (b) investigate ways to minimise waste generated by the development;
    (c) implement reasonable and feasible measures to minimise waste generated by the development;
    (d) ensure irrigation of treated wastewater is undertaken in accordance with EPA's *Environmental Guideline for the Utilisation of Treated Effluent*; and
    (e) report on waste management and minimisation in the Annual Review,
    to the satisfaction of the Secretary.

BUSHFIRE MANAGEMENT

36. The Applicant must:
    (a) ensure that the development is suitably equipped to respond to any fires on site; and
    (b) assist the RFS and emergency services as much as practicable if there is a fire in the vicinity of the site.

REHABILITATION

37. The Applicant must rehabilitate the site to the satisfaction of Resources Regulator. The rehabilitation must comply with the objectives in Table 8, and be generally consistent with the proposed rehabilitation strategy in the EIS and as shown conceptually in Appendix 3.

Table 8: Rehabilitation Objectives

Feature	Objective
Mine site (as a whole)	• Safe, stable and non-polluting • Final landforms designed to incorporate micro-relief and integrate with surrounding natural landforms • Constructed landforms drain to the natural environment (excluding the final voids) • Minimise visual impact of final landforms as far as reasonable and feasible • Ensure there are no adverse flood impacts to privately owned properties
Final voids	• Minimise to the greatest extent practicable: - the size and depth of final voids - the drainage catchment of final voids
Surface infrastructure	• To be decommissioned and removed, unless the Secretary agrees otherwise
Revegetation	• Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprising: - at least 731 hectares of Central Hunter Box-Ironbark Woodland - habitat for threatened flora and fauna species including habitat connectivity for the Spotted-tailed Quoll • Maintain, establish and/or restore grassland areas with pockets of native vegetation to support sustainable agricultural activities, as shown conceptually in Appendix 3
Community	• Ensure public safety • Minimise the adverse socio-economic effects associated with mine closure
Final land use	• Restore or maintain land capability generally as described in the EA and as shown conceptually in Appendix 3.

Progressive Rehabilitation

38. The Applicant must carry out rehabilitation progressively, that is, as soon as reasonably, practicable following disturbance. All reasonable and feasible measures must be taken to minimise the total area exposed for dust generation at any time. Interim rehabilitation strategies must be employed when areas prone to dust generation cannot yet be permanently rehabilitated.

Note: It is accepted that parts of the site that are progressively rehabilitated may be subject to further disturbance in the future.

Rehabilitation Management Plan

39. The Applicant must prepare a Rehabilitation Management Plan for the development to the satisfaction of DRG must, This plan must:

(a) be submitted to DRE for approval by the end of June 2015;
(b) be prepared in consultation with the Department, DoI, OEH, MSC and SC;
(c) be prepared in accordance with relevant DRE guidelines;
(d) describe how the rehabilitation of the site would be integrated with the implementation of the biodiversity offset strategy;
(e) include a detailed performance and completion criteria for evaluating the performance of the rehabilitation of the site, and triggering remedial action (if necessary);
(f) describe the measures that would be implemented to ensure compliance with the relevant conditions of this consent, and address all aspects of rehabilitation including mine closure, final landform including final voids and final land use;
(g) include interim rehabilitation where necessary to minimise the area exposed for dust generation;
(h) include a program to monitor and report on the effectiveness of the measures, and progress against the detailed performance and completion criteria; and
(i) build to the maximum extent practicable on other management plans required under this consent.

The Applicant must implement the management plan as approved by the Secretary.

Note: The Rehabilitation Management Plan may be combined with a Mining Operations Plan, or similar plan, required under a mining lease granted under the Mining Act 1992 for the development.

SCHEDULE 4
ADDITIONAL PROCEDURES

NOTIFICATION OF LANDOWNERS

1. By 31 October 2007, the Applicant must notify the landowners of the land listed in Table 1 that they have the right to an independent review in accordance with Condition 4 of Schedule 4 if they consider that the development is exceeding the relevant impact assessment criteria at any stage during the life of the development.

2. If the results of monitoring required in Schedule 3 identify that impacts generated by the development are greater than the impact assessment criteria, except where this is predicted in the EA, and except where a negotiated agreement has been entered into in relation to that impact, then the Applicant must notify the Secretary and the affected landowners and/or existing or future tenants (including tenants of mine owned properties) accordingly, and provide quarterly monitoring results to each of these parties until the results show that the development is complying with the criteria in Schedule 3.

3. The Applicant must send a copy of the NSW Health fact sheet entitled 'Mine Dust and You' (as may be updated from time to time) to advise landowners and/or existing or future tenants (including tenants of mine owned properties) of the possible health and amenity impacts associated with exposure to particulate matter, to the satisfaction of the Secretary where the predictions in the EA identify that the dust emissions generated by the development are likely to be greater than the air quality criteria in Schedule 3.

INDEPENDENT REVIEW

4. If a landowner of privately-owned land considers the development to be exceeding the impact assessment criteria in Schedule 3, then he/she may ask the Secretary in writing for an independent review of the impacts of the development on his/her land.

   If the Secretary is satisfied that an independent review is warranted, the Applicant must within 2 months of the Secretary decision:

   (a) commission a suitably qualified, experienced and independent expert, whose appointment has been approved by the Secretary, to:
   - consult with the landowner to determine his/her concerns;
   - conduct monitoring on the land, to determine whether the development is complying with the relevant impact assessment criteria in Schedule 3; and
   - if the development is not complying with these criteria then:
     - determine if more than one mine is responsible for the exceedances; and if so the relevant share of each mine regarding the impact of the land;
     - identify measures that could be implemented to ensure compliance with the relevant criteria;

   (b) give the Secretary and landowner a copy of the independent review.

5. If the independent review determines that the development is complying with the relevant impact assessment criteria in Schedule 3, then the Applicant may discontinue the independent review with the approval of the Secretary.

6. If the independent review determines that the development is not complying with the relevant impact assessment criteria in Schedule 3, and that the development is primarily responsible for this non-compliance, then the Applicant must:

   (a) take all reasonable and feasible measures, in consultation with the landowner and appointed independent expert to ensure that the development complies with the relevant criteria; or

   (b) secure a written agreement with the landowner to allow exceedances of the criteria in Schedule 3,

   to the satisfaction of the Secretary.

   If the additional monitoring referred to above subsequently determines that the development is complying with the relevant criteria in Schedule 3, then the Applicant may discontinue the independent review with the approval of the Secretary.

   If measures referred to in (a) do not achieve compliance with the criteria in Schedule 3, and the Applicant cannot secure a written agreement with the landowner to allow these exceedances within 3 months, then upon receiving a written request from the landowner, then the Applicant or landowner may refer the matter to the Secretary for resolution.

SCHEDULE 5
ENVIRONMENTAL MANAGEMENT, AUDITING & REPORTING

ENVIRONMENTAL MANAGEMENT STRATEGY

1. The Applicant must prepare an Environmental Management Strategy for the development to the satisfaction of the Secretary. This strategy must:
   (a) provide the strategic context for environmental management of the development;
   (b) identify the statutory requirements that apply to the development;
   (c) describe in general how the environmental performance of the development would be monitored and managed;
   (d) describe the procedures that would be implemented to:
      - keep the local community and relevant agencies informed about the operation and environmental performance of the development;
      - receive, handle, respond to, and record complaints;
      - resolve any disputes that may arise during the course of the development;
      - respond to any non-compliance;
      - manage cumulative impacts; and
      - respond to emergencies;
   (e) describe the role, responsibility, authority, and accountability of all the key personnel involved in environmental management of the development; and
   (f) include:
      - copies of various strategies, plans and programs that are required under the conditions of this consent once they have been approved; and
      - a clear plan depicting all the monitoring to be carried out in relation to the development.

   The Applicant must implement the approved strategy as approved from time to time by the Secretary.

2. DELETED.

ANNUAL REVIEW

3. Each year, the Applicant must prepare an Annual Review to the satisfaction of the Secretary. This review must:
   (a) identify the standards and performance measures that apply to the development;
   (b) describe the works carried out in the last 12 months;
   (c) describe the works that will be carried out in the next 12 months;
   (d) include a comprehensive review of monitoring results and complaints received during the past year, and compare the results against:
      - limits/criteria in this consent, statutory requirements and performance measures/criteria;
      - monitoring results from previous years; and
   (e) predictions in the latest EA;
   (f) identify any trends in the monitoring over the life of the development;
   (g) identify and discuss any non-compliance during the previous year and describe what actions were (or are being) taken to ensure compliance;
   (h) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and
   (i) describe what measures will be implemented over the next year to improve the environmental performance of the development.

INDEPENDENT ENVIRONMENTAL AUDIT

4. Within a year of the approval of modification application DA 305-11-01 MOD 5, and every 3 years thereafter, unless the Secretary directs otherwise, the Applicant must commission and pay the full cost of an Independent Environmental Audit of the development. This audit must:
   (a) be conducted by a suitably qualified, experienced, and independent team of experts whose appointment has been endorsed by the Secretary;
   (b) include consultation with relevant agencies;
   (c) assess the environmental performance of the development, and its effects on the surrounding environment;
   (d) assess whether the development is complying with the relevant standards, performance measures, and statutory requirements;
   (e) review the adequacy of any strategy/plan/program required under this consent; and, if necessary,
   (f) recommend measures or actions to improve the environmental performance of the development, and/or any strategy/plan/program required under this consent.

Note: This audit team must be led by a suitably qualified auditor and include experts in the field of mine rehabilitation and mine closure.

5. Within 6 weeks of completing this audit, or as otherwise agreed by the Secretary, the Applicant must submit a copy of the audit report to the Secretary with a response to any recommendations contained in the audit report.

6. DELETED.

COMMUNITY CONSULTATIVE COMMITTEE

7. The Applicant must maintain a Community Consultative Committee for the development to the satisfaction of the Secretary. The CCC must be operated in accordance with the *Department's Community Consultative Committee Guidelines: State Significant Projects (2016)*.

Notes:
- *The CCC is an advisory committee. The Department and other relevant agencies are responsible for ensuring that the Applicant complies with this consent.*
- *In accordance with the Guideline, the Committee should comprise an independent chair and appropriate representation from the Applicant, Councils and the community.*

8. DELETED.

ACCESS TO INFORMATION

9. By the end of February 2015, and for the remainder of the life of the development, the Applicant must:
   (a) make the following information publicly available on its website:
   - a copy of all current statutory approvals for the development;
   - a copy of the current environmental management strategy and associated plans and programs;
   - a summary of monitoring results of the development, which have been reported in accordance with the various plans and programs approved under the conditions of this consent;
   - a complaints register, which is to be updated in a monthly basis;
   - a copy of the CCC minutes;
   - a copy of any Annual Reviews (over the last 5 years);
   - a copy of any Independent Environmental Audit, and the Applicant's response to the recommendations in any audit;
   - any other matter required by the Secretary; and

   (b) keep this information up to date

   to the satisfaction of the Secretary.

REVISION OF STRATEGIES, PLANS AND PROGRAMS

10. Within 3 months of:
   (a) the submission of an Annual Review under condition 3 above;
   (b) the submission of an incident report under condition 11 below;
   (c) the submission of an audit under condition 4 above; or
   (d) any modification to the conditions of this consent,

   the Applicant must review, and if necessary revise, the strategies, plans, and programs required under this consent to the satisfaction of the Secretary. Where this review leads to revisions in any such document, then within 2 months of the review the revised document must be submitted to the Secretary for approval, unless the conditions in Schedule 3 provide for an alternative timing and/or the Secretary agrees otherwise.

Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the development.

INCIDENT NOTIFICATION

11. The Applicant must immediately notify the Department and any other relevant agencies immediately after it becomes aware of an incident. The notification must be in writing to compliance@planning.nsw.gov.au and identify the development (including the development application number and name) and set out the location and nature of the incident.

NON-COMPLIANCE NOTIFICATION

12. Within seven days of becoming aware of a non-compliance, the Applicant must notify the Department of the non-compliance. The notification must be in writing to compliance@planning.nsw.gov.au and identify the development (including the development application number and name), set out the condition of this approval that the development is non-compliant with, the way in which it does not

comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance.

***Note**: A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance*

13. Any condition of this consent that requires the carrying out of monitoring or an environmental audit, whether directly or by way of a plan, strategy or program, is taken to be a condition requiring monitoring or an environmental audit under Division 9.4 of Part 9 of the EP&A Act. This includes conditions in respect of incident notification, reporting and response, non-compliance notification, compliance report and independent audit.

***Note**: For the purposes of this condition, as set out in the EP&A Act, "monitoring" is monitoring of the development to provide data on compliance with the consent or on the environmental impact of the development, and an "environmental audit" is a periodic or particular documented evaluation of the development to provide information on compliance with the consent or the environmental management or impact of the development.*

APPENDIX 1
SCHEDULE OF LAND

LOCAL GOVERNMENT AREA: MUSWELLBROOK

LOT	DP	COUNTY	PARISH
Part C.R 197 MS 8378		Durham	Liddell
13	Sec C 6841	Durham	Liddell
40	Sec B 6842	Durham	Liddell
1	48556	Durham	Liddell
2	48556	Durham	Liddell
3	48556	Durham	Liddell
1	*211043*	*Durham*	*Liddell*
2	*231880*	*Durham*	*Liddell*
3	231880	Durham	Liddell
1	237654	Durham	Liddell
2	237654	Durham	Liddell
3	237654	Durham	Liddell
4	237654	Durham	Liddell
5	*237654*	*Durham*	*Liddell*
6	237654	Durham	Liddell
7	*237654*	*Durham*	*Liddell*
8	*237654*	*Durham*	*Liddell*
2	574166	Durham	Liddell
12	579783	Durham	Liddell
1	583527	Durham	Liddell
135	752470	Durham	Liddell
31	837350	Durham	Liddell
Pt Lot 33	862516	Durham	Liddell
34	862516	Durham	Liddell
37	862517	Durham	Liddell
Pt Lot 380	869839	Durham	Liddell
1	1012624	Durham	Liddell
101	1053098	Durham	Liddell
102	1103268	Durham	Liddell
1	1103323	Durham	Liddell
1	1193227	Durham	Liddell
3	1193227	Durham	Liddell
4	1193227	Durham	Liddell
Various unformed Crown road reserves		Durham	Liddell

*Note: Lots shown in **bold** font are part of the Cumnock CHPP site.*
*Lots shown in **italic** font are part of the Main Northern Railway easement.*

LOCAL GOVERNMENT AREA: SINGLETON

1	48556	Durham	Liddell
1	135026	Durham	Liddell
1	**213065**	**Durham**	**Liddell**
3	**213065**	**Durham**	**Liddell**
2	233019	Durham	Liddell
1	237655	Durham	Liddell
2	237655	Durham	Liddell
3	237655	Durham	Liddell
1	237766	Durham	Liddell
2	237766	Durham	Liddell
4	237766	Durham	Liddell
5	237766	Durham	Liddell
4	255403	Durham	Liddell
Pt Lot 6	255403	Durham	Liddell
1	**403032**	**Durham**	**Liddell**
2	*534888*	*Durham*	*Liddell*
32	535087	Durham	Liddell
Pt Lot 32	545601	Durham	Liddell
1	*565031*	*Durham*	*Liddell*
80	607296	Durham	Liddell
Pt Lot 81	607296	Durham	Liddell
2	619383	Durham	Liddell
43	654013	Durham	Liddell
Pt Lot 101	700429	Durham	Liddell
225	752470	Durham	Liddell
232	752470	Durham	Liddell
101	**825292**	**Durham**	**Liddell**
25	841160	Durham	Liddell
22	841165	Durham	Liddell
23	841165	Durham	Liddell
24	841165	Durham	Liddell
Pt Lot 201	848078	Durham	Liddell
100	858173	Durham	Liddell
2	859544	Durham	Liddell
Pt Lot 33	862516	Durham	Liddell
35	862516	Durham	Liddell
Pt Lot 36	862516	Durham	Liddell
2	865784	Durham	Liddell/Vane
352	867083	Durham	Liddell
Pt Lot 353	867083	Durham	Liddell
354	867083	Durham	Liddell
22*	869399	Durham	Liddell
31	870789	Durham	Liddell
32	870789	Durham	Liddell

Pt Lot 211	975271	Durham	Liddell
219	975271	Durham	Liddell
601	1019325	Durham	Liddell
102	1103268	Durham	Liddell
1	1103323	Durham	Liddell
181	1126510	Durham	Liddell
602	1019325	Durham	Liddell
11	6842	Durham	Liddell
24	6830	Durham	Goorangoola
1	48490	Durham	Goorangoola
Various unformed Crown road reserves		Durham	Liddell

*Note: Lots shown in **bold** font are part of the Cumnock CHPP site.*
*Lots shown in **italic** font are part of the Main Northern Railway easement.*
*Lots identified with * are the RUM site, incorporating the RCCP facility.*

APPENDIX 2
DEVELOPMENT LAYOUT PLANS

Figure: Development layout plan

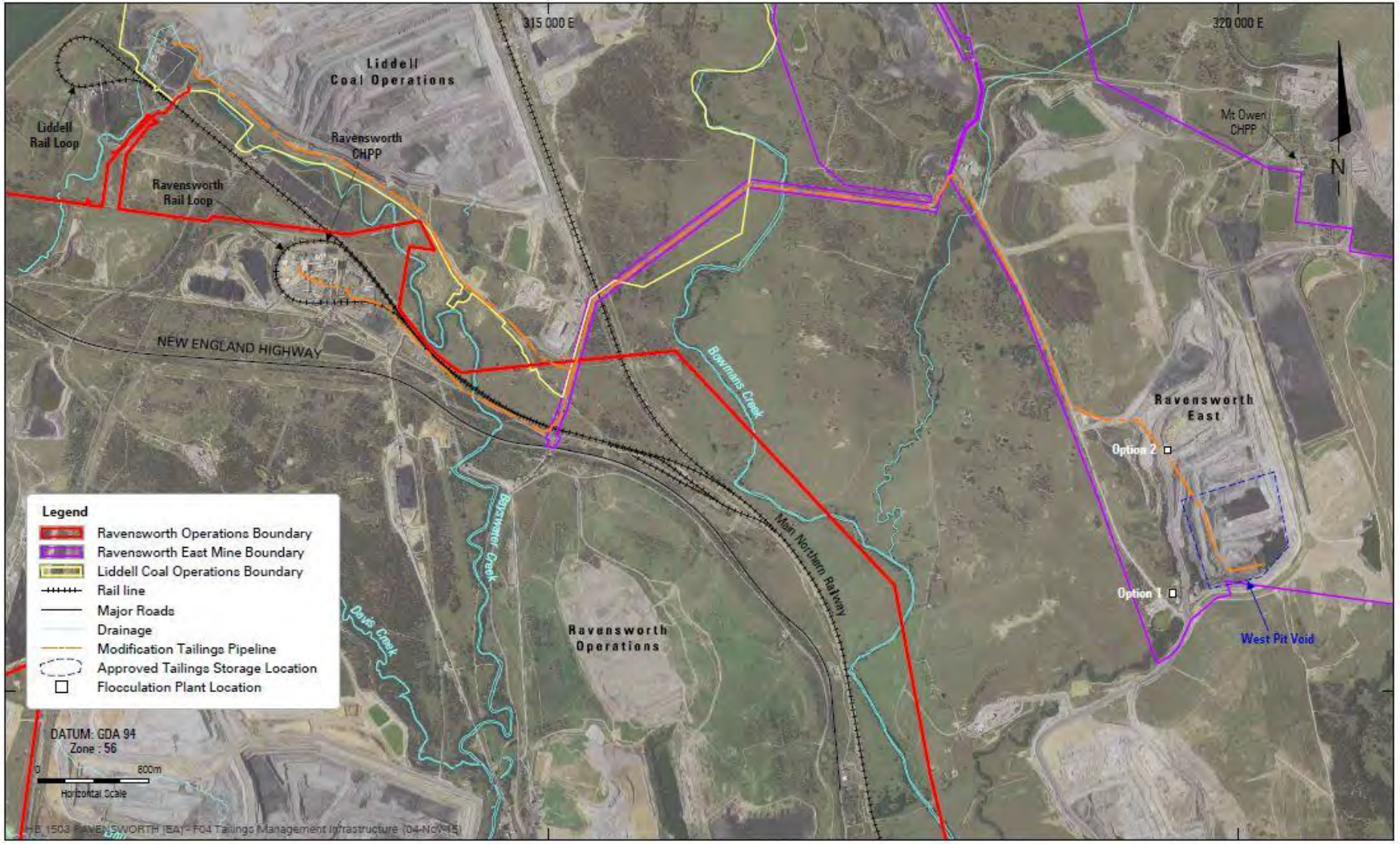

Figure: *Greater Ravensworth tailings management infrastructure*

APPENDIX 3
CONCEPTUAL FINAL LANDFORM

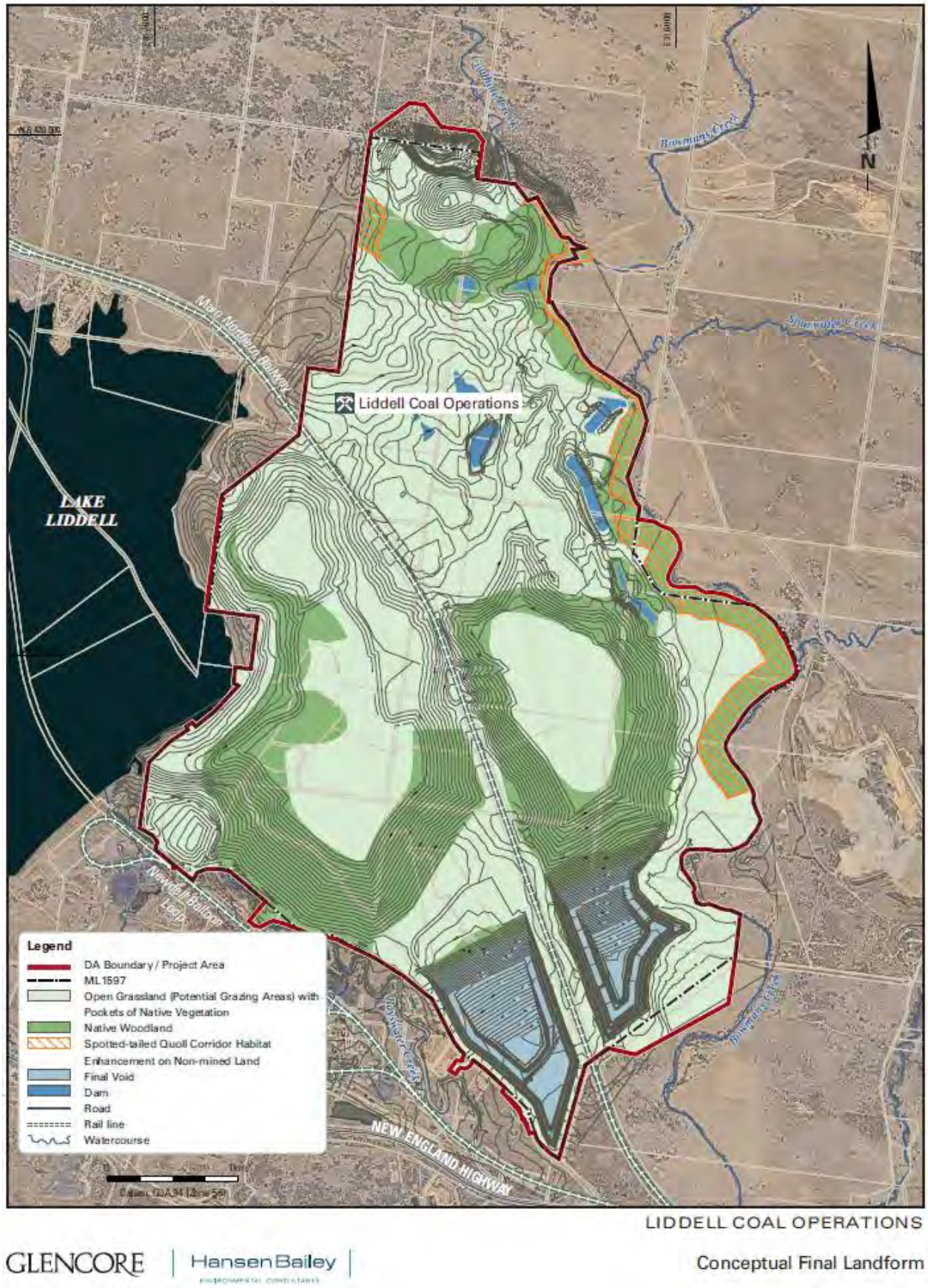

***Figure**: Conceptual Final Landform*

APPENDIX 4

Deleted

APPENDIX 5
RECEIVER LOCATIONS

***Figure**: Sensitive Receptors*

APPENDIX 6
NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 1 of Schedule 3 are to apply under all meteorological conditions except the following:
   (a) during periods of rain or hail;
   (b) average wind speed at microphone height exceeds 5 m/s;
   (c) wind speeds greater than 3 m/s measured at 10 m above ground level; or
   (d) temperature inversion conditions greater than 3°C/100 m, or alternatively stability class F and G.

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station on or in the vicinity of the site.

Compliance Monitoring

3. Attended monitoring is to be used to determine compliance with the relevant conditions of this consent.

4. This monitoring must be carried out at least once a month (but at least two weeks apart), unless the Secretary directs otherwise.

   Note: The Secretary may direct that the frequency of attended monitoring increase or decrease at any time during the life of the development.

5. Unless otherwise agreed with the Secretary, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
   (a) monitoring locations for the collection of representative noise data;
   (b) meteorological conditions during which collection of noise data is not appropriate;
   (c) equipment used to collect noise date, and conformity with Australian Standards relevant to such equipment; and
   (d) modifications to noise data collected including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration, with the exception of applying appropriate modifying factors for low frequency noise during compliance testing. This should be undertaken in accordance with Fact Sheet C of the NSW Noise Policy for Industry (EPA, 2017).

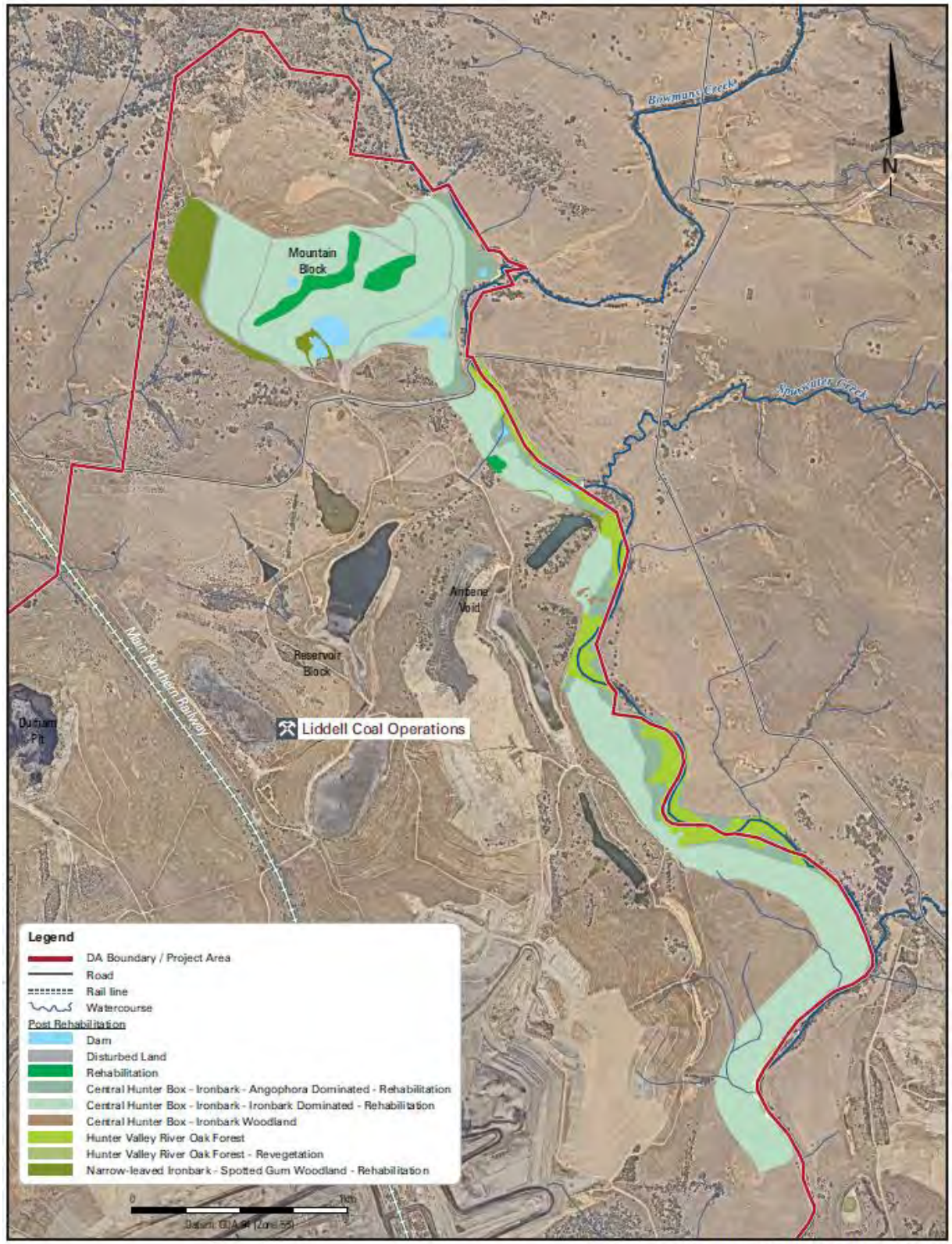

***Figure**: Post Rehabilitation of Bowmans Creek Riparian Corridor*

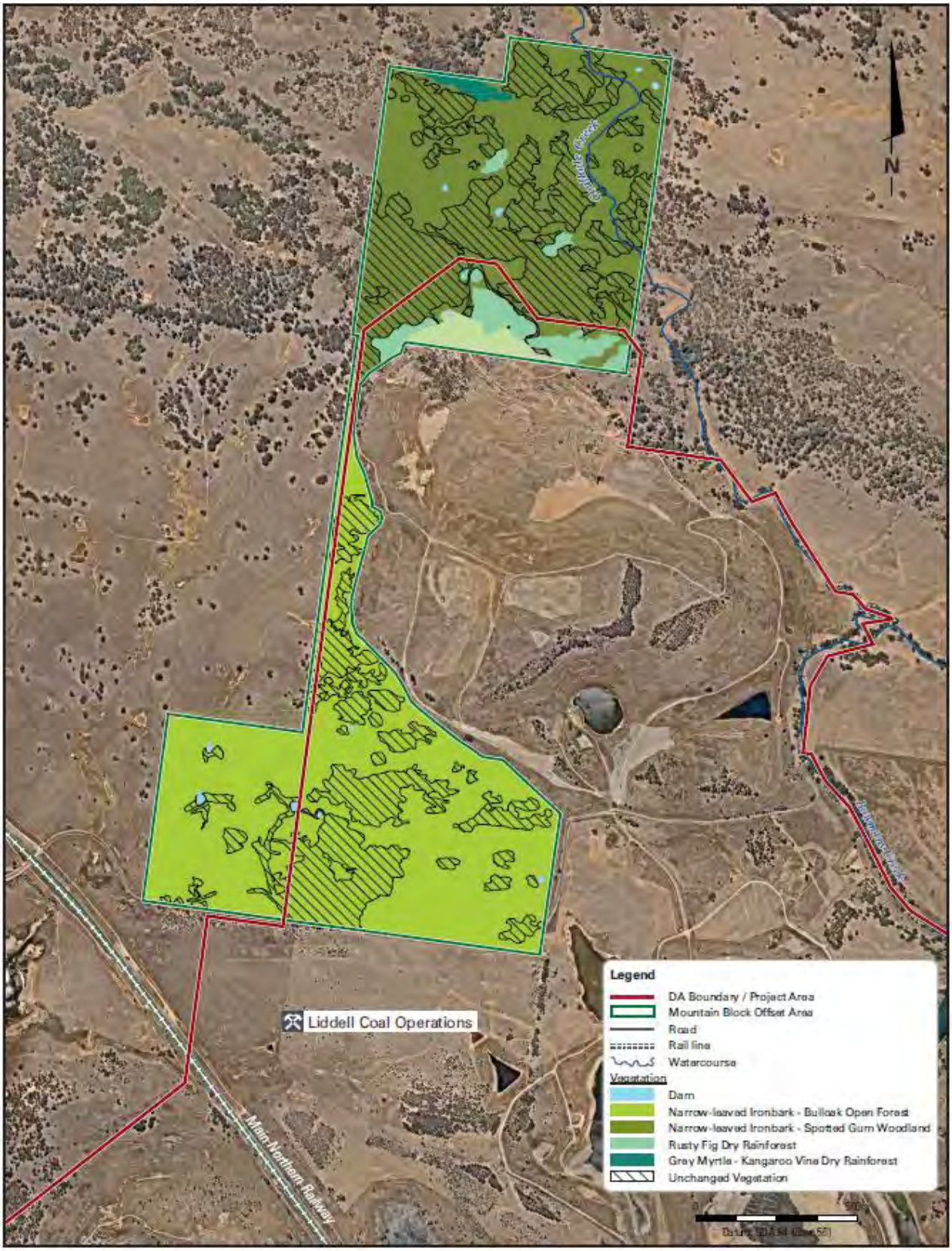

***Figure**: Post Rehabilitation of Mountain Block Offset Area*

APPENDIX 8
GENERAL TERMS FOR THE PLANNING AGREEMENT WITH SINGLETON COUNCIL

Project	Description	Applicant Contribution	Funding Time Frame
Hebden Hall/Rural Halls	Relocate and upgrade the existing Hebden Hall onto a parcel of land adjacent to the community	$200,000	Initiated following approvals. Capital project funded and completed by Applicant. Any remain funds to be allocated to SC Rural Halls
Lake St Clair Recreational Park	Contribution to SC for the construction of a tourism centre at Lake St Clair	$300,000 over a 5 year term $75,000 per annum over the first 2 years with $50,000 per annum thereafter for 3 years	End of quarter following DA approval
Rose Point Netball Amenities Upgrade	Contribution towards funding of upgrade	$80,000	End of quarter following DA approval Contribution to be paid upon request from SC.

APPENDIX 9
GENERAL TERMS FOR THE PLANNING AGREEMENT WITH MUSWELLBROOK SHIRE COUNCIL

Description	Applicant Contribution	Funding Time Frame
Liddell Coal Project including all prior modifications	$320,000	The payment will be paid in two annual instalments within two years of the date of approval of Modification 5.

APPENDIX 10
ENVIRONMENTAL IMPACT ASSESSMENTS

- EIS - Development application 305-11-2001 and supporting information including:
  - *Liddell Colliery Continued Operations Environmental Impact Statement*, dated October 2001 and prepared by Umwelt (Australia) Pty Limited;
  - *Response to NPWS Request for Further Information in Relation to the Archaeological Assessment, Liddell EIS* prepared by Umwelt (Australia) Pty Limited and dated December 2001, as supplemented by the additional information dated 20 February 2002;
  - correspondence submitted to the Department and SC in response to the request for addition information from SC and dated 20 December 2001;
  - *Response to Submissions Liddell Colliery Environmental Impact Statement*, prepared by Umwelt (Australia) Pty Limited and dated March 2002;
  - *Response to EPA request for further information Liddell Colliery Continued Operations Environmental Impact Statement* prepared by Umwelt (Australia) Pty Limited and dated March 2002;
  - *Continued Operations of Liddell Colliery – Revised Development Application Area* prepared by Umwelt (Australia) Pty Limited and dated 13 March 2002; and
  - additional air quality contours provided to the Department by Umwelt (Australia) Pty Limited relating to PM_{10} concentrations on 7 May 2002;
- MOD 2 – (approved 8 July 2007) modification application and supporting information including:
  - *Liddell Colliery Modification to Development Consent Environmental Assessment*, prepared by Umwelt (Australia) Pty Limited and dated December 2006;
  - *Response to Submissions Environmental Assessment for Liddell Colliery Modification to Development Consent*, prepared by Umwelt (Australia) Pty Limited and dated March 2007;
  - *Response to Submissions from the Roads and Traffic Authority and the Hunter Regional Development Committee Environmental Assessment for Liddell Colliery Modification to Development Consent*, prepared by Umwelt (Australia) Pty Limited and dated April 2007; and
  - *Revised Statement of Commitments for the Liddell Development Consent Modification,* prepared by Umwelt (Australia) Pty Limited and dated July 2007 ;
- MOD 3 – (approved 7 May 2008) modification application DA305-11-01 and accompanying Statement of Environmental Effects, titled *Liddell Coal Operations Pty Limited Statement of Environmental Effects for Liddell Colliery Modification to Development Consent*, prepared by Umwelt Australia Pty Limited, and dated February 2008;
- MOD 4 – (approved 27 October 2009) modification application and accompanying document and site plans prepared by Umwelt Australia Pty Limited, and dated 7 October 2009; and
- MOD 5 – (approved 1 December 2014) modification application and accompanying document and site plans prepared by SLR, and dated September 2013;
- MOD 6 – modification application DA 305-11-01 – MOD 6 and accompanying documents and site plans prepared by Hansen Bailey and dated November 2015.

Appendix C - Land Ownership Register

Owner	Lot	DP
Coal and Allied	2	574166
Coal and Allied	2	808431
Coal and Allied	1	808431
Coal and Allied	321	860535
Coal and Allied	1	125406
Coal and Allied	2	125406
Coal and Allied	3	125406
Coal and Allied	4	125406
Coal and Allied	5	125406
Coal and Allied	6	125406
Coal and Allied	7	125406
Coal and Allied	8	125406
Coal and Allied	9	125406
Coal and Allied	10	125406
Coal and Allied	11	125406
Coal and Allied	182	975271
Coal and Allied	183	975271
Coal and Allied	184	975271
Coal and Allied	192	975271
Coal and Allied	193	975271
Coal and Allied	211	975271
Coal and Allied	212	975271
Coal and Allied	217	975271
Coal and Allied	218	975271
Coal and Allied	219	975271
Coal and Allied	221	975271
Coal and Allied	11	858172
Coal and Allied	380	869839
Coal and Allied	1	211043
Coal and Allied	103	1103268
Coal and Allied	1000	1153575
LCO	1	567124
LCO	132	752470
LCO	313	549456
LCO	10	6841
LCO	3	233020
LCO	2	113736
LCO	Z	373693
LCO	139	752470
LCO	1	1128333
LCO	1	860901
LCO	3	532671
LCO	311	549456
LCO	138	752470
CUMNOCK NO.1 COLLIERY PTY LIMITED 90%, ICRA CUMNOCK PTY LIMITED 10%	1	403032
CUMNOCK NO.1 COLLIERY PTY LIMITED 90%, ICRA CUMNOCK PTY LIMITED 10%	1001	1153575
CUMNOCK NO.1 COLLIERY PTY LIMITED 90%, ICRA	3000	1132357

Owner	Lot	DP
CUMNOCK PTY LIMITED 10%		
CUMNOCK NO.1 COLLIERY PTY LIMITED 90%, ICRA CUMNOCK PTY LIMITED 10%	1	213065
CUMNOCK NO.1 COLLIERY PTY LIMITED 90%, ICRA CUMNOCK PTY LIMITED 10%	101	825292
CUMNOCK NO.1 COLLIERY PTY LIMITED 90%, ICRA CUMNOCK PTY LIMITED 10%	16	848095
CUMNOCK NO.1 COLLIERY PTY LIMITED 90%, ICRA CUMNOCK PTY LIMITED 10%	3	213065
Ravensworth Operations Pty Limited	2	1171724
Cumnock No 1 Colliery Pty Ltd 90% ICRA Cumnock Pty Limited 10%	1	1175191
Ravensworth Operations Pty Limited	1	1171724
CUMNOCK NO.1 COLLIERY PTY LIMITED 90%, ICRA CUMNOCK PTY LIMITED 10%	1	859924
Resource Pacific Pty Limited	100	868268
Resource Pacific Pty Limited	602	1019325
Resource Pacific Pty Limited	21	869399
Resource Pacific P/L 53.4 Cumnock No.1 Colliery P/L 32.04 Muswellbrook Coal Company 11 ICRA Cumnock P/L 3.56	22	869399
Glendell Tenements Pty Ltd	3	232149
LIDDELL SOUTHERN TENEMENTS PTY LIMITED	32	545601
LIDDELL SOUTHERN TENEMENTS PTY LIMITED	228	752470
LIDDELL SOUTHERN TENEMENTS PTY LIMITED	2	534889
LIDDELL SOUTHERN TENEMENTS PTY LIMITED	1	1089438
LIDDELL SOUTHERN TENEMENTS PTY LIMITED	2	1089438
LIDDELL TENEMENTS PTY LIMITED	1	1012624
LIDDELL TENEMENTS PTY LIMITED	31	870789
SAVAGE COAL P/L 35% GABUME P/L 32.5% MITSUI MATSUSHIMA AUST 32.5%	33	862516
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	353	867083
SAVAGE COAL P/L 35% GABUME P/L 32.5% MITSUI MATSUSHIMA AUST 32.5%	4	237654
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	354	867083
LIDDELL TENEMENTS PTY LIMITED	35	862516
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	101	1053098
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	37	862517
LIDDELL TENEMENTS PTY LIMITED	1	237655
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	2	48556
LIDDELL TENEMENTS PTY LIMITED	34	862516
LIDDELL TENEMENTS PTY LIMITED	229	752470
LIDDELL TENEMENTS PTY LIMITED	1	583527
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	1	48556

Owner	Lot	DP
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	1	237766
SAVAGE COAL P/L 35% GABUME P/L 32.5% MITSUI MATSUSHIMA AUST 32.5%	31	837350
LIDDELL TENEMENTS PTY LIMITED	32	870789
LIDDELL TENEMENTS PTY LIMITED	12	579783
LIDDELL TENEMENTS PTY LIMITED	20	841165
LIDDELL TENEMENTS PTY LIMITED	100	858173
LIDDELL TENEMENTS PTY LIMITED	24	841165
LIDDELL TENEMENTS PTY LIMITED	21	841165
LIDDELL TENEMENTS PTY LIMITED	23	841165
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	201	848078
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	4	255403
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	81	607296
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	6	255403
Glencore Coal (NSW) Pty Limited	181	1126510
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	135	752470
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	136	752470
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	43	654013
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	42	6842
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	102	1103268
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	1	48536
SAVAGE COAL P/L 35% GABUME P/L 32.5% MITSUI MATSUSHIMA AUST 32.5%	3	237654
LIDDELL COAL OPERATIONS PTY LIMITED	3	48556
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	3	231880
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	36	862516
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	6	237654
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	1	237654
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	3	237655
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	13	6841
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	131	752470

Owner	Lot	DP
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	80	607296
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	225	752470
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	40	6842
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	1	1103323
Enex Liddell Pty Limited 35% Gabume Pty Ltd 32.5% Mitsui Matsushima Australia Pty Limited 32.5%	4	1193227
LIDDELL COAL OPERATIONS PTY LIMITED	2	48536
Macquarie Generation	102	1053098
Macquarie Generation	13	247945
Macquarie Generation	15	247945
Macquarie Generation	2	628645
Macquarie Generation	601	1019325
Macquarie Generation	1	658099
Macquarie Generation	1	574166
Pacific Power	1	645240
Macquarie Generation	2012	1151790
Macquarie Generation	1	1142103
Macquarie Generation	1000	1132937
Macquarie Generation	36	255215
Macquarie Generation	37	255215
Macquarie Generation	4	774680
Macquarie Generation	32	255215
Macquarie Generation	1	236869
Macquarie Generation	33	255215
AGL Macquarie Generation	3	1193186
Ravensworth Operations Pty Limited	1	135027
Ravensworth Operations Pty Limited	202	848078
Mt Owen Pty Limited	4	774683
Ravensworth Operations Pty Limited	1	135026
Ravensworth Operations Pty Limited	1	303842
Ravensworth Operations Pty Limited	352	867083
Mt Owen Pty Limited	25	841160
Mt Owen Pty Limited	21	6842
Mt Owen Pty Limited	355	867083
Mt Owen Pty Limited	3	774683
Mt Owen Pty Limited	22	841165
Mt Owen Pty Limited	180	858299

Appendix D - Risk to Rehabilitation Broad Brush Risk Assessment

Table A.2: Consequence Criteria

	Health & Safety	Environment	Financial Impact	Image & Reputation/ Community	Legal & Compliance
5 Catastrophic	• Multiple fatalities • Multiple cases of permanent total disability / health effects	• Environmental damage or effect (permanent; >10 years) • Requires major remediation	• >$600M investment return • >$100M operating profit • >$20M property damage	• Negative media coverage at international level • Loss of multiple major customers or large proportion of sales contracts • Loss of community support • Significant negative impact on the share price	• Major litigation / prosecution at Glencore corporate level
4 Major	• Fatality or permanent incapacity / health effects	• Long-term (2 to 10 years) impact • Requires serious remediation	• $60-600M investment return • $20-100M operating profit • $2-20M property damage	• Negative media coverage at a national level • Scrutiny from government and NGOs • Complaints from multiple “final” customers • Loss of major customer • Loss of community support • Negative impact on share price	• Major litigation / prosecution at Division level
3 Moderate	• Lost time / disabling injury / occupational health effects / multiple medical treatments	• Medium-term (<2 years) impact • Requires moderate remediation	• $6-60M investment return • $2-20M operating profit • $200K-2M property damage	• Negative media coverage at local / regional level over more than one day • Complaint from a “final” customer • Off-spec product • Community complaint resulting in social issue	• Major litigation / prosecution at Operation level
2 Minor	• Medical Treatment Injury (MTI) / occupational health effects • Restricted Work Injury (RWI)	• Short-term impact • Requires minor remediation	• $600K-6M investment return • $200K-20M operating profit • $10-200K property damage	• Complaint received from stakeholder or community • Negative local media coverage	• Regulation breaches resulting in fine or litigation
1 Negligible	• First Aid Injury (FAI) / illness	• No lasting environmental damage or effect • Requires minor or no remediation	• <$600K investment return • <$200K operating profit • <$10K property damage	• Negligible media coverage	• Regulation breaches without fine or litigation

Risk Rating

Risk Ratings were assigned by combining the consequence rating and the likelihood rating. A numerical risk rating, between 1 and 25, was allocated for each aspect using the Glencore Coal Assets Australia Risk Matrix Tool. This aims to identify the priority and level of management action(s) required to reduce the risk rating. According to Glencore's Risk Matrix Tool and as identified in **Table A.3**, the following risk ratings were used:

Table A.3: Risk Rating Matrix

	E - Rare	D - Unlikely	C - Possible	B - Likely	A - Almost Certain
5 Catastrophic	15 (M)	19 (H)	22 (H)	24 (H)	25 (H)
4 Major	10 (M)	14 (M)	18 (H)	21 (H)	23 (H)
3 Moderate	6 (L)	9 (M)	13 (M)	17 (H)	20 (H)
2 Minor	3 (L)	5 (L)	8 (M)	12 (M)	16 (M)
1 Negligible	1 (L)	2 (L)	4 (L)	7 (M)	11 (M)

Table A.4: Risk Rating Classification

Consequence Category	Consequence Type	Ownership	Action
Cat 5	Catastrophic Hazard	Divisional / Functional / Operational / Asset Leadership	• Quantitative or semi-quantitative risk assessment required. • Capital expenditure will be justified to achieve ALARP ('As Low As Reasonably Practicable'). • Catastrophic Hazard Management Plans (CHMP) must be implemented where practical, Crisis Management plans (CMP) tested and Catastrophic Event Recovery Plans (CERP) developed.
Cat 4 (Health& Safety Consequence)	Fatal Hazard	Divisional / Functional / Operational / Asset Leadership	• Glencore SafeWork Fatal Hazard Protocols or appropriate management plans must be applied. • Capital expenditure will be justified to achieve ALARP.
Risk Rank	**Risk Rating**	**Ownership**	**Action**
17 to 25	High Risk	Divisional / Functional / Operational / Asset Leadership	• Install additional HARD and SOFT controls to achieve ALARP. • Capital expenditure will be justified to achieve ALARP
7 to 16	Medium Risk	Operational / Asset Leadership	• Install additional HARD and SOFT controls if necessary to achieve ALARP. • Capital expenditure may be justified
1 to 6	Low Risk	Operational / Asset Leadership	• Install additional controls if necessary to achieve ALARP. • Capital expenditure is not usually

The risk ratings assigned to each potential risk identified were dependent on group consensus. **Table A.5** outlines the key identified risks and associated inherent risk ratings. The ratings assume that the risks are untreated i.e. have not been addressed by specific risk mitigation measures.

2017 Liddell Coal Operations Rehabilitation Risk Assessment

Key Element … (Activity)	Risk Description - Something happens……	Consequence - resulting in:	Causes - Caused by	Existing Control Description	Risk Control Effectiveness	Consequence Category	Expected Risk Consequence	Risk Likelihood	Current Risk Rating
Geology and Geochemistry	Failure to achieve the rehabilitation outcome prescribed in the MOP within budget and desired timeframe	Increased costs/resources associated with meeting rehab criteria	LTA knowledge of material and its geochemistry Erodibility, dispersive soils	1. Geochem testing as part of annual rehab planning 2. Dumping practices - Spon com effected and rejects not tipped at final surface	Satisfactory	Financial Impact	1	C	4
Geotechnical	Stability of Highwalls (e.g. Railway pillar)	Damage to infrastructure	LTA geotech knowledge for mine design	1. Min 1.2 FoS 2. Rregular geotech monitoring and assessment. 3. Refer to actions in LOM risk register.	Satisfactory	Financial Impact	3	D	9
Geotechnical	Stability of Mountain Block rehab	Inability to reach closure and relinquishment of the lease Additional costs for rework Safety concerns	Ground failure Exposed sodic soils LTA vegetation cover	1. Previous rehabilitation efforts and previous studies. 2. Remediation plan/strategy underway 3. Monthly monitoring inspections	Requires Improvement	Financial Impact	2	B	12
Acid Mine Drainage	Not considered an issue	Nil	Nil						
Erosion and Sediment Control	Erosion and sediment on disturbed areas Uncontrolled discharge offsite of sediment laden water	Impact on rehab Pollution off site	Failure to implement progressive rehab Failure of existing rehab areas LTA water management system and/or design	1. Closed mine water management system 2. Drainage design 3. Annual land management and rehabilitation plan 4. Monitoring and maintenance of structures (contour banks, drop structures etc)	Satisfactory	Environment	2	D	5
Soil Type(s) and Suitability	Inadequate volume of topsoils / subsoils	Inability to reach closure and relinquishment of the lease. Cost of sourcing alternatives	Insufficient stockpiled topsoil Timing of rehab at South Pit not coinciding with access to in situ topsoil resources	Direct seeding on spoil Sourcing alternatives such as OGM as required Soil survey to determine what topsoil is available	Satisfactory	Financial Impact	1	B	7
Soil Type(s) and Suitability	LTA quality of topsoil to achieve the rehabilitation outcome prescribed in the MOP	Inability to reach closure and relinquishment of the lease Cost of sourcing ameliorants and alternatives	LTA topsoil quality	Routine addition of gypsum to topsoil	Requires Improvement	Financial Impact	1	B	7
Biodiversity	Failure to achieve the rehabilitation commitments in relation to habitat corridors and connectivity within budget and desired timeframe	Inability to reach closure and relinquish lease	Not meeting commitment to corridor plantings Failure of plantings Failure to manage pests/weeds	Annual rehab and Land management plan Weed and pest control programs Annual rehab monitoring programs Biodiversity management plan Successful trial areas, including tree corridors Offset strategy in the EA	Satisfactory	Financial Impact	2	D	5
Biodiversity	Failure to establish key target communities in rehab and offset areas that are consistent with Central Hunter Box Ironbark Woodland within budget and desired timeframe	Delayed lease relinquishment, Not meeting consent criteria	Not considering requirements in rehab planning (i.e. species mix, topsoil) Failure to manage weeds Fauna grazing pressures (kangaroos, rabbits etc.)	Annual Rehab and Land Management Plan Biodiversity Management Plan. Successful trial areas Bi-monthly inspections Weed and pest control programs	Satisfactory	Environment	2	C	8
Biodiversity	Failure to achieve nominated agricultural final land use on the flatter areas of the final landform within budget and desired timeframe	Inability to reach closure and relinquish lease	Not considering requirements in rehab planning Failure to manage weeds Inadequate water sources Inadequate soil properties	Grazing trial (ongoing) Annual rehab and Land Management Plan Weed and pest control programs Annual rehab monitoring programs Biodiversity Management Plan. Engagement with local engronomist	Satisfactory	Environment	2	D	5
Biodiversity (Bowmans Creek corridor)	Failure to establish suitable habitat for the spotted tailed quoll e.g. log/boulder piles	Inability to reach closure and relinquish lease within a desired timeframe and budget.	Not considering requirements in rehab planning Failure to preserve resources in the land clearing program	Biodiversity Offset Management Plan Glencore experience and monitoring of the spotted-tailed quoll Annual rehab and Land Management Plan Annual Rehab Monitoring Programs Biodiversity Management Plan Ground Disturbance Permit to identify potential habitat. Land Clearing procedure	Satisfactory	Environment	2	D	5

2017 Liddell Coal Operations Rehabilitation Risk Assessment

Key Element … (Activity)	Risk Description - Something happens……	Consequence - resulting in:	Causes - Caused by	Existing Control Description	Risk Control Effectiveness	Consequence Category	Expected Risk Consequence	Risk Likelihood	Current Risk Rating
Groundwater	Final void water balance - void overtopping	Discharge of saline water, particularly from South Pit void, leading to downstream impacts on water resources Inability to relinquish lease	Groundwater inflows and surface water runoff being different to that predicted in water balance. LTA water infrastructure Failure to implement the final lanform drainage design	Annual update of water balance 3 yearly update of groundwater model Final landform design and drainage design as presented in the EA Groundwater monitoring program The predicted final void level of 67m AHD is well below the spill level of both voids (south pit is 80m AHD and Entrance Pit 95m AHD).	Satisfactory	Environment	3	D	9
Interactions with underground workings	Not considered a risk to rehab.								
Hazardous Materials and Dangerous Goods	Hazardous materials and dangerous goods remaining on the site at closure (e.g. radiation source or PCBs)	Breach of licence, exposure of personnel to hazardous materials.	Failure to identify HAZMAT at closure	Radiation management plan Gauge licences Known locations of PCBs High Voltage Safety Management Plan Hazardous materials/Dangerous goods registers in chemalert and hard copy Phase 1 Contaminated Land Assessment	Satisfactory	Environment	2	E	3
Mine Subsidence and Settlement	Failure to achieve the rehabilitation outcome prescribed in the MOP within budget and desired timeframe	Settlement of rehab landform resulting in unstable landforms and impact on water drainage structures	Settlement of dumps	Long history of mining at LCO resulting in thorough understanding of materials on site Spon com management Annual rehab inspections Mine design control inspections Ground or Strata Failure management plan All underground workings have already been mined out meaning furthersubsidence is very unlikely to occur Known adequate availability of capping	Satisfactory	Financial Impact	2	D	5
Mine Subsidence and Settlement	Pot-holing over old underground workings	Failure to achieve stable landform within budget and desired timeframe	Presence of underground workings Inappropriate surface water drainage controls	Rehab sits over areas where underground workings have already been mined out Annual rehab inspections, monthly environment inspections	Satisfactory	Financial Impact	2	D	5
Tailings	Failure to achieve appropriate capping of dams within budget and desired timeframe	Ponding on capped tailings landform Tailings dam instability Failure to achieve relinquishment in a desired timeframe and budget	Inadequate tailings capping design Inadequate execution of tailings capping Insufficient capping material available Settlement of capping and/or tailings	Relevant capping management plans Adequate volume of stockpiled capping material Inspection schedule Operational and maintenance manuals for tailings dams Known adequate availability of capping	Satisfactory	Financial Impact	3	C	13
Contaminated Land	Contaminated land occurring on the site at closure	Potential pollution of water resources Constraint for future land use	Long term use of the site Spills, leaks etc.	Pollution incidence response management plan (PIRMP) Phase 1 Land Contamination Bioremediation area No underground fuel tanks Water monitoring program Hazardous Substances and Dangerous Goods Plan	Satisfactory	Environment	2	D	5
Visual Amenity & Lighting	Some rehab and closure works at elevated locations	Complaints, rehab work visible to receptors.	Lighting plant visible during bulk earthworks. Exposed areas visible	Light Management Plan Limited receptors LCO has never received a complaint in relation to lighting	Satisfactory	Image & Reputation / Community	2	D	5
Heritage	Failure to comply with ACHMP requirements (respreading archaeological sensitive topsoil)	Prosecution Loss of culturally significant site	Unintended interaction with Aboriginal site due to lack of awareness Closure or rehabilitation activities LTA stockpile management	Induction includes section on cultural heritage Fencing and signage of sites Existing ACHMP Ground Disturbance Permit process	Satisfactory	Legal & Compliance	3	D	9

2017 Liddell Coal Operations Rehabilitation Risk Assessment

Key Element … (Activity)	Risk Description - Something happens……	Consequence - resulting in:	Causes - Caused by	Existing Control Description	Risk Control Effectiveness	Consequence Category	Expected Risk Consequence	Risk Likelihood	Current Risk Rating
Air Quality	Rehabilitation not completed in accordance with the MOP schedule	Increased dust Dust emissions	Exposed areas Delays in being able to commence rehab Rehab failure Drought	Annual Rehab Management Plan Air Quality Management Plan Dust Management TARP Annual & Monthly Inspections	Satisfactory	Legal & Compliance	2	D	5
Noise	Rehabilitation not completed in accordance with the MOP schedule	Increased noise to neighbouring residents	Rehab activities occurring outside of noise model assumptions	Annual Rehab Management Plan, Noise Management Procedure Real time monitoring network Rehab undertaken in daytime hours (current practice)	Satisfactory	Legal & Compliance	2	D	5
Bushfire	Damage to rehab	Loss of established rehabilitation Additional costs for rework of rehab Exposed areas (erosion, sediment, dust)	Increased fuel loads onsite Lightning/Storm activity Arson Equipment fire	Bushfire Management Procedure Quarterly Land Management Inspections Maintain access in rehab areas Maintain water sources in proximity to rehab areas Grazing of some areas to keep vegetation low	Satisfactory	Financial Impact	2	C	8
Spontaneous Combustion	Spon com impedes rehabilitation	Inability to complete rehab Impact on established rehab Cost of managing spon com outbreak	Poor management of materials with propensity for spon com	Long history of mining at LCO resulting in thorough understanding of materials on site Spon com management Annual rehab inspections Mine design control inspections Dumping procedures for where son com material is tipped	Satisfactory	Financial Impact	2	D	5
Weeds and Pests	Failure to achieve the rehabilitation commitments prescribed in the MOP	Inability to reach closure and relinquish lease	Failure to manage weeds Pest species / grazing pressures (kangaroos, rabbits etc.)	Biodiversity Management Plan Annual rehab inspections	Satisfactory	Financial	2	D	5
Rehabilitation	Not meeting the specific criteria of DA305-11-01 SCH3 Condition 37 (achieving micro relief and void size)	Inability to reach closure and relinquish lease	LTA landform design/plan/formation Unknown external influences (market downturn, legislation changes)	LOM and Budget planning processes Annual Rehab & Land Management Planning Compliance verification processes Mine design control	Satisfactory	Legal & Compliance	2	D	5

Appendix E - Stakeholder Consultation

Young, Jarith (Liddell - AU)

From: Megan Dawson <Megan.Dawson@planning.nsw.gov.au>
Sent: Wednesday, 15 November 2017 1:24 PM
To: Young, Jarith (Liddell - AU)
Cc: Matthew Sprott
Subject: RE: Liddell Coal Operations Mining Operations Plan

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Jarith,

The Department has undertaken a high level review of the Liddell MOP and generally found the plan to be comprehensive and to an acceptable standard.
A few minor comments are provided below:

- The majority of the MOP has been updated to reflect MOD6, however several sections refer to the MOD5 consolidated consent (ie. Section 5) or refer to assessments associated with MOD5 (e.g. Section 3.3.12). These should be updated to reflect MOD6.
- Several of the completion criteria in Section 6 could be more specific. For example, specify:
    - topsoil depths for final land uses;
    - densities for habitat features;
    - legislation to be complied with for pest control;
    - 'target' native fauna species; and
    - 'critical' EEC species.

Regards, Megan

Megan Dawson
Team Leader
Resource Assessments | Planning Services
320 Pitt Street | GPO Box 39 | Sydney NSW 2001
T 02 9274 6391 E megan.dawson@planning.nsw.gov.au


Subscribe to our newsletter

From: Jarith.Young@glencore.com.au [mailto:Jarith.Young@glencore.com.au]
Sent: Tuesday, 31 October 2017 4:08 PM
To: Megan Dawson <Megan.Dawson@planning.nsw.gov.au>; Matthew Sprott <Matthew.Sprott@planning.nsw.gov.au>
Subject: RE: Liddell Coal Operations Mining Operations Plan

Hi Megan,

If we could have comments back by the 21st November that would be great. Feel free to call me in the meantime if anything comes up just so we can address and finalise.

muswellbrook shire council

Enquiries
Please ask for Scott Brooks
Direct 02 6549 3700
Our reference
Your reference

23 November 2017

Mr Ben de Somer
Environment & Community Manager
Liddell Coal Operations Pty Ltd
PO Box 7
SINGLETON 2330

Dear Ben

Response to Liddell Coal Operations Mining Operations Plan

Thank you for the opportunity to review the Liddell Coal Operations Mining Operations Plan dated October 2017. We are aware that the majority of the Liddell mine is within the Singleton LGA. In our review we only focused on items that may affect the Muswellbrook LGA. Muswellbrook Shire Council's comments are as follows:

1. We noted that the active mining area of the Liddell mine is no longer within the Muswellbrook LGA. Therefore our interest now lies in the rehabilitation of the former mining areas. It is noted that there is an ongoing plan to rehabilitate the former tailings dams and this needs to continue to release land for post mining land uses.

2. Council's main concern is the rehabilitation of the Mountain Block. The draft MOP only commits for further planning and provides no works program or time line for engineering and rehabilitation works. It is accepted that designing an acceptable rehabilitation program for this area is difficult. With this comes the fact that the risk of failure in this area will always be high, and so the works need to be undertaken as early as possible to allow time for monitoring and maintenance whilst the mine is operating. The Mountain Block needs to be completed and proven stable before the main areas of mining at Liddell close. Closure of the operating pits at Liddell will be difficult enough without the need to continue to deal with the legacies of the Mountain block. This area is well separated from the main part of the mine and needs to be rehabilitated and available for post mining land uses.

3. It is noticed that this MOP period does not offer any land for relinquishment. Considering the length of time the Liddell mine has been operating, this is disappointing. Council a keen for mining companies to have transitional and post mining land uses that provide employment and provide a benefit to the community. This process can be simplified if the rehabilitation works are completed to a standard so it can be relinquished.

Council appreciates the opportunity to comment and would be pleased to provide additional information if requested.

Yours faithfully

Pathum Gunasekara
A/Manager, Planning & Regulatory Services

OUT17/47424

Jarith Young
Environment and Community Officer
Liddell Coal Opertaions Pty Ltd
Via email: Jarith.Young@glencore.com.au

Dear Mr Jarith Young,

Liddell Coal Operations 2018 – 2020 Mining Operations Plan

I am writing in reference to your letter dated 31 October 2017. Crown Lands and Water Division (formerly DPI Water) thanks you for the opportunity to comment on the Liddell Coal Operations 2018- 2020 Mining Operations Plan (MOP).

Crown Lands and Water Division has reviewed the MOP and provides the following comments.

Section 1.4.3 - Licences

Further information is required regarding 20SL042837 which is noted in Table 4. According to Crown Lands and Water Division records this licence was cancelled in 2008.

The following comments are made regarding Table 5 – Groundwater Licences.

- **20BL168063** has been converted following the commencement of the *Water Sharing Plan North Coast Fractured and Porous Rock Groundwater Sources 2016*. The relevant reference for this licence is now WAL 41499 which represents 6000 shares in the Sydney Basin-North Coast Groundwater Source.
- **20BL168062** and **20BL172588** have converted following the commencement of the *Water Sharing Plan North Coast Fractured and Porous Rock Groundwater Sources 2016*. The relevant reference for these licences is now WAL 41498 which represents 6000 shares in the Sydney Basin-North Coast Groundwater Source.
- **20BL168061** has been converted following the commencement of the *Water Sharing Plan North Coast Fractured and Porous Rock Groundwater Sources 2016*. The relevant reference for this licence is now WAL 41497 which represents 1000 shares in the Sydney Basin-North Coast Groundwater Source.
- Further information is required regarding **20BL017861**. It is noted that table 5 indicates this licence has a 5 ML entitlement for irrigation purposes. It is recommended that information regarding actual extraction from this bore over the past 3 water years be submitted to Crown Lands and Water Division for consideration. This licence converted to 20WA210940 as of 1 August 2009 as part of the commencement of the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*, however there is no linked Water Access Licence (WAL) representative of the 5 ML.

- **20BL172293** and **20BL168209** have converted following the commencement of the *Water Sharing Plan North Coast Fractured and Porous Rock Groundwater Sources 2016*. The relevant reference for these licences is now WAL 41493 which represents 2500 shares in the Sydney Basin-North Coast Groundwater Source.
- Further information is required regarding **20BL169544**. Currently this licence is Active under the Water Act 1912 however there is no linked entitlement of 2500 ML. To assist Crown Lands and Water Division in assessing this licence further information is required regarding the point of extraction and the volume of water pumped over the past 3 water years.

Section 2.3.4 – Land Preparation

All works on waterfront land must be undertaken in accordance with Guidelines for Controlled Activities on Waterfront Land 2012. Specifically erosion and sediment control must be undertaken in accordance with *Managing Urban Stormwater: Soils and Construction, Volume 1* (Landcom, 2004). Also where soil disturbance is within 40 m of a river high bank consideration must be given to rehabilitation/establishment of the riparian corridor.

Further information on Departmental Guidelines may be found via the following link, http://www.water.nsw.gov.au/water-licensing/approvals/controlled-activity.

Section 3.3.3 - Surface Water

It is recommended that in-stream gauge monitoring of Bowmans Creek be included in the MOP. This monitoring should be both up and downstream of the final void location.

Section 3.3.7 – Biodiversity

Similarly it is noted that the MOP does not go into detail regarding design and implementation remediation targets for Bowmans Creek. Project Approval, DA 305-11-01, does not require the Biodiversity Management Plan (BMP) to be developed in consultation with Crown Lands and Water Division however it should be considered that the rehabilitation of Bowmans Creek and revegation of riparian land is of strategic importance to improvement of geomorphic and ecological processes. Although not required, Crown Lands and Water Division will be available for consultation on the BMP as required. It is recommended that any assessment or remediation plan for Bowmans Creek should be consistent with *A Rehabilitation Manual for Australia Streams*, Land and Water Resources Research and Development Corporation 2000.

Section 4 – Post Mining Land Use

Where the water captured by dams is intended to be accounted through harvestable rights, consideration should be given to the final ownership of the land to ensure the dams will be within the maximum harvestable right, or otherwise licensed or decommissioned. Further information on basic landholder rights may be found via the following link, http://www.water.nsw.gov.au/water-licensing/basic-water-rights.

Section 9.2 – Trigger Action Response Plan (TARP)

It is recommended that the TARPs be updated to include timeframes for proposed action and also notifications to the relevant regulatory agencies.

Please contact Hannah Grogan, Water Regulation Officer (Newcastle) on (02) 4904 2516 or hannah.grogan@dpi.nsw.gov.au if you have further enquiries regarding this matter.

Yours sincerely

Irene Zinger
Manager Regulatory Operations – Metro
Crown Lands and Water Division

Planning & Environment
Resources & Geoscience

29 November 2017

Ben de Somer
Liddell Tenements Pty Limited
PO Box 7,
SINGLETON NSW 2330
By email: *ben.desomer@glencore.com.au*

OUT17/47719

Dear Ben,

CCL708 (*Mining Act 1973*), ML1313, ML1552, ML1597 (*Mining Act 1992*), Liddell Tenements Pty Limited, Approval of Mining Operations Plan

NOTICE OF APPROVAL

Pursuant to Condition 2 of CCL708 and Condition 3 of ML1313, ML1552 and ML1597, the Liddell Glencore Mining Operations Plan (MOP) that was submitted to the Department of Planning and Environment – Division of Resources and Geoscience (the Division) on 29/11/2017 (Reference: INW17/72204) is approved for the period from the date of this approval until 1 December 2020.

This MOP approved by the Division is limited to:

- the rehabilitation objectives and completion criteria; and,
- the schedule of rehabilitation activities proposed for the MOP period.

It is the responsibility of the Authorisation Holder to ensure that all mining and mining related operations described in this MOP are as approved within the relevant Project Approval or Development Consent and all necessary approvals, consents or permits required under the relevant NSW or Commonwealth regulations have been obtained prior to carrying out the operations.

It is the responsibility of the Authorisation Holder to fulfil their obligations and commitments to the rehabilitation outcomes and performance standards as approved by the relevant consent authority to ensure the rehabilitation outcomes identified are achieved.

ASSESSED DEPOSIT

Approval of this MOP has triggered a review of the assessment of the security deposit required to secure funding for the fulfilment of rehabilitation obligations under CCL708, ML1313, ML1552 and ML1597.

Notice of the change in the security deposit condition related to this MOP approval will be provided separately.

DEFINITIONS

In this letter, words have the meaning given to those terms in the *Mining Act 1992*, unless otherwise specified below.

Division means the NSW Department of Planning and Environment – Division of Resources and Geoscience

Authorisation Holder means the holder of the relevant authorisation(s).

Mining Operations Plan means the project, mining and mining related operations described in the "Liddell Glencore Mining Operations Plan 2018 - 2020" prepared by Liddell Coal Operations Pty Ltd and dated 29 November 2017.

If you have any questions about this Notice, please contact Dan Adams directly on (02) 4931 6707.

Yours sincerely,

MONIQUE MEYER
Manager & Principal Inspector
Environmental Sustainability Unit
Division of Resources and Geoscience
NSW Department of Planning and Environment
Signed under delegation from the Secretary of the NSW Department of Planning and Environment.

Planning & Environment
Resources Regulator

17 September 2019

David Foster
Liddell Tenements Pty Limited
PO Box 7,
SINGLETON NSW 2330

Our ref: DOC19/813046

By email: Jarith.Young@glencore.com.au

Dear Mr Foster,

CCL708 (Mining Act 1973), ML1313, ML1552 and ML1597 (Mining Act 1992), Liddell Tenements Pty Limited, Approval of Mining Operations Plan Amendment A

NOTICE OF APPROVAL

Pursuant to Condition 2 of CCL708 and Condition 3 of ML1313, ML1552 and ML1597, the Mining Operations Plan Amendment A (MOP) that was submitted to the Resources Regulator within the Department of Planning, Industry & Environment (Resources Regulator) on 4 July 2019 (Department Reference: DOC19/601807) is approved for the period from the date of this approval until 1 December 2020.

Note that CCL708 is held by Liddell Tenements Pty Limited, however Hunter Valley Operations conduct activities due to sub-lease arrangements and owing the land.

It is the responsibility of the Authorisation Holder to ensure that all mining and mining related operations described in this MOP are as approved within the relevant Project Approval or Development Consent and all necessary approvals, consents or permits required under the relevant NSW or Commonwealth regulations have been obtained prior to carrying out the operations.

It is the responsibility of the Authorisation Holder to fulfil their obligations and commitments to the rehabilitation outcomes and performance standards as approved by the relevant consent authority to ensure the rehabilitation outcomes identified are achieved.

ASSESSED DEPOSIT

Approval of this MOP has not triggered a review of the assessment of the security deposit required as the current security is deemed to be sufficient to secure funding for the fulfilment of rehabilitation obligations under the above **Mining Authorisations**.

DEFINITIONS

In this letter, words have the meaning given to those terms in the *Mining Act 1992*, unless otherwise specified below.

Authorisation Holder means the holder of the relevant authorisation(s).

Mining Operations Plan means the project, mining and mining related operations described in the "Liddell Glencore Mining Operations Plan 2018-2020 Amendment A" prepared by Liddell Glencore and dated 16 June 2019

If you have any questions about this Notice, please contact Resources Regulator at nswresourcesregulator@service-now.com

Yours sincerely,

MONIQUE MEYER
Manager Environmental Operations
Mining Act Inspectorate
Resources Regulator
NSW Department of Planning, Industry & Environment
Signed under delegation from the Minister for Resources.
Signed under delegation from the Secretary of the NSW Department of Planning, Industry & Environment.

Planning, Industry & Environment

SF20/2806
DOC20/21139

Liddell Coal Operations Pty. Limited
c/ Ben de Somer
Environmental & Community Manager
PO Box 7
SINGLETON NSW 2330

By email: ben.desomer@glencore.com.au
liddellenquiries@glencore.com.au

21 January 2020

Dear Mr De Somer

VARIATION OF MINING LEASE 1597 (ACT 1992) UNDER CLAUSES 7(1)(b1) & 12 OF SCHEDULE 1B OF THE *MINING ACT 1992*

ANCILLARY MINING ACTIVITY CONDITION REF: AMA1020

I refer to your application to add an Ancillary Mining Activity (AMA) condition to Mining Lease 1597 (Act 1992) (ML 1597) that was received by the NSW Department of Planning and Environment – Division of Resources and Geoscience (Division) on 13 November 2017.

According to the Division's records, no comments were received in response to the notice of the proposed decision to vary the conditions of ML 1597 dated 14 December 2019.

In accordance with Clauses 7(1)(b1) and 12 of Schedule 1B of the *Mining Act 1992*, the Minister has determined to vary the conditions of ML 1597 by including an AMA condition.

This variation takes effect on and from 21 January 2020.

Please note that AMA condition 2(2.2) requires the lease holder to update their existing Mining Operations Plan (MOP) to incorporate the carrying out of the ancillary mining activity(s) and submit the updated MOP to the Minister for approval within 45 days of the date of effect of this variation.

If you would like to discuss this matter, please contact Resource Operations Customer Service on 4063 6600.

Yours sincerely,

Stephen Wills
Executive Director
Resource Operations
Division of Resources and Geoscience

NSW Department of Planning and Environment
Division of Resources & Geoscience – Titles Services
516 High St Maitland NSW 2320 PO | Box 344 Hunter Region Mail Centre NSW 2310
Tel: (02) 4063 6600 Fax: (02) 4063 6974 Email: titles.services@planning.nsw.gov.au
www.resourcesandenergy.nsw.gov.au
ABN 38 755 709 681

Variation of Mining Lease
Clause 12(1) of Schedule 1B

I, Stephen Wills, Executive Director, Resource Operations, Resource Operations, with the delegated authority of the Minister for Resources, pursuant to clauses 7(1)(b1) and 12(1) of Schedule 1B of the *Mining Act 1992*, authorise the variation of Mining Lease 1597 by attaching the conditions specified in Schedule A in respect of carrying out the ancillary mining activity(s) described in Schedule B on the land described in Schedule C.

Schedule A

Pursuant to clause 7B(2) of Schedule 1B of the *Mining Act 1992*, the following conditions apply to the carrying out of the ancillary mining activity(s) in Schedule B, as if the ancillary mining activity(s) is an activity(s) carried out in accordance with the Mining Lease:

1. **Rehabilitation**
   The lease holder must rehabilitate the land described in Schedule C that is or may be affected by the carrying out of the ancillary mining activity(s).

2. **Mining Operations Plan and Annual Rehabilitation Report**
   2.1 Condition 2 of Mining Lease 1597 relevant to the Mining Operations Plan (MOP) and annual rehabilitation report applies to the ancillary mining activity(s).
   2.2 The lease holder must update the MOP to incorporate the carrying out of the ancillary mining activity(s) and submit the updated MOP to the Minister for approval within 45 days of this variation.

Schedule B

The activity(s) prescribed as ancillary mining activities by clause 7 of the *Mining Regulation 2016*, listed below:

1. Construction, maintenance or use of any drain or water race associated with the rehabilitation of the Mountain Block area, as identified on the indicative plan at Attachment A prepared by Liddell Coal Operations Pty. Limited.
2. Removal, stockpiling or depositing of overburden or ore associated with the rehabilitation of the Mountain Block Area, as identified on the indicative plan at Attachment A prepared by Liddell Coal Operations Pty. Limited.

Schedule C

The Land described in the attached survey plan M27521 for AMA1020, approved on 10 December 2019 which is not embraced by the lease plan M27018 attached to Mining Lease 1597 (Act 1992).

Dated this 21st day of January 2020

Stephen Wills
Executive Director
Resource Operations
Division of Resources and Geoscience

Our ref: MAAG0006064
LETT0003749

LIDDELL TENEMENTS PTY LIMITED
PO BOX 7
SINGLETON NSW 2330
Attn: LIDDELL TENEMENTS PTY LIMITED

Dear LIDDELL TENEMENTS PTY LIMITED

ML 1313 (1992), ML 1552 (1992), CCL 708 (1973), ML 1597 (1992), LIDDELL TENEMENTS PTY LIMITED
Approval of Mining Operations Plan

NOTICE OF APPROVAL

Pursuant to the relevant Condition of ML 1313 (1992), ML 1552 (1992), CCL 708 (1973), ML 1597 (1992), the Mining Operations Plan (MOP) that was submitted to the Resources Regulator within the Department of Planning, Industry & Environment (Resources Regulator) on 7 February 2020 (Department Reference: MAAG0006064) is approved for the period from the date of this approval until 1 December 2020.

It is the responsibility of the Authorisation Holder to ensure that all mining and mining related operations described in this MOP are as approved within the relevant Project Approval or Development Consent and all necessary approvals, consents or permits required under the relevant NSW or Commonwealth regulations have been obtained prior to carrying out the operations.

It is the responsibility of the Authorisation Holder to fulfil their obligations and commitments to the rehabilitation outcomes and performance standards as approved by the relevant consent authority to ensure the rehabilitation outcomes identified are achieved.

ASSESSED DEPOSIT

Approval of this MOP has triggered a review of the assessment of the security deposit required to secure funding for the fulfilment of rehabilitation obligations under the listed Mining Authorisation Number(s).

Notice of the change in the security deposit condition related to this MOP approval will be provided separately.

DEFINITIONS

In this letter, words have the meaning given to those terms in the *Mining Act 1992*, unless otherwise specified below.

Authorisation Holder means the holder of the relevant authorisation(s).

Mining Operations Plan means the project, mining and mining related operations described in the "Liddell Mining Operations Plan 208 - 2020 Amendment B".

If you require additional information, please contact the Resources Regulator on 1300 814 609 (Option 2, then 5), or via email at nswresourcesregulator@service-now.com.

Yours sincerely,

Peter Ainsworth
Manager Environmental Operations
Mining Act Inspectorate
Resources Regulator
NSW Department of Planning, Industry & Environment

17 February 2020

Signed under delegation from the Minister for Resources, Secretary of the NSW Department of Planning, Industry and Environment