



Moolarben Coal Complex Open Cut Optimisation Modification

Environmental Assessment

ENVIRONMENTAL ASSESSMENT



**MOOLARBEN COAL COMPLEX
OPEN CUT OPTIMISATION MODIFICATION**

ENVIRONMENTAL ASSESSMENT

MOOLARBEN COAL PROJECT STAGE 1
PROJECT APPROVAL (05_0117) [MOD 14]

MOOLARBEN COAL PROJECT STAGE 2
PROJECT APPROVAL (08_0135) [MOD 3]



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1 INTRODUCTION

The Moolarben Coal Complex is located approximately 40 kilometres (km) north of Mudgee in the Western Coalfields of New South Wales (NSW) (Figure 1).

Moolarben Coal Operations Pty Ltd (MCO) is the operator of the Moolarben Coal Complex on behalf of the Moolarben Joint Venture (Moolarben Coal Mines Pty Ltd [MCM], Sojitz Moolarben Resources Pty Ltd and a consortium of Korean power companies). MCO and MCM are wholly owned subsidiaries of Yancoal Australia Limited (Yancoal).

The Moolarben Coal Complex comprises four approved open cut mining areas (OC1 to OC4), three approved underground mining areas (UG1, UG2 and UG4) and other mining related infrastructure (including coal processing and transport facilities) (Figure 2).

Mining operations at the Moolarben Coal Complex are currently approved until 31 December 2038 in accordance with Project Approval (05_0117) (Moolarben Coal Project Stage 1) (as modified) and Project Approval (08_0135) (Moolarben Coal Project Stage 2) (as modified).

Since the commencement of coal mining operations in 2010, mining activities have occurred within OC1, OC2 and OC4 (Figure 2). First workings for UG1 commenced in April 2016, with secondary workings (i.e. longwall extraction) commencing in October 2017.

This Environmental Assessment (EA) has been prepared for MCO to support requests to modify both the Stage 1 and Stage 2 Project Approvals (05_0117 and 08_0135, respectively) under section 75W of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act) (the Open Cut Optimisation Modification [the Modification]).

Secretary's Environmental Assessment Requirements (SEARs) were issued for the Modification by the NSW Department of Planning and Environment (DPE) (Attachment 1).

Relevant components of the Modification were referred to the Commonwealth Department of the Environment and Energy (DEE) (Reference 2017/7974). The DEE's Referral decision was that the Modification is a controlled action, and therefore, approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) is required.

The controlled action will be assessed under the assessment bilateral agreement with the NSW Government, and as such, this EA has also been prepared to address the DEE's assessment requirements, which are included in the SEARs (Attachment 1).

A reconciliation against the SEARs and the DEE's assessment requirements is provided in Tables 1 and 2.

The key element of the Modification is an increase in run-of-mine (ROM) coal production from the Stage 1 and Stage 2 open cuts (OC1 to OC4).

The Modification also involves a minor extension to the OC2 pit limit, minor extensions and reductions of the OC3 pit limits and relocated/additional surface infrastructure (Figure 2). These elements of the Modification would require additional surface disturbance (Figure 2). However, net disturbance associated with the Modification would be reduced by the relinquishment of areas of approved disturbance, which would no longer be required for major surface infrastructure.

In addition, the approved OC3 out-of-pit emplacement would no longer be required for permanent out-of-pit rock emplacement, with waste rock extracted during the initial development of OC3 to be used as backfill material following temporary emplacement out-of-pit.

1.1 BACKGROUND

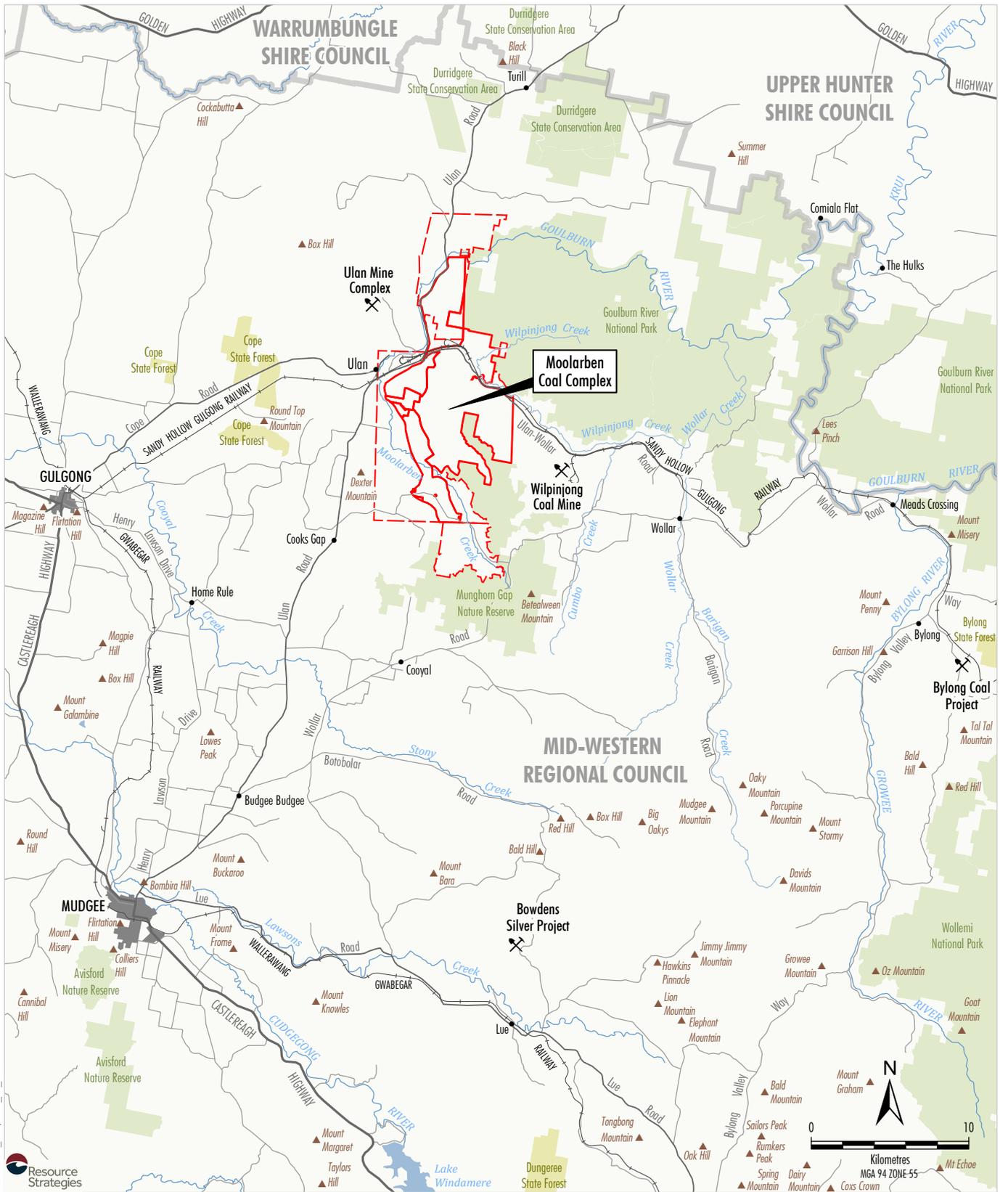
1.1.1 Moolarben Coal Complex History

The Moolarben Coal Project Stage 1 was approved by the NSW Minister for Planning on 6 September 2007 (Project Approval [05_0117]).

Stage 1 of the Moolarben Coal Complex comprises open cut operations in OC1, OC2 and OC3, underground mining operations in UG4 and the handling, processing and rail transport of coal from both Stage 1 and Stage 2.

The Moolarben Coal Project Stage 2 was approved by the Planning Assessment Commission (as delegate of the NSW Minister for Planning) on 30 January 2015 (Project Approval [08_0135]).

Stage 2 of the Moolarben Coal Complex comprises open cut operations in OC4 and underground operations in UG1 and UG2. All ROM coal produced by the Stage 2 operations is transported to the Stage 1 coal handling and processing facilities.



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Resource Strategies

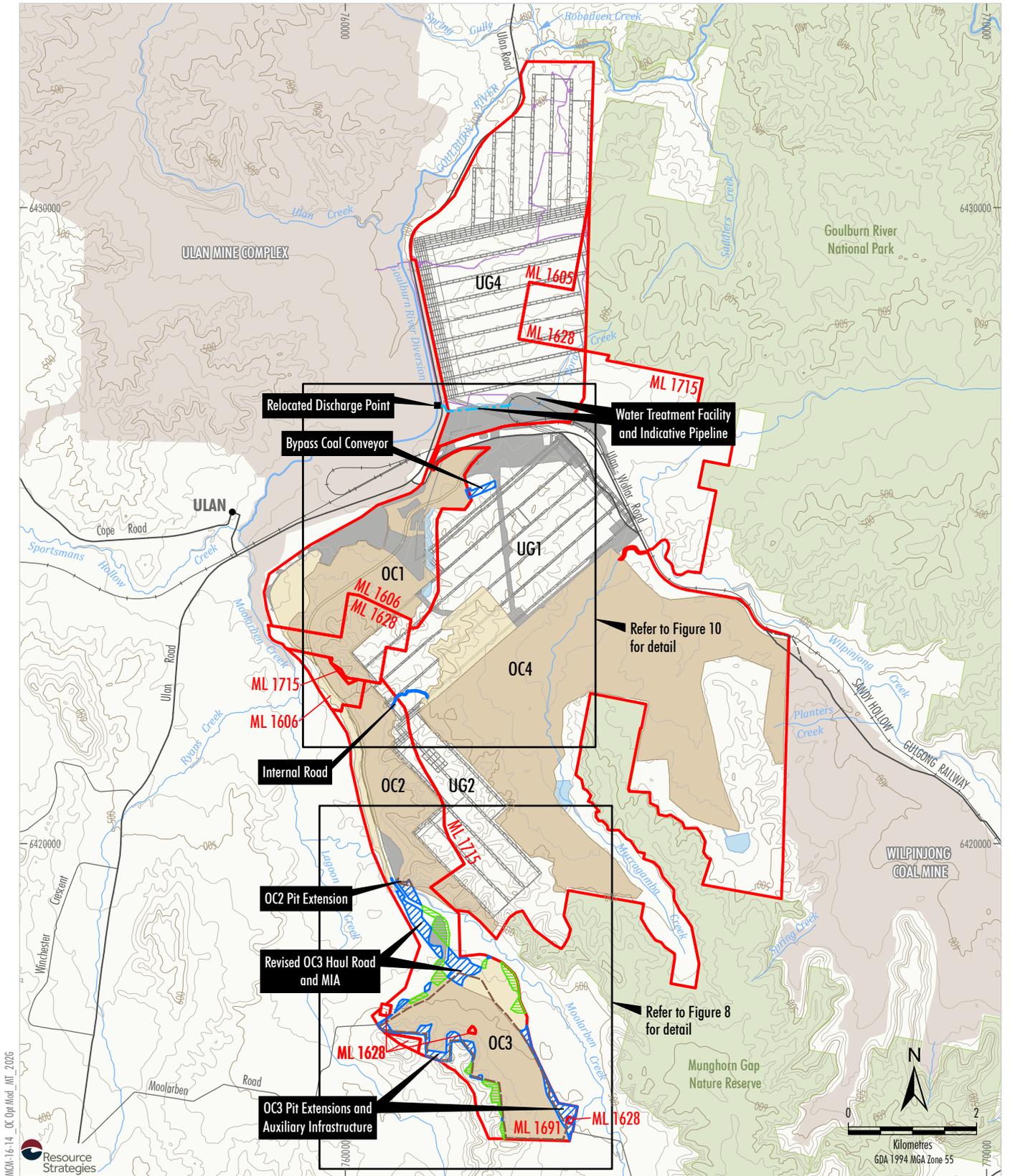


- LEGEND**
- State Forest
 - NSW National Parks and Wildlife Service
 - Local Government Boundary
 - Exploration Licence Boundary
 - Mining Lease Boundary
 - Mining Operation

Source: NSW Land & Property Information (2017); NSW Department of Industry (2017); Office of Environment and Heritage NSW (2017)


MOOLARBEN COAL COMPLEX
 Regional Location

Figure 1



MOA-16-14_OC Opi Mod_MIT 2026
 Resource Strategies

- LEGEND**
- NSW National Parks and Wildlife Service
 - Other Mining Operations
 - Mining Lease Boundary
 - Existing/Approved Development
 - Open Cut Mining Area
 - Out-of-pit Emplacement
 - Surface Infrastructure Area
 - Pipeline and Borefield Infrastructure
 - Clean Water Diversion Infrastructure
 - Underground Longwall Layout
 - Haul Road
 - Road Realignment (not yet constructed)

- Open Cut Optimisation Modification**
- Approximate Extent of Revised Open Cut Mining Area
 - Approximate Extent of Additional Surface Development
 - Approved Open Cut Mining Area, Out-of-pit Emplacement and Surface Infrastructure to be Relinquished

Source: MCO (June 2017); NSW Dept of Industry (2017);
 NSW Land & Property Information (2017);
 Office of Environment and Heritage NSW (2017)

MOOLARBEN COAL
 MOOLARBEN COAL COMPLEX
 Open Cut Optimisation Modification
 General Arrangement

Figure 2

Table 1
Secretary’s Environmental Assessment Requirements – Reference Summary

Summary of EA Requirement	EA Reference
General Requirements	
The EA must include:	
• A full description of the Modification.	Sections 3 and 5
• An assessment of the likely impacts of the Modification on the environment.	Section 4 and Appendices A to I
• A consolidated summary of all the proposed environmental management and monitoring measures associated with the Modification, and how these measures would be integrated into the existing environmental management framework of the Moolarben Coal Complex.	Section 7
• The reasons why the Modification should be approved having regard to biophysical, social and economic considerations.	Section 7
The EA must also address the requirements relating to the assessment of matters of national environmental significance under the EPBC Act, in accordance with the Bilateral Agreement between the Commonwealth and NSW Governments.	Table 2
Key Issues	
The EA must address the following issues:	
• Water;	Sections 4.5 to 4.8 and Appendices E to I
• Biodiversity;	Section 4.3 and Appendix C (terrestrial) and Section 4.8 and Appendix G (aquatic)
• Noise;	Section 4.1 and Appendix A
• Air Quality;	Sections 4.2 and 4.9.5 and Appendix B
• Transport;	Section 4.9.2
• Heritage;	Sections 4.4 and 4.9.1 and Appendix D
• Land;	Section 4.9.4
• Visual;	Section 4.9.3
• Public Safety; and	Section 4.9.8
• Social and Economic.	Section 4.9.7
Consultation	
Consultation with local government, relevant State and Commonwealth Government authorities, service providers, community groups, Registered Aboriginal Parties (RAPs) and affected landowners must be conducted during preparation of the EA. The EA must describe the consultation that was carried out, identify the issues raised during this consultation, and explain how these issues have been addressed in the EA.	Section 1.4

Note: The complete version of the SEARs is presented in Attachment 1.

Table 2
Assessment Requirements Relevant to the Environment Protection and
Biodiversity Conservation Act, 1999 – Reference Summary

Summary of EA Requirement	EA Reference
General Requirements	
The EA must include:	
<ul style="list-style-type: none"> • a description of the project; 	Sections 1 to 5
<ul style="list-style-type: none"> • assessment of relative impacts of the Modification on threatened species and communities and water resources; and 	Section 4.3 and 4.5 to 4.8 and Appendices C and E to I
<ul style="list-style-type: none"> • information on proposed avoidance, mitigation and offsetting measures to deal with the impacts of the Modification on the relevant matters. 	Section 4.3 and 4.5 to 4.8 and Appendices C and E to I
Key Issues	
The EA must address issues relating to:	
<ul style="list-style-type: none"> • biodiversity; and 	Section 4.3 and Appendix C
<ul style="list-style-type: none"> • a water resource, in relation to coal seam gas development and large coal mining development. 	Sections 4.5 to 4.8 and Appendices E to I
Environmental Record of person proposing to take the action	
The information provided in the EA must include details of any proceedings under Commonwealth, State or Territory law for the conservation and sustainable use of natural resources.	Attachment 1
If the person proposing to take the action is a corporation, details of the corporation's environmental policy and planning framework must also be included.	

Note: The complete version of the assessment requirements relevant to the EPBC Act is presented in Attachment 1.

1.2 MODIFICATION OVERVIEW

The Modification involves the changes to the approved Moolarben Coal Complex operations described below.

Annual Production Limits

Review of the mine schedule and planning indicates MCO can optimise its operations to increase annual coal production volumes with no material change to the existing mining fleet.

As a result, the ROM coal production from the open cuts would increase as follows:

- increase in combined ROM coal production from the Stage 1 open cuts (OC1, OC2 and OC3) from 8 to 10 million tonnes per annum (Mtpa);
- increase in ROM coal production from the Stage 2 open cut (OC4) from 12 to 16 Mtpa; and
- an associated increase in the combined Stage 1 and Stage 2 open cut ROM coal limit from 13 to 16 Mtpa.

The increased open cut production limits would result in the following additional changes to the approved Moolarben Coal Complex:

- increase in the coal processing (washing) limit from 13 to 16 Mtpa;
- increase in the combined open cut and underground ROM coal limit from 21 to 24 Mtpa;
- increase in the product coal limit from 18 to 22 Mtpa;
- increase in product coal rail movements (one additional train per day on average and two additional trains per day at peak); and
- increase in the annual rate of coal reject production.

Open Cut Pit Limits

To facilitate safe and efficient mining, increase long-term stability of the final landform and in consideration of the latest resource drilling results, there would be minor changes to the OC2 and OC3 pit limits, as follows (Figure 2):

- minor increase to the pit limit in the south-west of OC2 (to avoid leaving a potentially geotechnically unstable section of hill between the current pit limit and Moolarben Creek);

- straightening of the western pit limits of OC3, resulting in both minor extensions and minor reductions in pit limits; and
- minor extensions to the northern and eastern pit limits of OC3.

Final Landuse

The approved OC3 out-of-pit emplacement would no longer be required for permanent out-of-pit waste rock emplacement, with waste rock extracted during the initial development of OC3 to be used as backfill material in OC2 and OC3 (some waste rock may be temporarily emplaced in this area during initial OC3 establishment).

In addition, some areas of the final landform in OC2 and OC3 would be rehabilitated to woodland, rather than agricultural land, to improve conservation outcomes and for consistency with adjacent areas of native vegetation.

Mine Infrastructure

The Modification involves the following minor changes to infrastructure at the Moolarben Coal Complex, which would result in extensions to the approved extent of surface development (Figure 2):

- relocation of the OC3 mine infrastructure area (MIA) (including access tracks, power, services, communications, explosives reload facilities and pipelines) to within the approved disturbance footprint of the OC3 out-of-pit emplacement (portions of the currently approved MIA footprint would no longer be required);
- revised alignment and widening of the haul road from OC2 to OC3, with the revised width of the haul road corridor determined by the distance required for haul trucks to safely pass (e.g. Cat 789s), and to allow for water management infrastructure (portions of the currently approved haul road footprint would no longer be required);
- new internal road from OC2 to OC4 to allow for the occasional transfer of mining equipment (i.e. no waste or coal haulage is proposed);
- new bypass conveyor to enable coal from the open cuts of suitable quality to be bypassed (i.e. not washed/processed at the Coal Handling and Preparation Plant [CHPP]); and
- CHPP additions within the CHPP footprint, including an additional thickener and additional belt press filters.

Other minor surface infrastructure would also be developed within the extent of approved surface development:

- additional ROM coal stockpiles (at OC3 and for open cut and underground bypass coal), relocation of OC4 ROM coal facilities and increased size of product coal stockpiles;
- upgrade of the train loadout infrastructure (including conveyor and bin upgrades) to facilitate more efficient train loading;
- installation of water treatment facilities and associated water storages adjacent to the existing rail loop area to provide water for on-site use and support the controlled release of water under Environment Protection Licence (EPL) release conditions, with an increase in the rate of controlled releases, when required;
- construction of pipelines from the water treatment facilities to a relocated EPL discharge point at the confluence of Bora Creek and the Goulburn River Diversion;
- stockpiling of material excavated during construction activities for use in final landform shaping and rehabilitation; and
- ongoing exploration activities within the Moolarben Coal Complex mining leases.

Table 3 provides a summary comparison of the currently approved Moolarben Coal Complex under Stage 1 Project Approval (05_0117) and Stage 2 Project Approval (08_0135), and the Moolarben Coal Complex incorporating the Modification.

The Modification **does not** involve changes to the Moolarben Coal Complex (Stages 1 and 2) for the following relevant approval components:

- operational mine life;
- OC1 or OC4 pit limits;
- hours of operation;
- underground coal extraction limits or mine layouts;
- blasting frequency limits;
- site access;
- method of reject disposal; and
- peak workforce.

1.2.1 Modification Justification

Justification for the Modification is based on the following:

- The proposed increases in the rate of open cut ROM coal production can be achieved with no material change to the existing mining fleet. Noise and air quality modelling conducted for the Modification shows the Moolarben Coal Complex can continue to operate in accordance with current Project Approval limits for noise and air quality.
- A suitable offset property has been identified to compensate for the majority or all of the additional surface disturbance required for the Modification, with any residual offset requirements to be satisfied via supplementary measures outlined in the NSW *Framework for Biodiversity Assessment* (FBA) (NSW Office of Environment and Heritage [OEH], 2014a).
- The Modification would result in an improved final landform due to the removal of the approved OC3 out-of-pit emplacement.
- The Modification would improve efficiency of resource recovery, which would result in an increase in Government royalties of approximately \$82 million (M). The net present value (NPV) of this Government royalty increase is approximately \$69M. The increase is as a result of:
 - minor increases in ROM coal from the OC2 and OC3 pit limit extensions;
 - inclusion of a CHPP bypass circuit for open cut ROM coal, enabling open cut yield increases (and associated reduced production of reject material); and
 - increased rate of recovery of the resource.
- The increased production limits allow annual revenue from the Moolarben Coal Complex to increase. This improves the productivity of the Moolarben Coal Complex, which improves the security of the continued employment of the existing workforce and ongoing expenditure in the State and local economies.
- The modifications and additions to infrastructure for the Modification would create construction employment at the Moolarben Coal Complex.

Table 3
Summary Comparison of Approved and Modified Moolarben Coal Project

Relevant Approval Component	Moolarben Coal Complex		Moolarben Coal Complex (including the Modification)	
	Stage 1 Project Approval (05_0117)	Stage 2 Project Approval (08_0135)	Stage 1 Project Approval (05_0117)	Stage 2 Project Approval (08_0135)
Operational Mine Life	Mining operations can be carried out until 31 December 2038.		Unchanged.	
Hours of Operation	Mining operations can be carried out 24 hours per day, 7 days per week.		Unchanged.	
Coal Extraction Limits	Up to 8 million tonnes (Mt) of ROM coal can be extracted from the open cut mining operations in any calendar year.	Up to 12 Mt of ROM coal can be extracted from the open cut mining operations in any calendar year.	Up to 10 Mt of ROM coal extracted from the open cut mining operations in any calendar year.	Up to 16 Mt of ROM coal extracted from the open cut mining operations in any calendar year.
	Up to 13 Mt (total) of ROM coal can be extracted from the open cut operations at the Moolarben Coal Complex in any calendar year.		Up to 16 Mt (total) of ROM coal extracted from the open cut operations at the Moolarben Coal Complex in any calendar year.	
Underground Coal Extraction Limits	Up to 8 Mt (total) of ROM coal can be extracted from the underground mining operations at the Moolarben Coal Complex in any calendar year.		Unchanged.	
Coal Processing and Offsite Transport	Up to 13 Mt (total) of ROM coal from the Moolarben Coal Complex can be processed (washed) in any calendar year, except in the year 2017.	The Proponent shall ensure that all coal extracted from the site is sent to the Moolarben Stage 1 mine surface infrastructure area for processing (washing) and/or transport to market.	Up to 16 Mtpa of ROM coal from the Moolarben Coal Complex can be processed (washed) in any calendar year.	Unchanged.
	Up to 13.5 Mt (total) of ROM coal from the Moolarben Coal Complex can be processed (washed) in 2017.			
	Total coal production of 18 Mtpa.			
	All coal is to be transported from the site by rail (average of 7 trains per day and peak of 9 trains per day).		Total coal production of 22 Mtpa.	
			Average of 8 trains per day and peak of 11 trains per day.	
Blasting Frequency Limits	A maximum of 2 blasts per day and 9 blasts per week (averaged over a calendar year) can be carried out at the Moolarben Coal Complex.		Unchanged.	
	Blasting can be carried out on site between 9:00 am and 5:00 pm Monday to Saturday inclusive. No blasting allowed on Sundays, public holidays, or at any other time without written approval of the Secretary.			
Biodiversity Offset Strategy	The Biodiversity Offset Strategy is shown in Appendix 8 of the Project Approval (05_0117).	The Biodiversity Offset Strategy is shown in Appendix 7 of the Project Approval (08_0135).	Updated Biodiversity Offset Strategy to account for additional disturbances as required.	
Site Access	Site access via Ulan Road and Ulan-Wollar Road.		Unchanged.	

Table 3 (Continued)
Summary Comparison of Approved and Modified Moolarben Coal Project

Relevant Approval Component	Moolarben Coal Complex		Moolarben Coal Complex (including the Modification)	
	Stage 1 Project Approval (05_0117)	Stage 2 Project Approval (08_0135)	Stage 1 Project Approval (05_0117)	Stage 2 Project Approval (08_0135)
Water Management Design and Objectives	Design, install and maintain the dams generally in accordance with the series <i>Managing Urban Stormwater: Soils and Construction – Volume 1 and Volume 2E Mines and Quarries</i> .		Unchanged.	
	Ensure there is sufficient water for all stages of the project in accordance with Condition 29, Schedule 3 of Stage 1 Project Approval (05_0117) and Condition 25, Schedule 3 of Stage 2 Project Approval (08_0135).			
	Maximise as far as reasonable and feasible the diversion of clean water around disturbed areas on site.			
	Mine water storage infrastructure is designed to store a 50 year average recurrence interval 72 hour storm event.	Mine water storage infrastructure is designed to store a 100 year average recurrence interval 72 hour storm event.		
	On-site storages (including tailings dams, mine infrastructure dams, groundwater storage and treatment dams) are suitably lined to comply with a permeability standard of less than 1×10^{-9} metres per second (m/s).	On-site storages (including tailings dams, mine infrastructure dams, groundwater storage and treatment dams) are suitably lined to comply with a permeability standard of less than 1×10^{-9} m/s.		
	Unless an EPL authorises otherwise, MCO will comply with section 120 of the NSW <i>Protection of the Environment Operations Act, 1997</i> (PoEO Act). (EPL 12932 currently authorises controlled releases of up to 10 megalitres per day [ML/day] to the Goulburn River)	Unchanged. Water treatment facilities to support authorised discharge under EPL water release limits and increase in maximum rate of controlled releases from 10 to 20 ML/day, when required.		
Coal rejects	Co-disposal of coal rejects with waste rock in the open cut voids.		Unchanged.	
Employment	Peak operational workforce of 740 personnel. Average operational workforce of 667 personnel. Peak construction workforce of 250 personnel. Average construction workforce of 120 personnel.		Unchanged.	

1.3 SITE LOCATION AND TENURE

The Moolarben Coal Complex is located within Mining Lease (ML) 1605, ML 1606, ML 1628, ML 1691, ML 1715 and within Exploration Licence (EL) 6288, EL 7073 and EL 7074.

The Project Application Areas and the real property descriptions are provided in Appendix 1 of the Stage 1 and 2 Project Approvals, which are provided as Attachments 2 and 3 to this EA.

Relevant land ownership information within the immediate vicinity of the Moolarben Coal Complex is provided on Figures 3 and 4.

The Moolarben Coal Complex is located within the Mid-Western Regional Local Government Area (LGA).

1.4 CONSULTATION

MCO consults with relevant State Government agencies on a regular basis in regard to the approved Moolarben Coal Complex.

Consultation for the Modification has been conducted with key State and Commonwealth Government agencies, local councils, asset owners, affected landowners, the local community, Aboriginal stakeholders and neighbouring mines during the preparation of this EA. A summary of consultation to date is provided below. Consultation will continue during both the public exhibition of this EA and the assessment of the Modification.

Department of Planning & Environment

Briefings with the DPE were conducted in November 2016, December 2016 and May 2017 to provide an overview of the proposed Modification, approvals pathway and proposed scope of environmental assessment.

On 12 October 2017, the DPE issued SEARs for the Modification (Attachment 1).

Commonwealth Department of Environment and Energy

Relevant components of the Modification were referred to the DEE in June 2017, with the DEE deciding the Modification was a controlled action on 24 August 2017.

The DEE's assessment requirements for the Modification are included in the SEARs (Attachment 1).

Regulatory Agencies and Local Council

MCO consulted with the following regulatory authorities, providing an overview description of the Modification and proposed scope of environmental assessment:

- NSW Division of Resources and Geoscience (DRG);
- NSW Environment Protection Authority (EPA);
- OEH;
- NSW Department of Primary Industries - Water (DPI Water);
- NSW Roads and Maritime Services (RMS);
- Transport for NSW; and
- Mid-Western Regional Council (MWRC).

The EPA provided feedback to MCO indicating the EA should consider the Hunter River Salinity Trading Scheme (HRSTS). The HRSTS is considered in Section 4.6.2.

The RMS provided feedback to MCO indicating the EA should consider potential impacts to the road network, which is provided in Section 4.9.2.

Neighbouring Mines

No direct interaction between the Modification and the neighbouring Ulan Mine Complex and Wilpinjong Coal Mine is expected (i.e. beyond the currently approved Moolarben Coal Complex).

Potential cumulative impacts with the Ulan Mine Complex and Wilpinjong Coal Mine have been considered where relevant in this EA.

MCO consulted with Ulan Coal Mines Limited (UCML) and Wilpinjong Coal Pty Ltd to provide an overview of the Modification.

Asset Owners

MCO sent briefing letters providing an overview description of the Modification to the following asset owners:

- Australian Rail Track Corporation (ARTC);
- TransGrid;
- Telstra;
- Essential Energy; and
- MWRC.

Ref No	Landholder	Ref No	Landholder	Ref No	Landholder	Ref No	Landholder
1-8	Moolarben Coal Operations Pty Ltd	98	ME & JJ Piper	184	(a&b) LA Stevenson	251	NF Potter & CE Selley
9	Orica Australia Pty Limited	99	DE Jenner & WB Jensen	186	RW & IJ Adamson	253-254	Ulan Coal Limited
10	Moolarben Coal Operations Pty Ltd	100	W Ellem	187	BT & KM Feeney	255	HJ & H Schmitz
11	JE Mullins & CD Imrie	101	RD & DMZ Hull	188	KR & T Fielding	256	RC Campbell
12-25	Moolarben Coal Operations Pty Ltd	101(a)	PJ Kearns	189	GA Fay	258	PM & CD Elias
26	Forty North Pty Limited	102	KA Roberts	190	T & LK Sahyoun	300	CM Collins & CY Marshall
27-33	Moolarben Coal Operations Pty Ltd	103	SB Burnett & SL Grant	191	BW & TS Lasham	301-302	Moolarben Coal Operations Pty Ltd
34	T Rheinberger	104	RA & LA Deeben	192	D Williams	303	HJ Ungaro
35-36	Moolarben Coal Operations Pty Ltd	105	DJ & N Katsikaris	193	DJ Moloney	304	G Balajan
37	M Stewart	106	TB & JH Reid	194	PM & K Potts	305	L Barisic & M Aul
38	The State of New South Wales	107	ZJ & M & AA Raso	195	R Cottam	306	E Armstrong
39	RM & DJ Sprigg	108	R Varga	196	F Saxberg & M Weir	307	M Chant & NK Young
40	JM Devenish	109	DA Evans	197	PGG & I Neilsen	308	NA Dower
41	Moolarben Coal Operations Pty Ltd	110	JT Thompson & HT Evans	198	GR & ME Metcalfe	309	GS Maher
41(a&b)	PP Libertis	111	GJ & NJ McEwan	199	PGG & I Nielsen	310	KI Death
42	C & L Schmidt	112	MJ & LM Croft	200	VK Grimshaw	311	BJ & LC Williamson
43-44	Moolarben Coal Operations Pty Ltd	113	CPG Ratcliff	201	KR & GM Towerton	312	MS & JJ Ioannou
45	Advance Energy	114	TF & K Holland	202	H & VF Butler	313	NJ & BDE Pracy
46	Moolarben Coal Operations Pty Ltd/ Ulan Coal Mines Limited	115	PR McLean	203	DJ Miller	314	SL Ford
46(b)	North-Eastern Wiradjuri Wilpinjong Community Fund Limited	116	DJ & SM Reid	204	RB & JE Donnan	315	WJ Richards & BJ Uzelac
47	SF & MR Andrews - Under MCO Contract/Purchase Agreement	117	JM Dick	205	DW Sparrow & M Tallan	316	CR Vassel & CM Williams
48-52	Moolarben Coal Operations Pty Ltd	118	A Scott	206	CA Marshall & R Vella	317	RJ Hore & V Bingham
53	WD & MS Bryant	119	PJ Kearns	207	AA & DM Smith	320	Moolarben Coal Operations Pty Ltd
54	MA & C Harris	120	PS & DR Ord	208	SA & CR Hasaart	325	S & T Fevale
56	MJ & V Cundy	121	EJ Cullen	209	F Mawson	326	AW & LM Murray
58-59	Moolarben Coal Operations Pty Ltd	122	WF Wirth	210	JM & AM Tebutt	327	CA Tanner
59	G & GM Szymkarczuk	123	G Tuck-Lee & Symons	211	SA McGregor & WJ Gray	328	Essential Energy
60	CL Rayner & DM Munday	124	WJ & HE Bailey	212	E & M Lepik	329	G Tuck-Lee
61	MA Miller	125	DB McBride	213	D & J Parsonage		
62	R Menchin	126	MP Julian	214	RK & EG O'Neil		
63	BF & B Whiticker	127	BKT & SA Bracken	215	SG & PM Green		
64	Moolarben Coal Operations Pty Ltd	128	AW Sims	216	G Holland & FA Handicott		
66	Rostherne Pty Limited	129	M Yelds	217	GF & GEL Soady		
69	Moolarben Coal Operations Pty Ltd	130	GP McEwen	219	T & S Riger		
70	DJ & A Coventry	131	GR & RA King	220	SJ Rusten & NJ Smith		
71	Moolarben Coal Operations Pty Ltd	132	N Atkins	221	The State of New South Wales		
73-74	Moolarben Coal Operations Pty Ltd	134	Moolarben Coal Operations Pty Ltd	222	BJ Purtell		
75	P Ban	144	Moolarben Coal Operations Pty Ltd	223	EW Palmer & JM Stewart		
76-78	Moolarben Coal Operations Pty Ltd	148	Moolarben Coal Operations Pty Ltd	224	RS & PCC Dupond		
79	PTJ & SE Nagle	149	Mid-Western Regional Council	225	G & RF Doualetas		
80	W & D Sebelic	151	Roman Catholic Church	226	LAA & FC Muscat		
81	Moolarben Coal Operations Pty Ltd	152	Moolarben Coal Operations Pty Ltd	227	WP & JA Hughes		
82	SC Hungerford & MC Clemens	153	Ulan Coal Mine Limited	229	JJ & BA Lowe		
83	DS Sebelic	154-159	Moolarben Coal Operations Pty Ltd	230	DA Hoole & DT Rawlinson		
85	J & Z Nikolovski	160	Minister For Education And Training	231	T Morrison & SM Benny		
86	NW Harris	160(b)	Moolarben Coal Operations Pty Ltd	232	L & JA Haaring		
87	BJ & K Howe	161	Moolarben Coal Operations Pty Ltd	233	K & D Boal		
88	BC Meyers	162	Rowmint Pty Limited	234	D & L Gaw		
89	MV & HM Glover & E & BJ Tomlinson	163-166	Moolarben Coal Operations Pty Ltd	235	LM & RS Wilson		
90	SA Powell	168	PJL Constructions Pty Limited	236	RG & CA Donovan		
91	HM Graham	169-170	Moolarben Coal Operations Pty Ltd	237	B & S Stokes		
92	VA Pulicino & J, S & G Bonnici	171	AD & SA McGregor	238	B Powell		
93	F & M Fenech	172-177	Moolarben Coal Operations Pty Ltd	239-241	Moolarben Coal Operations Pty Ltd		
94	LK Mittermayer	178	PR Stone	244	JT & YR Jones		
95	BJ Withington	180	CD & LL Barrett	245	MP & KLE Gresham		
96	D Lazicic	181	SM Forster	247	J & K Batshon		
97	DJ & MD Smith	182	J Dutoitcook	248	G Boustani		
		183	R & EA Steines	249	CJ & JI Eldridge		

Subsequent meetings were held with ARTC in regard to MCO's ongoing rail movements. ARTC confirmed in a letter dated 20 October 2017 that sufficient rail capacity can be made available for the Modification.

Registered Aboriginal Parties

MCO consulted with RAPs as part of the Aboriginal Cultural Heritage Assessment (ACHA) prepared for the Modification. A copy of the draft ACHA was provided to the RAPs for comment on 15 May 2017. Comments received from the RAPs were incorporated into the final ACHA (Appendix D).

1.4.1 Community Consultation

Local Community

The current Community Consultative Committee (CCC) was established in accordance with both Project Approvals (05_0117 and 08_0135) in March 2015.

The CCC provides a mechanism for ongoing communication between MCO and the local community. MCO conducted briefings with the CCC in March, June and September 2017, providing an overview (and subsequent updates) of the Modification and proposed scope of environmental assessment.

MCO notified the local community of the Modification via a fact sheet and newsletter, providing an overview of the Modification and proposed scope of environmental assessment. The fact sheet and newsletter were distributed throughout March and April 2017, with a second newsletter distributed in October 2017. Both newsletters were included in the Mudgee Guardian.

Public Consultation

The MCO website (www.moolarbencoal.com.au) provides regular updates on the Moolarben Coal Complex, and provides access to relevant environment and community information, including EA documents, compliance reports and approval documents.

The Moolarben Coal Hotline (1800 556 484) allows members of the public to contact MCO with enquiries or complaints.

A copy of this EA will be made available on the Moolarben Coal website.

1.5 STRUCTURE OF THE EA

This EA is structured as follows:

Section 1	Provides an overview of the existing/approved Moolarben Coal Complex, the Modification and a summary of the consultation undertaken in relation to the Modification.
Section 2	Provides a description of the existing/approved Moolarben Coal Complex.
Section 3	Provides a description of the Modification.
Section 4	Provides a review of the existing environment, assesses the potential impacts associated with the Modification and describes the existing MCO environmental management systems and measures in place to manage and monitor any potential impacts and identifies any additional controls required.
Section 5	Provides a description of the Moolarben Coal Complex Rehabilitation Strategy.
Section 6	Provides the planning framework and statutory context.
Section 7	Provides the conclusions of the EA.
Section 8	References and abbreviations.

Attachments 1 to 3 and Appendices A to I provide supporting information as follows:

Attachment 1	Secretary's Environmental Assessment Requirements
Attachment 2	Stage 1 Project Approval (05_0117)
Attachment 3	Stage 2 Project Approval (08_0135)
Appendix A	Noise Assessment
Appendix B	Air Quality Assessment
Appendix C	Biodiversity Assessment Review
Appendix D	Aboriginal Cultural Heritage Assessment
Appendix E	Site Water Balance and Surface Water Assessment
Appendix F	Controlled Water Release Impact Assessment
Appendix G	Aquatic Ecology Assessment
Appendix H	Geochemistry Review
Appendix I	Groundwater Assessment

2 SUMMARY DESCRIPTION OF EXISTING/APPROVED MOOLARBEN COAL COMPLEX

The following provides a summary description of the existing/approved Moolarben Coal Complex. Further description of the approved Stage 1 and Stage 2 operations is available in the respective EAs (including subsequent modifications).

2.1 APPROVALS HISTORY

Moolarben Coal Project (Stage 1)

The Moolarben Coal Project Stage 1 was approved under Part 3A of the EP&A Act by the NSW Minister for Planning on 6 September 2007 (Project Approval [05_0117]). Thirteen Modifications to Project Approval (05_0117) have since been approved, as summarised below.

- **MOD 1:** In August 2008, MCO submitted an application to modify Project Approval (05_0117) under section 75W of the EP&A Act to reconfigure the CHPP, emergency tailings dam, transfer stations and conveyors, rail loop, coal stockpiles, UG4 conveyor, groundwater treatment ponds and a water storage dam as well as amend the wording of three clauses in the Project Approval. The modification was approved by the NSW Minister for Planning on 26 November 2008.
- **MOD 2:** In December 2008, MCO submitted an application to modify Project Approval (05_0117) under section 75W of the EP&A Act to permit minor construction activities to commence at the site prior to completion of the main mine site access intersection off Ulan-Cassilis Road. The modification was approved by the NSW Minister for Planning on 18 December 2008.
- **MOD 3:** In February 2009, MCO submitted an application to modify Project Approval (05_0117) under section 75W of the EP&A Act to allow for Stage 1 infrastructure to receive, handle and process Stage 2 coal for the life of Stage 2 (to 31 December 2038). An additional void in OC1 was also proposed to allow access to UG4. The modification was approved by the NSW Planning Assessment Commission (as delegate of the NSW Minister for Planning) on 30 January 2015.
- **MOD 4:** In April 2009, MCO submitted an application to modify Project Approval (05_0117) under section 75W of the EP&A Act to change the configuration of the rail loop from a figure-8 to a balloon loop layout. The modification was approved by the NSW Minister for Planning on 30 June 2009.
- **MOD 5:** In June 2009, MCO submitted an application to modify Project Approval (05_0117) under section 75W of the EP&A Act to relocate the ROM coal facility and develop a water sharing pipeline from the Ulan Mine Complex. The modification was approved by the NSW Minister for Planning on 5 October 2009.
- **MOD 6:** In December 2009, MCO submitted an application to modify Project Approval (05_0117) under section 75W of the EP&A Act to relocate and double the capacity of the rejects bin. The modification was approved by the NSW Minister for Planning on 11 January 2010.
- **MOD 7:** In March 2010, MCO submitted an application to modify Project Approval (05_0117) under section 75W of the EP&A Act for the development and operation of a water supply and dewatering borefield and associated ancillary facilities. The modification was approved by the NSW Minister for Planning on 3 February 2011.
- **MOD 8:** In April 2010, MCO submitted an application to modify Project Approval (05_0117) under section 75W of the EP&A Act to establish and operate a ROM coal stockpile adjacent to the ROM coal dump hopper. The modification was approved by the NSW Minister for Planning on 27 May 2010.
- **MOD 9:** In May 2013, MCO submitted an application to modify Project Approval (05_0117) under section 75W of the EP&A Act to increase the extents of the approved Stage 1 open cuts. The modification was approved by the NSW Planning Assessment Commission (as delegate of the NSW Minister for Planning) on 16 June 2014.
- **MOD 10:** In February 2015, MCO submitted an application to modify Project Approval (05_0117) under section 75W of the EP&A Act to increase the Stage 1 open cut ROM coal production rate from 8 to 9 Mtpa for calendar years 2015 and 2016. The modification was approved by the DPE (as delegate of the NSW Minister for Planning) on 17 April 2015.

- **MOD 11:** In April 2015, MCO submitted an application to modify Project Approval (05_0117) under section 75W of the EP&A Act to construct a new haul road, backfill the OC1 void, adjust the site water management systems and refine surface mine infrastructure. The modification was approved by the DPE (as delegate of the NSW Minister for Planning) on 21 August 2015.
- **MOD 12:** In June 2015, MCO submitted an application to modify Project Approval (05_0117) under section 75W of the EP&A Act to increase the amount of ROM coal that can be extracted from underground mining from 4 to 8 Mtpa, adjust mine infrastructure and increase rail departures to seven per day on average and nine per day at peak. The modification was approved by the NSW Planning Assessment Commission (as delegate of the NSW Minister for Planning) on 29 April 2016.
- **MOD 13:** In November 2016, MCO submitted an application to modify Project Approval (05_0117) under section 75W of the EP&A Act to temporarily increase ROM coal washing from 13 Mtpa to 13.5 Mtpa for the 2017 calendar year. The modification was approved by the DPE (as delegate of the NSW Minister for Planning) on 20 January 2017.

Moolarben Coal Project (Stage 2)

The Stage 2 EA was originally prepared by MCO under Part 3A of the EP&A Act. MCO made a number of changes to the proposed layout and design of the Moolarben Coal Project Stage 2 in order to address issues raised by the NSW Department of Planning and Infrastructure (DP&I [now DPE]) and its independent technical reviewers, introduce additional impact avoidance measures and to enable the effective integration of Stage 2 with Stage 1.

Changes to the Moolarben Coal Project Stage 2 were described in the Stage 2 Preferred Project Report (PPR) which was exhibited from 31 January 2012 to 24 February 2012.

The Moolarben Coal Project Stage 2 was approved under Part 3A of the EP&A Act by the NSW Planning Assessment Commission (as delegate of the NSW Minister for Planning) on 30 January 2015 (Project Approval [08_0135]). Two modifications to Project Approval (08_0135) have since been approved, as summarised below:

- **MOD 1:** In April 2015, MCO submitted an application to modify Project Approval (08_0135) under section 75W of the EP&A Act to adjust infrastructure (e.g. Stage 2 haul road) as part of MOD 11 of Stage 1 (refer above). The modification was approved by the DPE (as delegate of the NSW Minister for Planning) on 21 August 2015.
- **MOD 2:** In July 2015, MCO submitted an application to modify Project Approval (08_0135) under section 75W of the EP&A Act to reconfigure UG1 and increase the amount of ROM coal that can be extracted from underground mining from 4 to 8 Mtpa. The modification was approved by the NSW Planning Assessment Commission (as delegate of the NSW Minister for Planning) on 29 April 2016.

Commonwealth Environment Protection and Biodiversity Act, 1999 Approvals

The Moolarben Coal Complex operates in accordance with three Approval Decisions granted by the DEE under the EPBC Act, as summarised below:

- **EPBC 2007/3297:** In February 2007, MCO referred relevant components of Stage 1 of the Moolarben Coal Project to the DEE. Approval under the EPBC Act was granted on 24 October 2007 and was varied by notice on 25 February 2009, 11 May 2010 and 20 July 2016.
- **EPBC 2008/4444:** In September 2008, MCO referred relevant components of Stage 2 of the Moolarben Coal Project to the DEE. Approval under the EPBC Act was granted on 15 May 2015 and was varied by notice on 20 July 2016.
- **EPBC 2013/6926:** In July 2013, MCO referred relevant components of the Stage 1 Optimisation Modification to the DEE. Approval under the EPBC Act was granted on 13 November 2014 and was varied by notice on 20 July 2016.

2.2 CONSTRUCTION

The majority of Stage 1 facilities were constructed in 2009, including the office administration complex, ROM pad, CHPP, rail spur, rail loop and rail loading infrastructure. Additional infrastructure construction activities have occurred as required over the life of the mine. Construction of Stage 2 facilities commenced in 2015.

2.3 OPEN CUT MINING

Four open cut mines (OC1, OC2, OC3 and OC4) targeting Illawarra Coal Measures, including the Ulan and Moolarben Seams, are approved at the Moolarben Coal Complex (Figure 5).

MCO is approved to mine up to 8 Mtpa of ROM coal from OC1, OC2 and OC3 combined (i.e. Stage 1), and up to 12 Mtpa of ROM coal from OC4 (i.e. Stage 2) using conventional open cut coal mining methods. A combined total of 13.5 Mtpa of ROM coal from Stages 1 and 2 is approved to be processed in 2017, and 13 Mtpa thereafter (i.e. the maximum ROM coal extraction rates from Stages 1 and 2 do not occur simultaneously).

MCO is currently conducting open cut mining at the Moolarben Coal Complex in the OC1, OC2 and OC4 pits (Figure 5).

ROM coal from the Stage 1 open cuts (OC1 and OC2) is currently hauled to the Stage 1 ROM coal facility (ROM coal stockpile and transfer bin), where it is sized and conveyed to the CHPP. ROM coal from OC3 will also be hauled to this ROM coal facility when mining commences.

ROM coal from OC4 is generally hauled to the OC4 ROM coal facility (ROM coal stockpile and transfer bin) and then conveyed to the CHPP via a sizing station. If necessary (e.g. during maintenance of the OC4 conveyor) ROM coal can be hauled to the ROM coal stockpile used by OC1, OC2 and OC3 via the OC4 south-west haul road.

Open cut mining is approved 24 hours per day, 7 days per week.

2.4 UNDERGROUND MINING

Three underground mines (UG1, UG2 and UG4) targeting the Ulan Seam are approved to be mined (Figure 5). Up to 8 Mtpa of ROM coal can be extracted from the underground mines using conventional longwall mining and transferred to the surface by conveyors.

The main headings and gate roads would be developed using continuous miners.

Highwall entries for UG1 were constructed in the OC1 highwall. Access to UG2 and UG4 would be via UG1.

ROM coal from the underground mines exits the OC1 highwall and is conveyed to a ROM coal stockpile at the UG1 pit top facilities. This coal is then reclaimed onto a second conveyor and transferred to a sizing station and then to the product stockpile in the CHPP area or trucked to the OC1 ROM coal facility for transfer to the CHPP.

Underground mining is approved 24 hours per day, 7 days per week.

2.5 COAL HANDLING AND PREPARATION

The Moolarben Coal Complex generally produces washed coal products from the open cut operations and unwashed (bypass) coal products from the underground operations (although some development coal requires washing).

The Moolarben Coal Complex is approved to handle up to 21 Mtpa of ROM coal (i.e. 13 Mtpa from open cut operations and 8 Mtpa from underground operations). The CHPP is approved to process (wash) up to 13.5 Mt of ROM coal in 2017, and 13 Mtpa thereafter.

The CHPP area includes an existing washed product coal stockpile and an unwashed (bypass) product coal stockpile.

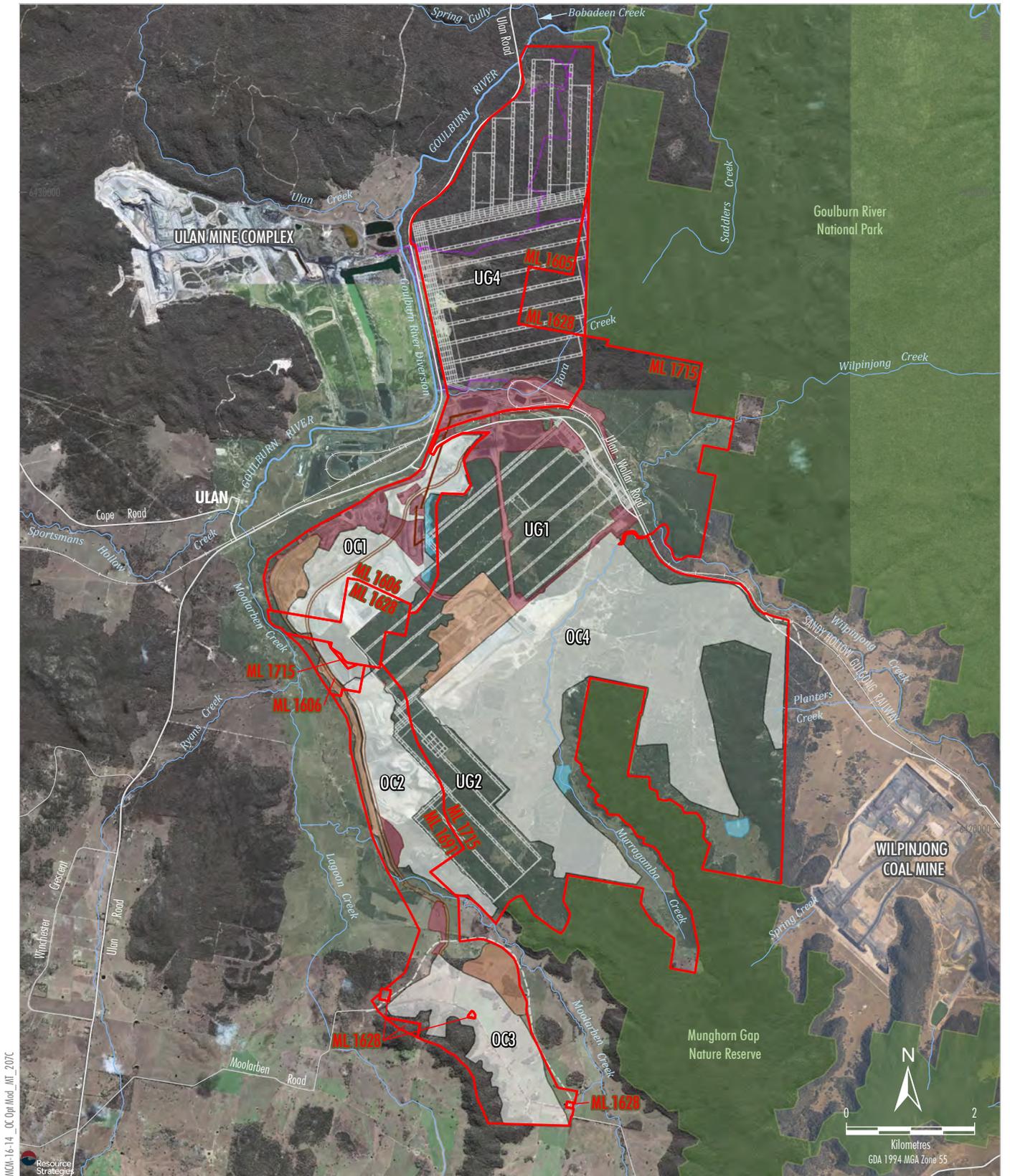
The CHPP is approved to operate 24 hours per day, 7 days per week.

2.6 PRODUCT COAL TRANSPORT

The Moolarben Coal Complex is approved to export up to 18 Mt of product coal from site each year. Product coal is loaded onto trains using a dedicated rail loop and rail loadout facility, and transported to the Port of Newcastle.

The Moolarben Coal Complex is approved to dispatch up to seven trains per day on average and nine trains per day at peak.

Product coal is loaded onto trains 24 hours per day, 7 days per week. Trains arrive and depart the Moolarben Coal Complex 24 hours per day, 7 days per week.



MOL-16-14_OC Opr Mod_Ant_2017C

- LEGEND**
- Mining Lease Boundary
 - Existing/Approved Development
 - Open Cut Mining Area
 - Out-of-pit Emplacement
 - Surface Infrastructure Area
 - Pipeline and Borefield Infrastructure
 - Clean Water Diversion Infrastructure
 - Underground Longwall Layout
 - Haul Road
 - Road Realignment (not yet constructed)

Source: MCO (2017); NSW Dept of Industry (2017); NSW Land & Property Information (2017); Office of Environment and Heritage NSW (2017)
 Orthophoto Mosaic: MCO (April 2016 - May 2012)


MOOLARBEN COAL
COMPLEX
 Approved Moolarben Coal Complex

Figure 5

2.7 WASTE ROCK MANAGEMENT

With the exception of initial boxcut development, overburden and interburden or partings material is progressively placed in-pit once the coal has been mined.

A combination of temporary and permanent out-of-pit emplacement areas are located adjacent to the open cut mining operations.

2.8 COAL REJECT MANAGEMENT

The Moolarben Coal Complex generates coarse and fine rejects and ultrafine (tailings) rejects in the coal preparation process.

A belt press filter is used to dewater the ultrafine material.

Rejects are combined and conveyed from the CHPP to the rejects bin adjacent to the Stage 1 ROM coal facility and then hauled or conveyed to an open cut for in-pit disposal/emplacement.

An emergency storage dam has been constructed adjacent to the CHPP to cater for emergency tailings storage (if required). The dam is also used for runoff and dirty water collection. Tailings in the emergency storage dam are periodically removed, allowed to dry in temporary cells and transported for disposal within the open cuts.

2.9 GENERAL INFRASTRUCTURE

2.9.1 Site Access and Infrastructure Areas

The main infrastructure areas approved at the Moolarben Coal Complex include the CHPP area and rail loadout facility, Stage 1 and Stage 2 MIAs, ROM coal handling facilities and conveyors, underground MIA and the underground remote services facility area.

Access to the CHPP area is via Ulan Road and access to the MIAs and remote services facility area is via Ulan-Wollar Road.

The Moolarben Coal Complex CHPP area and rail loadout facility include (among other things) the CHPP, rail loop, rail loadout, conveyors, hoppers, coal stockpiles, mine water dams, fuel store, workshop, sump, B-double turning loop, office, bathhouse, stores, main substation, hardstand areas, crib shed, car park and a number of service facilities (i.e. potable water, sewerage, electricity, fire services, water management, roads, material stockpiles and hydrocarbon management).

The Stage 1 open cut MIA includes a workshop, bathhouse, offices, fuel store, light and heavy vehicle parking and other minor infrastructure and supporting facilities.

A second Stage 1 open cut MIA is approved to be constructed to the north of OC3 to service the OC3 mining operations.

The underground MIA has been constructed in the OC1 void adjacent to the UG1 entry, comprising offices, bathhouse, substation, sump, ventilation fan and other ancillary facilities.

The Stage 2 open cut MIA in OC4 includes offices, bathhouses, workshops, final storages, explosives facility and other supporting facilities.

The underground remote services facility area is located at the eastern end of UG1 longwall panels and includes verification and service borehole infrastructure.

2.9.2 Electricity Supply and Distribution

Power is supplied to the Moolarben Coal Complex at 66 kilovolt (kV) from the existing Essential Energy Ulan Switchyard. The 66 kV powerline runs adjacent to the road and rail corridor to the CHPP area where a 66/11 kV substation is located. Power is distributed around the site by overhead cable or underground cable where necessary.

Power to the underground mine is supplied via a substation located adjacent to the remote services facilities area.

2.9.3 Potable Water

Potable water for all facilities is sourced from a combination of rainwater captured from roofs of facilities, suitably treated bore water or imported water from external sources. The potable water supply reticulation system services areas around the site.

2.9.4 Ancillary Infrastructure

The Moolarben Coal Complex is supported by a range of ancillary infrastructure that are periodically relocated, modified or expanded as mining operations progress. Such components include water management features (e.g. bores, pipelines, pumps, drains, contour banks, diversion channels and dams), environmental monitoring equipment, electricity supply, access tracks, soil stockpiles, equipment such as communication towers, in-pit facilities including bulk fuel handling and personnel crib huts/ablution facilities.

2.10 WATER MANAGEMENT

The water management strategy for the Moolarben Coal Complex is based on the containment and re-use of mine water as well as the control of sediment that may be potentially carried with runoff from disturbed areas such as the waste rock emplacements or areas cleared in advance of mining.

The existing water management system at the Moolarben Coal Complex comprises the following:

- water management storages;
- diversion of runoff from catchment areas upslope of the mine disturbance area;
- runoff control on disturbed and rehabilitated areas at the mine;
- runoff control on infrastructure areas;
- sedimentation control;
- water transfer pumps and piping;
- open cut pit dewatering;
- sewage treatment and disposal of effluent; and
- release of water as licensed by EPL 12932.

Water is required to operate the CHPP, for washdown of mobile equipment, dust suppression on haul roads and coal stockpile areas and for the underground mines. The main water sources for the operation are:

- recovery from coal processing;
- groundwater inflows into the open cut voids and underground workings;
- catchment runoff (from disturbed areas) and infiltration;
- incidental rainfall over water storages;
- water sharing arrangements with UCML (via the existing pipeline between the two operations); and
- groundwater extraction from licensed bores.

If stored water volumes are excessive, EPL 12932 permits water to be released off-site, subject to release criteria and conditions being met.

The existing EPL 12932 water discharge locations and volume limits are summarised in Table 4. The existing discharge locations are shown on Figure 6.

Table 4
Existing EPL Water Discharge Locations

EPL ID	Receiving Watercourse	Volume Limit*
1	Bora Creek	10 ML/day
2	Goulburn River	10 ML/day
28	Moolarben Creek	1 kL/day

* In accordance with EPL 12932 the combined discharge volume from points 1, 2 and 28 must not exceed 10 ML/day.

kL/day = kilolitres per day.

2.11 WASTE MANAGEMENT

Waste disposal systems at the Moolarben Coal Complex are designed to minimise the amount of waste generated by the mine that goes to landfill.

Waste generated at the Moolarben Coal Complex includes general rubbish, sewage, scrap timber, batteries, tyres, waste oil and filters and other hydrocarbons, empty drums and scrap metals.

Operation of the mining fleet generates waste hydrocarbons such as oils, greases and hydraulic fluids. These waste hydrocarbons are placed in suitable containers and removed from the site for disposal at either an EPA-approved hydrocarbon waste site or a recycling depot.

Treated effluent is discharged in accordance with EPL 12932.

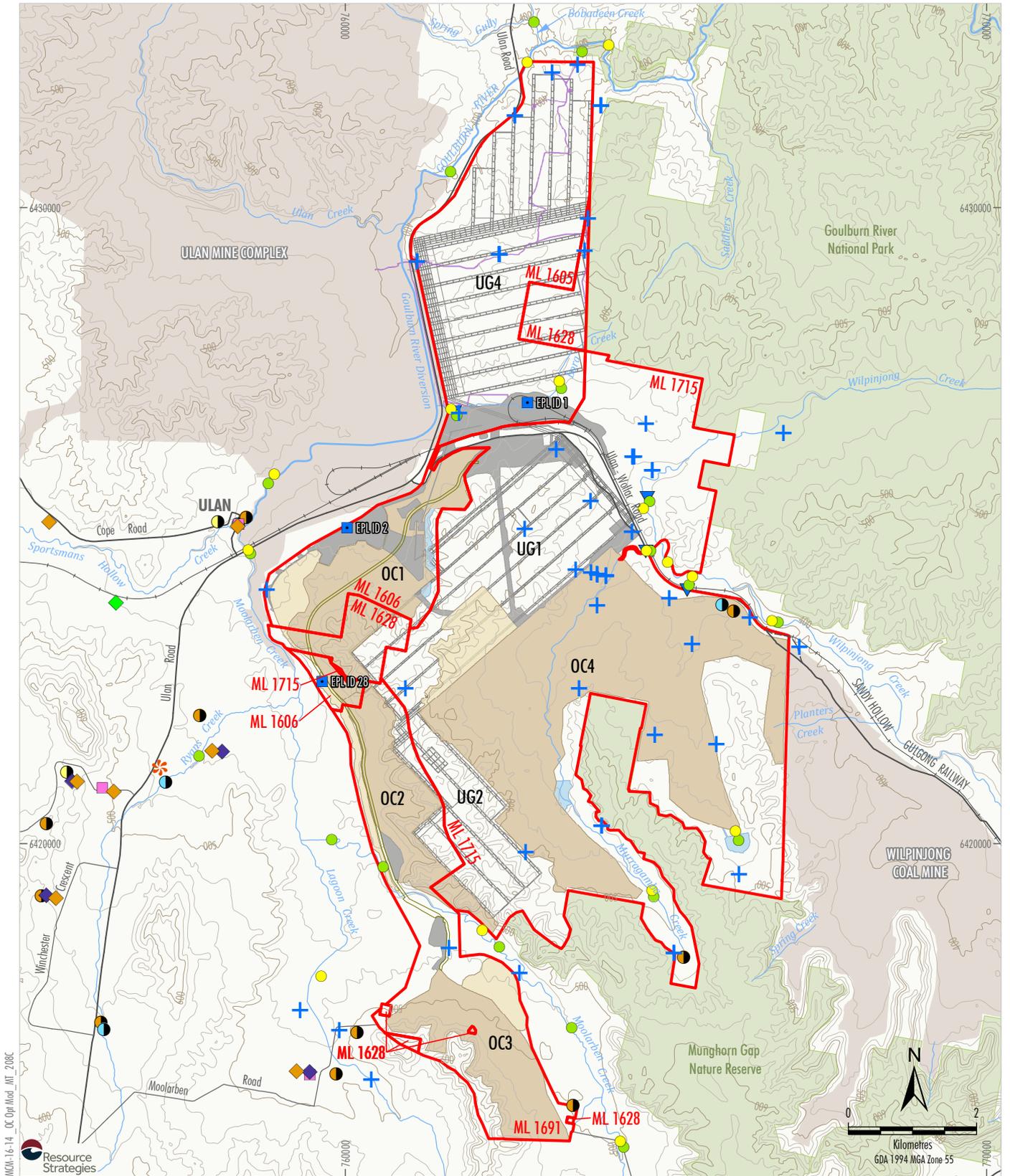
2.12 MANAGEMENT OF DANGEROUS GOODS

The transportation, handling and storage of all dangerous goods at the Moolarben Coal Complex is conducted in accordance with *Storage and Handling of Dangerous Goods – Code of Practice 2005* (Workcover, 2005).

2.12.1 Hydrocarbon Storages

Fuel and lubrication stores contain above-ground banded diesel-storage tanks in accordance with the requirements of Australian Standard (AS) 1940:2004 *The Storage and Handling of Flammable and Combustible Liquids*.

Runoff water from mobile equipment service areas is directed to an interceptor trap to extract hydrocarbons, prior to it being discharged into the mine water management system. The trap is routinely emptied of hydrocarbons by a licensed contractor.



MOA-16-14_OC Opr Mod_INT 20BC
Resource Strategies

- LEGEND**
- NSW National Parks and Wildlife Service
 - Other Mining Operations
 - Mining Lease Boundary
 - Existing/Approved Development
 - Open Cut Mining Area
 - Out-of-pit Emplacement
 - Surface Infrastructure Area
 - Pipeline and Borefield Infrastructure
 - Clean Water Diversion Infrastructure
 - Underground Longwall Layout
 - Haul Road
 - Road Realignment (not yet constructed)

- Environmental Monitoring**
- Licensed Discharge Point
 - Surface Water Monitoring Site
 - Stream Health Monitoring Site
 - Streamflow Gauge
 - Groundwater Monitoring Site
 - Attended Noise Monitoring Site
 - Directional Noise Monitoring Site (UCML)
 - Real-time Noise Monitoring Site
 - Dust Deposition Gauge
 - PM₁₀ Monitoring Site
 - Real-time TEOM
 - Blast Monitoring Site
 - Meteorological Station

Source: MCO (2017); NSW Dept of Industry (2017);
NSW Land & Property Information (2017);
Office of Environment and Heritage NSW (2017)

MOOLARBEN COAL
MOOLARBEN COAL COMPLEX
Moolarben Coal Complex
Environmental Monitoring Sites

Figure 6

2.12.2 Explosives Storage

Explosives required for the Moolarben Coal Complex include initiating products and detonators, ammonium nitrate fuel oil and emulsion explosives.

Explosives on-site are stored, transported and used in accordance with the requirements of AS 2187.2:2006 *Explosives – Storage and Use – Use of Explosives*.

2.13 WORKFORCE

The Moolarben Coal Complex has a peak operational workforce of 740 personnel and would maintain an average operational workforce of approximately 667 personnel throughout the life of the mine.

The peak construction workforce is 250 personnel and the average construction workforce is 120 personnel.

2.14 REHABILITATION

The Mining Operations Plan (MOP) for the Moolarben Coal Complex describes site activities and the progress toward environmental and rehabilitation outcomes required under MCO's mining lease conditions, Project Approval (05_0117) and Project Approval (08_0135).

Rehabilitation of the Moolarben Coal Complex is undertaken in accordance with the Rehabilitation Management Plan. More than 200 hectares (ha) of the Moolarben Coal Complex are under active rehabilitation.

The rehabilitation objectives for the Moolarben Coal Complex are described in the Rehabilitation Management Plan, and summarised in Section 5.

2.15 ENVIRONMENTAL MANAGEMENT AND MONITORING

Environmental management and monitoring at the Moolarben Coal Complex is conducted in accordance with the plans required by Project Approval (05_0117), Project Approval (08_0135), EPBC 2013/6926, EPBC 2008/4444 and EPBC 2007/3297.

Environmental management plans in place for the Moolarben Coal Complex include:

- Environmental Management Strategy.
- Noise Management Plan.

- Blast Management Plan.
- Air Quality Management Plan.
- Water Management Plan (including Site Water Balance, Surface Water Management Plan and Groundwater Management Plan).
- Biodiversity Management Plan.
- Heritage Management Plan.
- Rehabilitation Management Plan.
- Greenhouse Gas Minimisation Plan.
- Vegetation Clearance Protocol and Landscape Management Plan.
- Biodiversity Offset Management Plan.
- Extraction Plan(s).
- MOP.

The Moolarben Coal Complex has an extensive environmental monitoring regime. Environmental monitoring locations are shown on Figure 6.

2.16 COMMUNITY CONTRIBUTIONS

MCO financial contributions to the MWRC are made in accordance with Moolarben Coal Complex Planning Agreements, Project Approval (05_0117) and Project Approval (08_0135).

MCO also makes financial contributions to a number of non-Government and community organisations in the region. During 2010 to 2016, MCO's Community Foundation distributed over \$980,000 to support local community, sporting, cultural, educational and recreational activities. Recent recipients of financial contributions include the Gulgong Amateur Fishing Club, Mudgee Park Run and Mudgee Junior Triathlon Club.

In addition, MCO sponsors the annual Moolarben Coal Celebrity Golf Challenge, which raises funds for a number of local organisations including Mudgee Hospital, Pioneer House Nursing Home, Mudgee Men's Shed and Mudgee Junior Golf.

2.17 COMPLAINTS

MCO records and responds to all complaints. A complaints register summary is updated monthly and provided on the MCO website, with a yearly summary provided in the Annual Review.

3 DESCRIPTION OF THE PROPOSED MODIFICATION

Proposed changes to the approved Moolarben Coal Complex for the Modification are related to the following:

- increased annual ROM coal production from the open cuts;
- minor extensions to open cut pit limits of OC2;
- minor extensions and minor reductions to open cut pit limits of OC3;
- changes to final landuse in portions of OC2 and OC3;
- relocated/additional surface infrastructure; and
- installation of water treatment facilities and associated increase in rate of controlled releases.

3.1 ANNUAL PRODUCTION LIMITS

The Stage 1 and Stage 2 Project Approvals authorise the following from open cut operations:

- the extraction of up to 8 Mtpa of ROM coal from Stage 1 open cuts; and
- the extraction of 12 Mtpa of ROM coal from the Stage 2 open cut.

However, the combined total of ROM coal able to be extracted from the Stage 1 and Stage 2 open cuts is currently limited to 13 Mtpa.

Review of the mine schedule and planning indicates MCO can optimise its operations to increase annual coal production volumes with no material change to the existing mining fleet.

As a result, ROM coal production from the open cuts would increase as follows (Figure 7):

- increase in combined ROM coal production from the Stage 1 open cuts (OC1, OC2 and OC3) from 8 to 10 Mtpa;
- increase in ROM coal production from the Stage 2 open cut (OC4) from 12 to 16 Mtpa; and
- increase in the combined Stage 1 and Stage 2 open cut ROM coal limit from 13 to 16 Mtpa.

The increased open cut production limits would result in the following additional changes to the approved Moolarben Coal Complex (Figure 7):

- increase in the coal processing (washing) limit from 13 to 16 Mtpa;
- increase in the combined open cut and underground ROM coal limit from 21 to 24 Mtpa;
- increase in the product coal limit from 18 to 22 Mtpa;
- increase in product coal rail movements (one additional train per day on average and two additional trains per day at peak); and
- increase in the annual rate of coal reject production.

An indicative production schedule for the Moolarben Coal Complex including the Modification is provided in Table 5. The actual production schedule and mine progression would vary according to market demands and would be detailed in the MOP.

3.2 OPEN CUT PIT DISTURBANCE

To facilitate safe and efficient mining, increase long-term geotechnical stability of the final landform at the Moolarben Coal Complex and in consideration of the latest resource drilling results, there would be minor changes to the OC2 and OC3 pit limits.

OC2

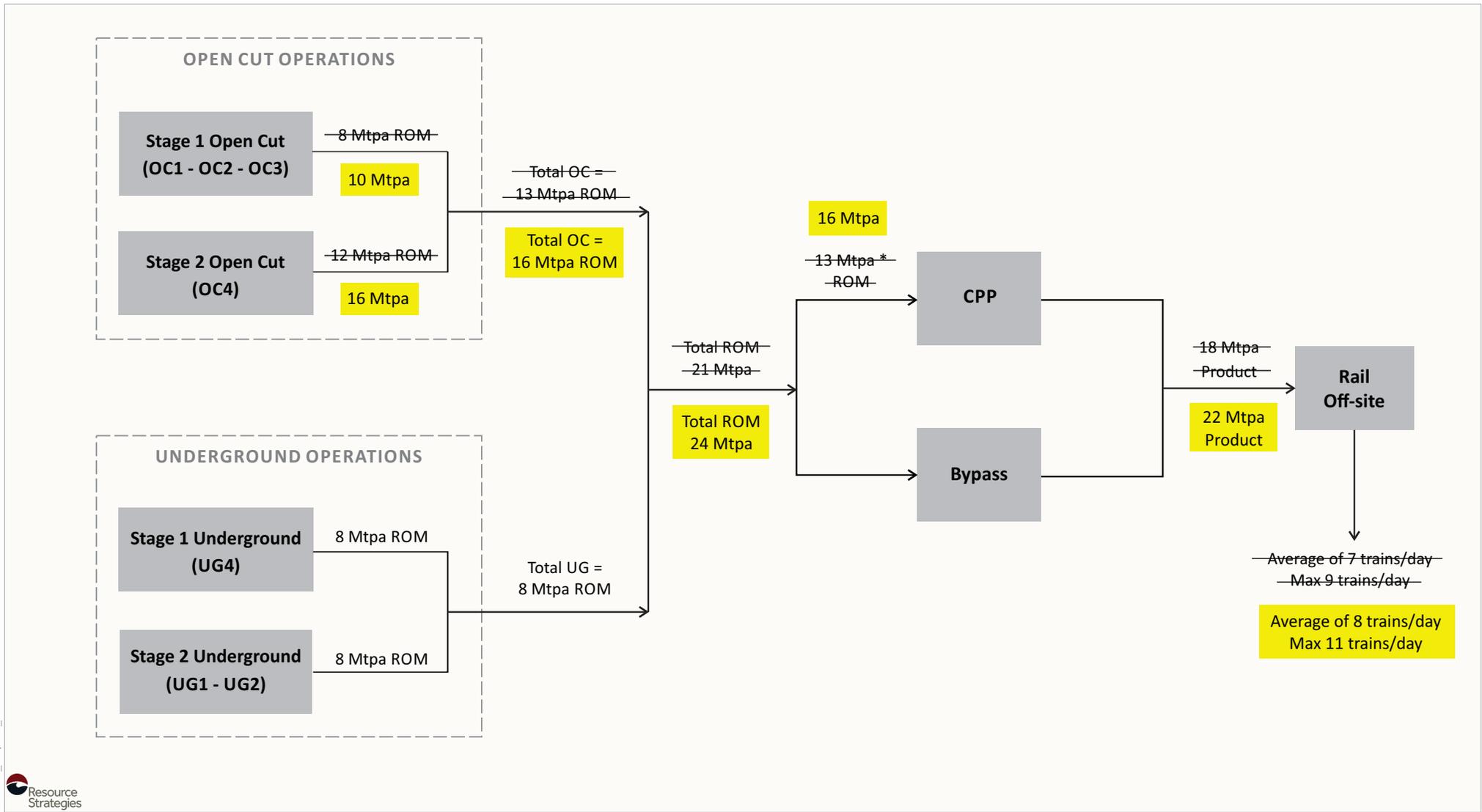
There would be a minor increase (of approximately 200 metres [m]) to the pit limit in the south-west of OC2 to avoid leaving a potentially geotechnically unstable section of hill between the currently approved pit limit and Moolarben Creek (Figure 8).

OC3

To improve mining efficiency and geotechnical stability of the final landform, the western pit limits of OC3 would be straightened (Figure 8).

This would result in minor extensions to the western extent of the pit in some areas (Figure 8). It would also result in minor reductions in pit limits, and as such, these approved surface disturbance areas would be relinquished for open cut development as part of the Modification (Figure 8).

As a result of recent exploration drilling results, there would also be minor extensions to the northern and eastern pit limits of OC3 (Figure 8).



MCC-16-14_OC Opt Mod_001C



LEGEND
 Modified Component

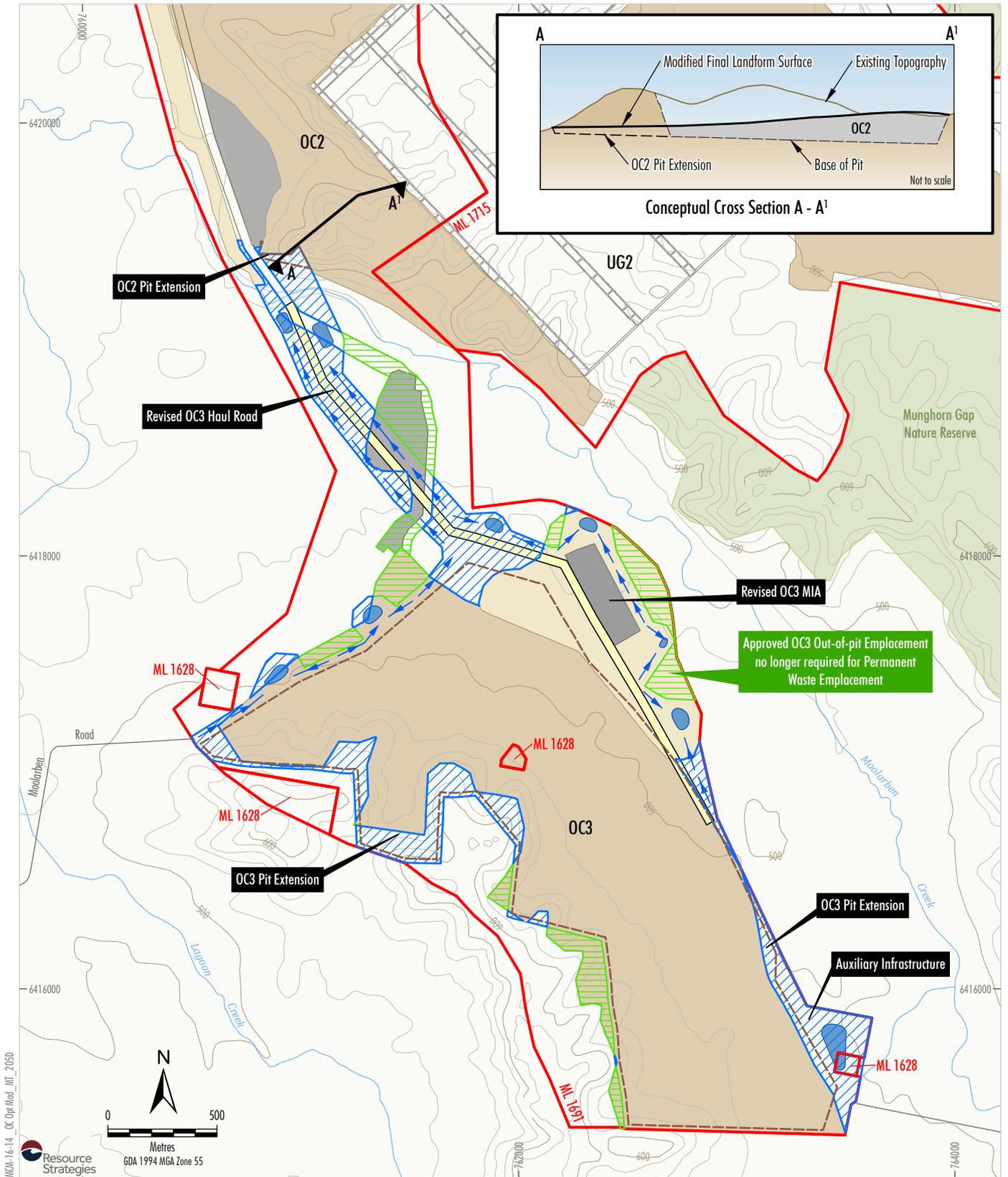
* Note: 13.5 Mtpa ROM in 2017

Figure 7

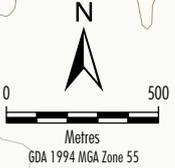
Table 5
Indicative Production Schedule (Mtpa)

Year	ROM Coal Production							CHPP Washing	Bypass	Reject	Total Product	
	Open Cut						Underground					Total
	Stage 1			Stage 2	Total Open Cut ROM							
	OC1	OC2	OC3	Total		OC4						
2018	-	4.4	2.4	6.9	8.0	14.9	4.5	19.4	14.9	4.5	3.1	16.3
2019	1.3	3.5	3.1	7.9	8.1	16.0	6.1	22.1	16.0	6.1	3.5	18.6
2020	5.7	0.8	3.6	10.0	5.7	15.7	8.0	23.7	13.4	10.3	3.0	20.7
2021	2.7	-	7.3	10.0	5.9	15.9	8.0	23.9	13.6	10.2	2.9	21.0
2022	-	-	7.4	7.4	7.7	15.1	6.8	21.9	15.1	6.8	3.3	18.5
2023	-	-	-	-	12.8	12.8	6.1	18.9	7.6	11.3	2.0	17.0
2024	-	-	-	-	10.6	10.6	6.5	17.1	6.1	11.0	1.5	15.7
2025	-	-	-	-	16.0	16.0	8.0	24.0	9.5	14.5	2.2	21.8
2026	-	-	-	-	16.0	16.0	5.9	21.9	9.4	12.5	2.1	19.8
2027	-	-	-	-	13.0	13.0	4.0	17.0	7.8	9.1	1.8	15.2
2028	-	-	-	-	11.9	11.9	4.0	15.9	7.3	8.6	1.7	14.2
2029	-	-	-	-	11.5	11.5	1.8	13.3	7.0	6.3	1.6	11.7
2030	-	-	-	-	11.3	11.3	-	11.3	6.9	4.5	1.6	9.8
2031	-	-	-	-	9.8	9.8	-	9.8	5.9	3.9	1.4	8.4
2032	-	-	-	-	8.0	8.0	-	8.0	4.7	3.3	1.1	6.9
2033	-	-	-	-	7.0	7.0	-	7.0	4.2	2.8	1.0	6.0
2034	-	-	-	-	6.0	6.0	-	6.0	3.6	2.4	0.8	5.2
2035	-	-	-	-	4.0	4.0	-	4.0	2.4	1.6	0.5	3.5
2036	-	-	-	-	3.5	3.5	-	3.5	2.1	1.4	0.5	3.0
2037	-	-	-	-	3.0	3.0	-	3.0	1.8	1.2	0.4	2.6
2038	-	-	-	-	1.0	1.0	-	1.0	0.6	0.4	0.1	0.9
Total	9.7	8.7	23.7	42.1	180.8	222.9	69.7	292.6	159.8	132.8	36.1	256.5

Note: Minor discrepancies in totals due to rounding.



AMD-16-14_OC Opr Mod_AIT_2015D
 Resource Strategies



- | | |
|---|---|
| <p>LEGEND</p> <ul style="list-style-type: none"> NSW National Parks and Wildlife Service Mining Lease Boundary Existing/Approved Development Open Cut Mining Area Out-of-pit Emplacement Surface Infrastructure Area Underground Longwall Layout Haul Road | <p>Open Cut Optimisation Modification</p> <ul style="list-style-type: none"> Approximate Extent of Revised Open Cut Mining Area Approximate Extent of Additional Surface Development Approved Open Cut Mining Area, Out-of-pit Emplacement and Surface Infrastructure to be Relinquished Water Management Infrastructure |
|---|---|

Source: MCO (2017); NSW Dept of Industry (2017);
 NSW Land & Property Information (2017);
 Office of Environment and Heritage NSW (2017)


MOOLARBEN COAL COMPLEX
Open Cut Optimisation Modification
OC2 and OC3 Indicative General Arrangement

Figure 8

3.3 FINAL LANDFORM AND REHABILITATION

A summary of proposed changes to approved final landforms and rehabilitation is provided below.

The rehabilitation strategy for the Modification is provided in Section 5.

OC3 Out-of-Pit Emplacement

The approved OC3 out-of-pit emplacement would no longer be required (Figure 8), with waste rock extracted during the initial development of OC3 to be temporarily stockpiled and then used as backfill material in OC3 and OC2.

The approved OC3 MIA would be relocated to within a portion of the approved surface development footprint of the OC3 out-of-pit emplacement (Figure 8). The MIA would be decommissioned and the area rehabilitated as part of mine closure.

OC2 and OC3 Rehabilitation

OC2 is approved to be rehabilitated to a combination of areas of native vegetation and agricultural land. For the Modification, OC2 would be rehabilitated to native vegetation (i.e. woodland) to improve conservation outcomes and for consistency with adjacent areas of native vegetation (Figure 9).

OC3 is approved to be rehabilitated to agricultural land. For the Modification, OC3 would be rehabilitated to a combination of agricultural land in the flatter areas adjacent to Moolarben Creek and native vegetation (i.e. woodland) in the steeper areas where the final landform approaches the ridge to the west of OC3 (Figure 9).

3.4 MINE INFRASTRUCTURE

The Modification involves minor changes to infrastructure at the Moolarben Coal Complex.

OC3 to OC2 Haul Road

The approved haul road from OC3 to OC2 would be realigned (i.e. straightened) and widened (Figure 8).

The width of the widened haul road corridor (approximately 200 m) is determined by the distance required for two haul trucks (e.g. Cat 789s) to safely pass, and to allow for water management, environmental bunding and other infrastructure adjacent to the haul road.

There would be no change to the location of the approved Moolarben Creek crossing.

As a result of the realigned haul road, portions of the approved haul road alignment would no longer be required (Section 3.5 and Figure 8).

OC3 MIA

The approved OC3 MIA, which would consist of offices, crib rooms, refuelling area, laydown area and parking and supporting facilities, would be relocated from its approved location to the approved surface disturbance footprint of the OC3 out-of-pit emplacement (which is no longer required [Section 3.3]) (Figure 8).

Portions of the surface development extent for the approved OC3 MIA would no longer be required and these areas would be relinquished (Section 3.5 and Figure 8).

OC2 to OC4 Internal Road

An unsealed internal road would be constructed between OC2 and OC4, generally following the alignment of an existing light vehicle track (Figure 10).

The existing track would be widened and graded to allow the occasional transfer of mining equipment between OC2 and OC4.

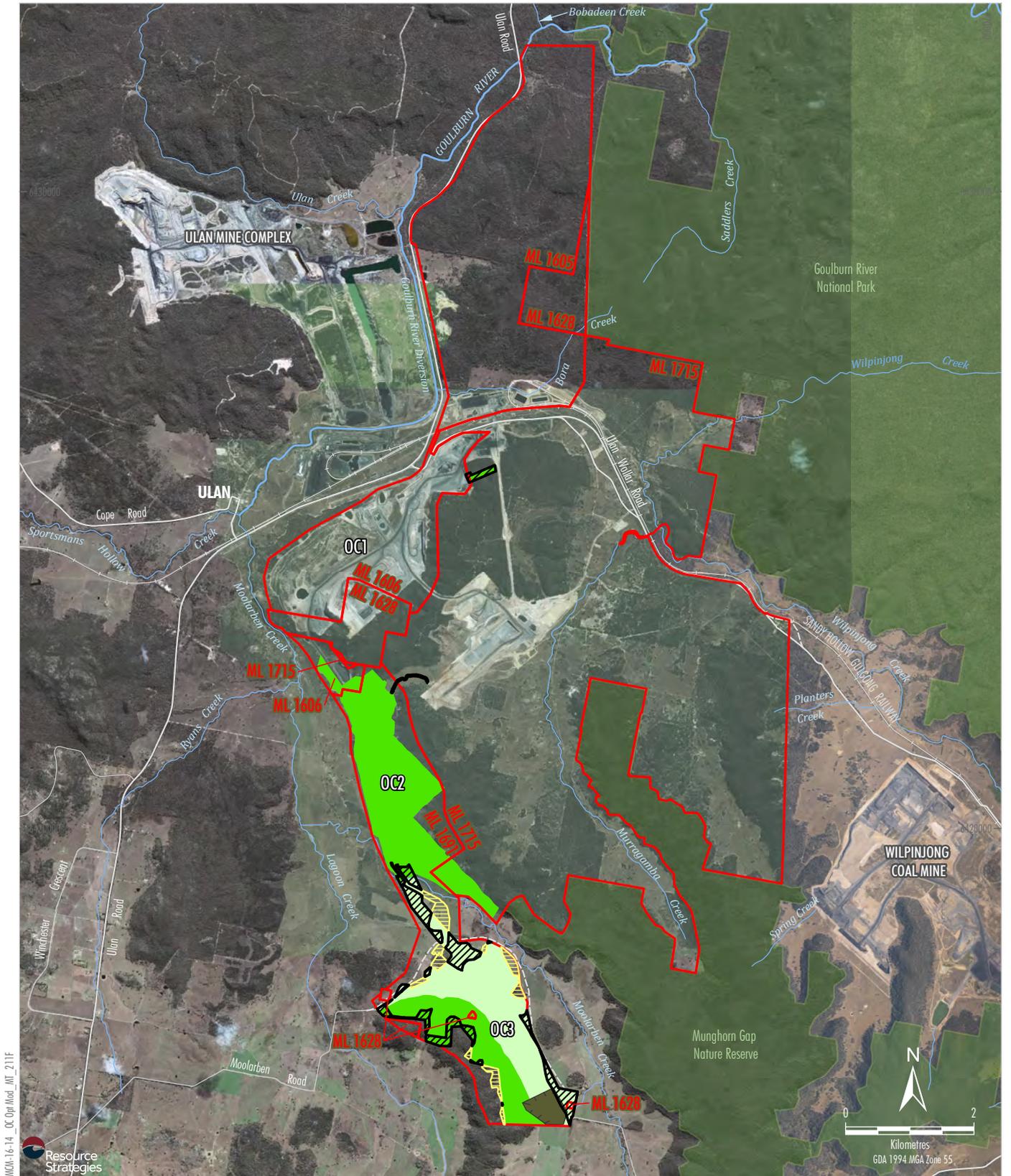
Bypass Conveyor System and ROM stockpile

ROM coal from the Stage 1 and Stage 2 open cuts is currently trucked to the OC1 or OC4 ROM coal stockpiles and then conveyed to the CHPP for washing.

A bypass conveyor system would be constructed to enable open cut ROM coal to bypass the CHPP and be transferred directly to the product stockpile, where it would be reclaimed and loaded onto trains. This would increase product coal yield, create additional marketing opportunities and reduce the production of rejects.

ROM coal from OC1, OC2 and OC3 to be bypassed would be hauled to a new ROM coal stockpile.

ROM coal from OC4 to be bypassed would be discharged from the OC4 conveyor to the bypass conveyor (Figure 10) and transferred to the northern extent of OC1 where it would be discharged to a new ROM coal stockpile.



MOL-16-14_OC Opt Mod_AIT_211F

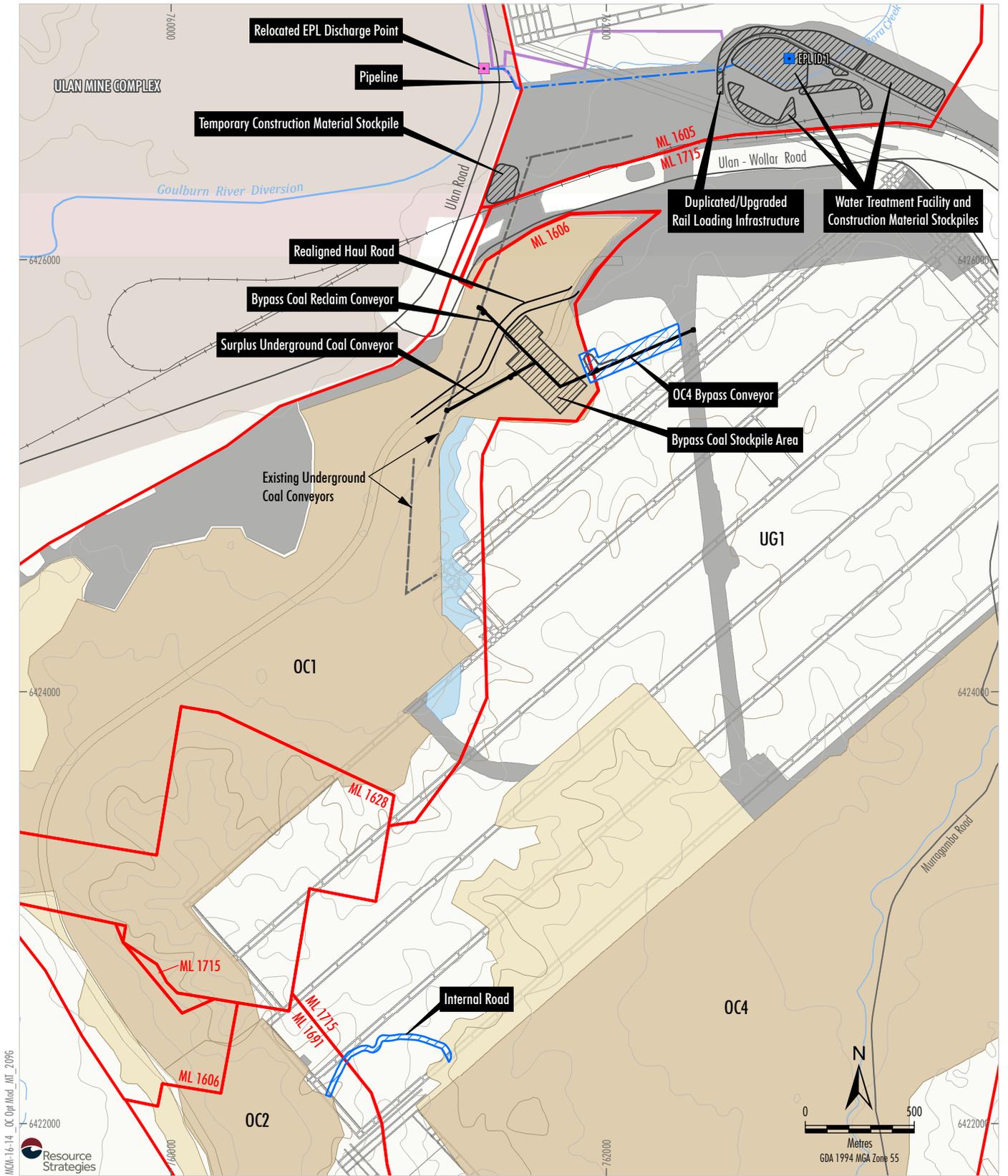


- LEGEND**
- Mining Lease Boundary
 - Road Realignment (not yet constructed)
 - Open Cut Optimisation Modification
 - Approximate Extent of Additional Surface Development
 - Approved Open Cut Mining Area, Out-of-pit Emplacement and Surface Infrastructure to be Relinquished
 - Rehabilitation Agricultural
 - Rehabilitation Native Vegetation
 - Final Void

Source: MCO (2017); NSW Dept of Industry (2017); NSW Land & Property Information (2017); Office of Environment and Heritage NSW (2017)
 Orthophoto Mosaic: MCO (April 2016 - May 2012)


MOOLARBEN COAL COMPLEX
 Indicative Areas of
 Modified Final Rehabilitation

Figure 9



Resource Strategies
 AML-16-14_OC Optr Mod_AIT_2016

Source: MCO (2017); NSW Dept of Industry (2017);
 NSW Land & Property Information (2017);
 Office of Environment and Heritage NSW (2017)

- | | |
|---------------------------------------|--|
| LEGEND | Open Cut Optimisation Modification |
| Mining Lease Boundary | Approximate Extent of Additional Surface Development |
| Existing/Approved Development | |
| Open Cut Mining Area | |
| Out-of-pit Emplacement | |
| Surface Infrastructure Area | |
| Pipeline and Borefield Infrastructure | |
| Clean Water Diversion Infrastructure | |
| Underground Longwall Layout | |
| Haul Road | |
| EPL Licensed Discharge Point | |

MOOLARBEN COAL
 MOOLARBEN COAL COMPLEX
 Indicative Layout of
 Revised/Additional Surface Infrastructure

Figure 10

A connecting conveyor from the approved underground conveyor to the additional stockpiles would also be constructed as part of the bypass coal conveyor system to coordinate coal flow from the open cut and underground operations.

Coal would then be reclaimed to a second bypass conveyor (located within the extent of existing surface disturbance) and discharged to the existing underground coal bypass conveyor system via a sizing station, and transferred to the approved product coal stockpile (Figure 10).

CHPP Infrastructure

Minor upgrades to the CHPP infrastructure would be installed (within the extent of approved disturbance), including an additional thickener and installation of additional belt press filters.

Product Coal Stockpiles

The footprint of the existing/approved washed coal and bypass coal stockpile would be increased (within the extent of the approved surface development area) to accommodate the increased annual coal production for the Modification.

Temporary Construction Material Stockpiles

Material excavated during construction activities would be temporarily stockpiled for use in final landform shaping and rehabilitation. Any such stockpiles would be established within approved disturbance areas and would be stabilised and temporarily rehabilitated until such time as the material is used for final landform shaping. The Modification also includes the continued temporary stockpiling of construction material within the extent of approved disturbance in the CHPP area adjacent to the underground coal conveyor (Figure 10).

Rail Loadout Infrastructure

The existing rail loadout infrastructure would be upgraded to facilitate more efficient train loading (Figure 10).

The infrastructure would comprise an upgrade of the existing infrastructure or an additional conveyor from the product coal stockpile area and a second rail loadout bin, which would operate simultaneously with the existing loadout bin.

The additional rail loadout infrastructure would be constructed within the currently approved extent of surface development.

Water Treatment Facilities and Pipeline

A water treatment facility would be constructed adjacent to the rail loop (Figure 10) to allow surplus water stored on-site to meet the water quality concentration limits of EPL 12932 and provide water for on-site use.

The water treatment process is subject to final engineering design but would likely involve pre-treatment followed by the secondary treatment of water via reverse osmosis (RO). RO plants are widely used treatment options for treating brackish water and are used successfully at numerous mines in NSW (including at the neighbouring Wilpinjong Coal Mine and Ulan Mine Complex).

Additional water storages would be required as part of the water treatment facilities to hold feed water, blend water and treated water, and to store by-products of the treatment process.

Advisian (2017) recommended EPL (12932) Discharge Point 1 (EPL ID1) (Table 4) be relocated from its current location on Bora Creek to the confluence of Bora Creek and the Goulburn River Diversion (Figures 10 and 11) to avoid potential erosion from controlled releases along Bora Creek.

Water would be blended and transferred from the water treatment facility to the relocated EPL discharge point via a pipeline (nominally polypipe with a diameter of approximately 400 millimetres). The pipeline would run through culverts under Ulan Road adjacent to the existing water supply pipeline between the Moolarben Coal Complex and Ulan Mine Complex to the relocated EPL discharge point (Figures 10 and 11).

Other Surface Infrastructure

Ancillary infrastructure would continue to be developed at the Moolarben Coal Complex to support mining and processing activities, including:

- water management infrastructure (e.g. dams and drains);
- access tracks;
- pipelines; and
- power supply.



Relocated EPL Discharge Point – Goulburn River Diversion Downstream



Relocated EPL Discharge Point – Goulburn River Diversion Upstream

3.5 AREAS TO BE RELINQUISHED

Approximately 34.5 ha of areas approved to be developed for surface infrastructure, emplacement areas and/or open cut mining would be relinquished as part of the Modification. Minor ancillary infrastructure may still be required in these areas (e.g. above ground pipeline or light vehicle track) however any minor disturbance would be limited to areas mapped as cleared land in Eco Logical Australia Pty Ltd (ELA) (2017).

3.6 CONSTRUCTION ACTIVITIES

Construction activities required for the development of additional/relocated surface infrastructure for the Modification (Section 3.4) would generally be conducted during daytime hours (7.00 am to 6.00 pm), up to 7 days per week, consistent with currently approved operations and previous construction activities.

The timing of construction activities would be subject to obtaining all necessary approvals and would be conducted as required over the life of the Moolarben Coal Complex.

3.7 UNDERGROUND MINING OPERATIONS

There would be no change to the approved underground mining operations for the Modification.

3.8 WATER MANAGEMENT

There would be no change to the water management strategy principles (Section 2.10) for the Modification or to the source or demands for water.

WRM Water and Environment (WRM) (2017) has undertaken water balance modelling for the Modification. The updated water balance modelling considers the:

- proposed increase in mining and processing rates;
- proposed incremental extensions to the open cut mining areas; and
- results of groundwater modelling undertaken by HydroSimulations (2017).

The updated water balance modelling indicates the Moolarben Coal Complex (incorporating the Modification) may be a surplus site in some years under certain climatic conditions.

Proposed Increase in Controlled Releases

To assist with managing excess water on-site, the volume of water to be discharged from the relocated EPL discharge point (Figure 10) is proposed to increase to 20 ML/day (EPL 12932 currently permits discharge of up to 10 ML/day).

An increase in the combined discharge volume from points 1, 2 and 28 to 20 ML/day would also be required. No change is proposed to the existing discharge volume limits for points 2 and 28 (Table 4) or the existing water quality concentration limits for points 1, 2 and 28.

Water Treatment Process

The recovery rate of the water treatment facility would vary according to detailed design, but is anticipated to be approximately 75 to 80%.

The majority of by-products generated from the treatment process would be diluted with mine water and used for dust suppression on haul roads, active mining areas and coal stockpile areas (average daily demand of 3 ML/day). Any runoff from dust suppression would be recaptured in the water management system.

Residual by-products would be:

- temporarily stored in dedicated by-product storage dams, or other mine water storages (e.g. OC2 and OC3 mine water dams following the completion of mining in these areas);
- reticulated to mining or waste emplacement areas draining to internal catchments with any runoff recaptured in the water management system; and/or
- evaporated in dams or via other evaporative techniques (e.g. evaporation cannons).

Once void space is available in the underground workings (i.e. down gradient of longwall mining) by-products would be permanently stored underground.

3.9 WASTE MANAGEMENT

The Modification would not change the existing waste streams (Section 2.11) and accordingly, no changes to the existing waste management practices at the Moolarben Coal Complex would be required.

3.10 EXPLORATION

Exploration activities would be undertaken within the Moolarben Coal Complex mining leases in accordance with the approved MOP as amended from time to time.

3.11 MANAGEMENT OF DANGEROUS GOODS

The Modification would not change the dangerous goods handled at the Moolarben Coal Complex (Section 2.12) and accordingly, no changes to the management of dangerous goods (e.g. hydrocarbons, explosives and chemicals) would be required.

3.12 WORKFORCE

A short-term increase in workers would be required for the construction of surface infrastructure required for the Modification. The number of workers would be within the peak construction workforce (250 personnel) previously assessed for the Moolarben Coal Complex.

The Modification would not require an increase to the peak operational workforce of 740 personnel previously assessed for the Moolarben Coal Complex.

4 ENVIRONMENTAL ASSESSMENT

The following sub-sections present the environmental assessment for the Modification, including a description of the existing environment, an assessment of the potential impacts of the Modification on the environment, and where relevant, a description of the measures that would be implemented to avoid, minimise, mitigate and/or offset the potential impacts.

4.1 NOISE

A Noise Assessment for the Modification has been undertaken by SLR Consulting (SLR) (2017) (Appendix A).

This section addresses potential operational noise impacts and rail noise impacts associated with the Modification.

Potential blast impacts associated with the Modification are described in Section 4.9.6.

4.1.1 Background

Previous Assessment

A number of noise assessments have been undertaken since 2006 to assess the potential impacts of Stages 1 and 2 of the Moolarben Coal Complex.

The most recent assessment of operational impacts for the approved Moolarben Coal Complex was conducted by SLR as part of the UG1 Optimisation Modification (SLR, 2015).

Operational Noise

The previous noise assessments compared predicted operational noise levels against the noise limits in Project Approvals (05_0117) and (08_0135).

It was predicted the Moolarben Coal Complex could comply with its Project Approval noise limits with the implementation of noise mitigation and management measures.

Rail Noise

SLR (2015) assessed the impact of the currently approved Moolarben Coal Complex rail departures of seven per day on average and nine per day at peak as part of the UG1 Optimisation Modification. This was an increase compared to the previously approved limit of five train departures per day.

SLR (2015) considered the cumulative impact of the Modification in combination with existing and approved neighbouring mining operations.

The predicted increase in rail noise was considered indiscernible.

Noise Management and Monitoring

Project-specific and cumulative noise impacts associated with the Moolarben Coal Complex are managed in accordance with the approved Noise Management Plan. The Noise Management Plan describes the noise monitoring program, which consists of a combination of operator-attended and continuous real-time noise monitoring, as well as an Automatic Weather Station (AWS) (Figure 12).

MCO implements a range of noise control and management measures at the Moolarben Coal Complex, including mine planning controls, operational controls, engineering controls, a real-time response protocol, meteorological forecasting and continuous improvement to identify and manage noise impacts aimed to achieve compliance with the approved noise criteria.

Operator-attended noise monitoring is used to demonstrate compliance with Project Approval noise criteria, while continuous real-time monitoring is used as a noise management tool to assist MCO to take pre-emptive noise management actions to avoid potential non-compliances.

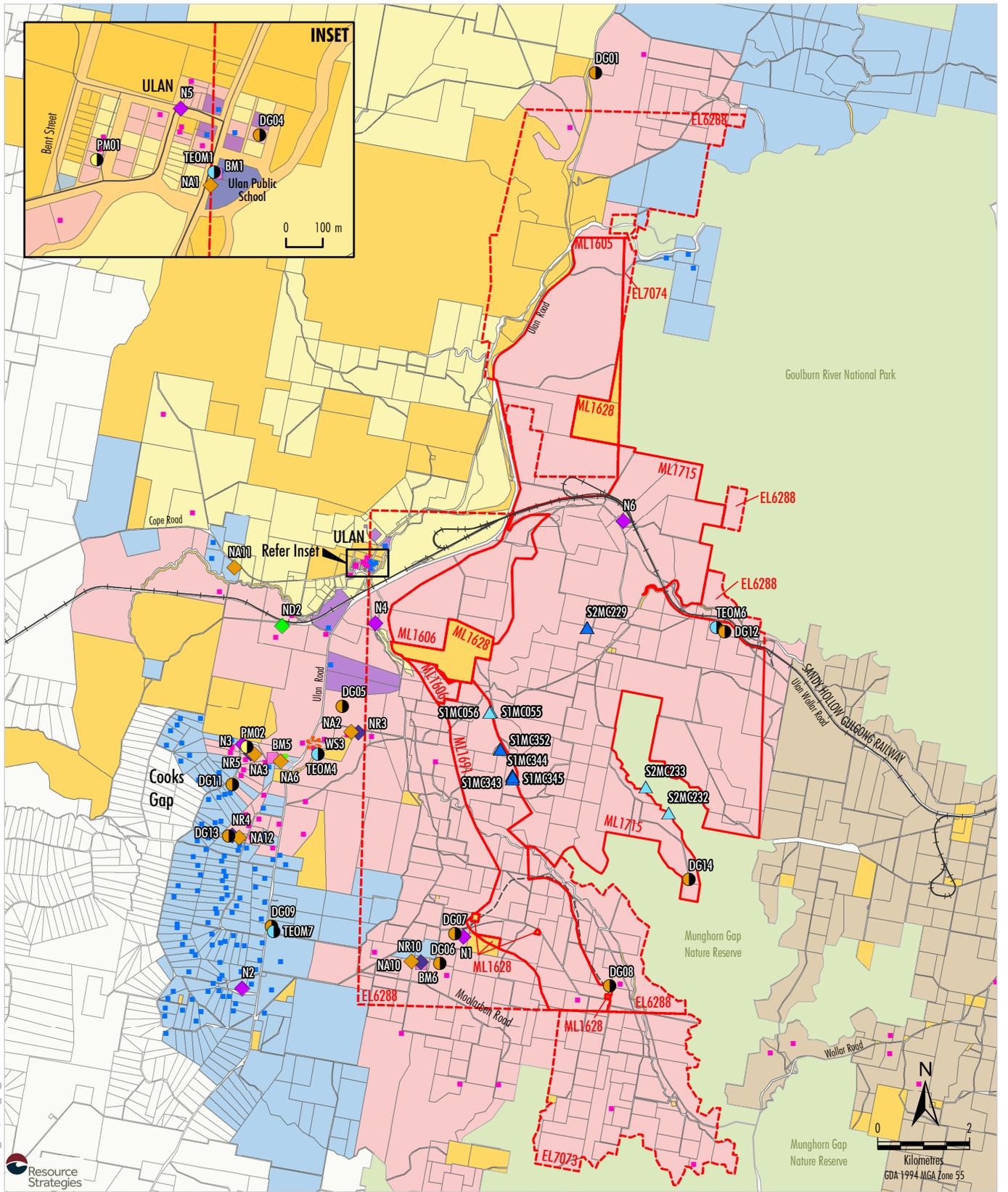
Further description of noise management measures is provided in Appendix A.

Attended Noise Monitoring

Attended noise monitoring has demonstrated compliance with Project Approval noise limits.

Attended noise monitoring results were reviewed as part of the January 2013 to December 2015 Independent Environmental Audit conducted by Trevor Brown & Associates (2015), which concluded:

The Auditor considers that Moolarben Coal Complex is currently meeting its obligations under all the Project Approval noise conditions, Statement of Commitments and EPL 12932 conditions.



MCC-16-14_OC Cpr/MoA_MIT_2 ISA



- LEGEND**
- NSW National Parks and Wildlife Service
 - Exploration Licence Boundary
 - Mining Lease Boundary
 - Railway
 - Land Ownership**
 - Moolarben Coal Operations Pty Ltd
 - Moolarben Coal Operations Pty Ltd – Under Contract/Purchase Agreement
 - Ulan Coal Mines Limited
 - Wilpinjong Coal Mine
 - Commercial
 - Minister for Education
 - Crown/State of NSW
 - Privately Owned
 - Mine Owned Receiver
 - Private Receiver (Under Contract to MCC)
 - Private Receiver
 - Environmental Monitoring
 - Attended Noise Monitoring Site
 - Directional Noise Monitoring Site (UCML)
 - Real-time Noise Monitoring Site
 - 2005 Background Noise Monitoring Site
 - Blast Monitoring Site
 - Meteorological Station
 - Rock Shelter Site
 - Rock Shelter Site (previously managed - no further monitoring required)
 - Dust Deposition Gauge
 - PM₁₀ Monitoring Site
 - Real-time TEOM

Source: MCC (2017); NSW Dept of Industry (2017); NSW Land & Property Information (2017); Office of Environment and Heritage NSW (2017)

MOOLARBEN COAL
MOOLARBEN COAL COMPLEX
Noise, Blast and Air Quality
Monitoring Sites

Figure 12

In addition, an independent review of noise was conducted at two properties during September and October 2015 by a DPE approved independent expert. The review concluded the Moolarben Coal Complex was achieving sustained compliance and no additional management measures were required (Appendix A).

The 2016 Annual Review for the Moolarben Coal Complex concluded the following in regard to attended noise monitoring:

Attended environmental noise monitoring was conducted monthly during reporting period. MCO complied with the project specific criteria at all monitoring sites during attended noise monitoring undertaken between January and December 2016.

Complaints

MCO maintains a complaints register in accordance with Project Approval (05_0117) and Project Approval (08_0135). All noise related complaints received by MCO are responded to and investigated.

The complaints register shows the number of noise related complaints has reduced from the peak recorded in 2011/2012. The reduction in complaints is considered to reflect the effective implementation of noise management measures including the application of an effective mine-owned land buffer, proactive noise controls, such as the introduction of Dura-Tray haul trucks, attenuation of mining fleet and the real-time noise management system.

4.1.2 Environmental Review

Noise modelling was conducted by SLR (2017) to predict noise impacts from the Moolarben Coal Complex incorporating the Modification.

Assessable Meteorological Conditions

The NSW *Industrial Noise Policy* (EPA, 2000) assessable meteorological noise modelling parameters are presented in Appendix A.

Based on analysis of available data between August 2011 and July 2014, SLR identified that noise impacts during temperature gradients up to 5.2 degrees Celsius per 100 m (plus drainage flow) were assessable under the NSW *Industrial Noise Policy* (EPA, 2000).

Modelling Scenarios

SLR (2017) modelled and assessed three key scenarios to assess potential noise impacts associated with the Modification:

- 2019 – representative of the initial year of open cut operations extracting ROM coal at the maximum proposed rate (i.e. 16 Mtpa of ROM coal), with mining in the northern section of OC3.
- 2021 – representative of Stage 1 open cut operations (i.e. mining domains closest to the private receivers to the west of the Moolarben Coal Complex) extracting ROM coal at the maximum proposed rate (i.e. 10 Mtpa) and combined Stage 1 and Stage 2 open cuts extracting ROM coal at the maximum proposed rate (i.e. 16 Mtpa).
- 2026 – representative of open cut operations extracting ROM coal at the maximum proposed rate (i.e. 16 Mtpa) from the Stage 2 open cut (OC4).

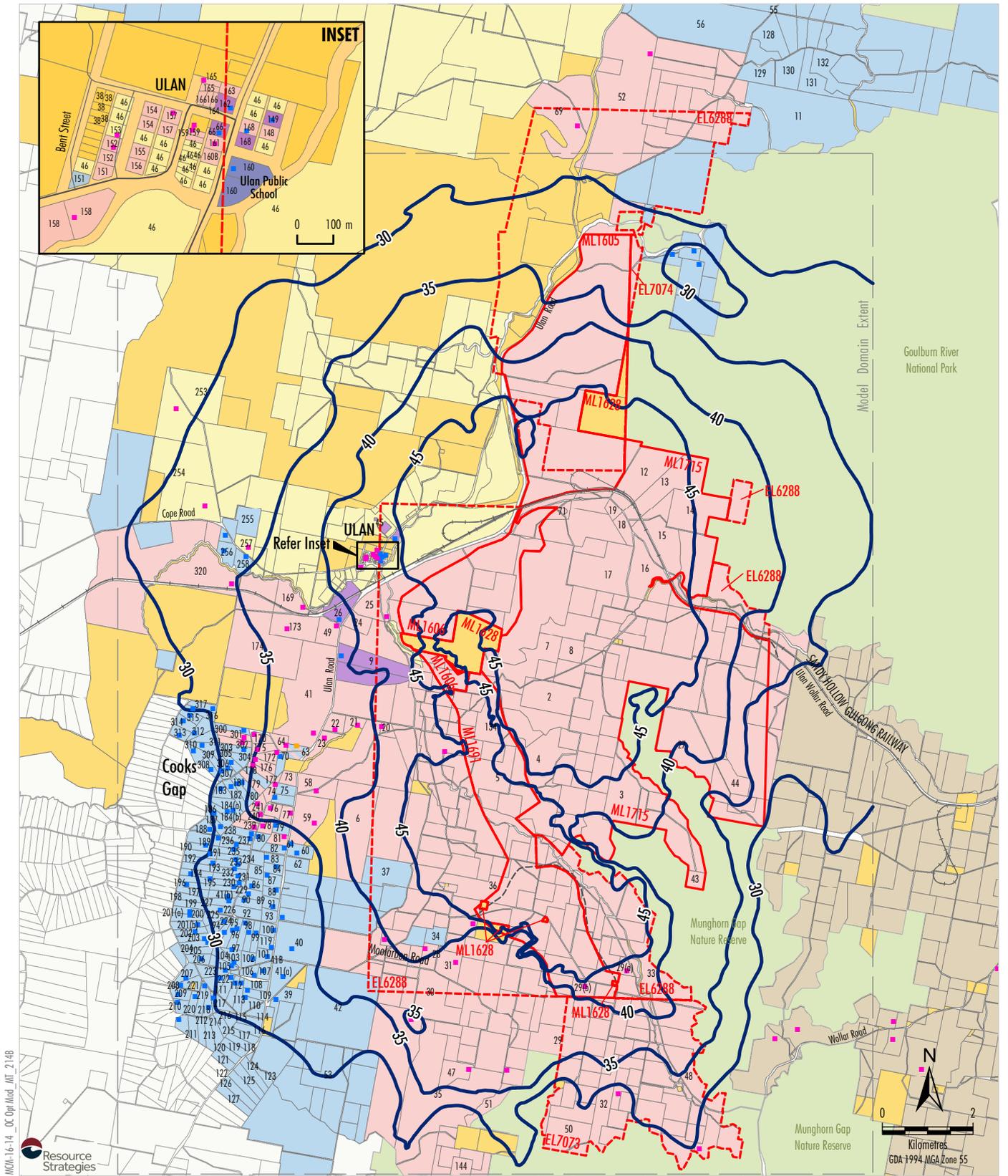
In all scenarios, the upgraded rail loading infrastructure proposed for the Modification was operational. The open cut bypass conveyor was modelled in the 2021 and 2026 scenarios.

Operational Noise Results

Potential noise impacts of the Moolarben Coal Complex incorporating the Modification were assessed and compared to the Project Approval noise limits.

It was predicted the Moolarben Coal Complex incorporating the Modification and noise management measures (as implemented through the Noise Management Plan) would continue to comply with Project Approval noise limits at all privately-owned receivers.

Indicative noise contours for night-time operations under adverse meteorological conditions for the Moolarben Coal Complex incorporating the Modification for each of the 2019, 2021 and 2026 modelling scenarios are shown on Figures 13, 14 and 15, respectively.



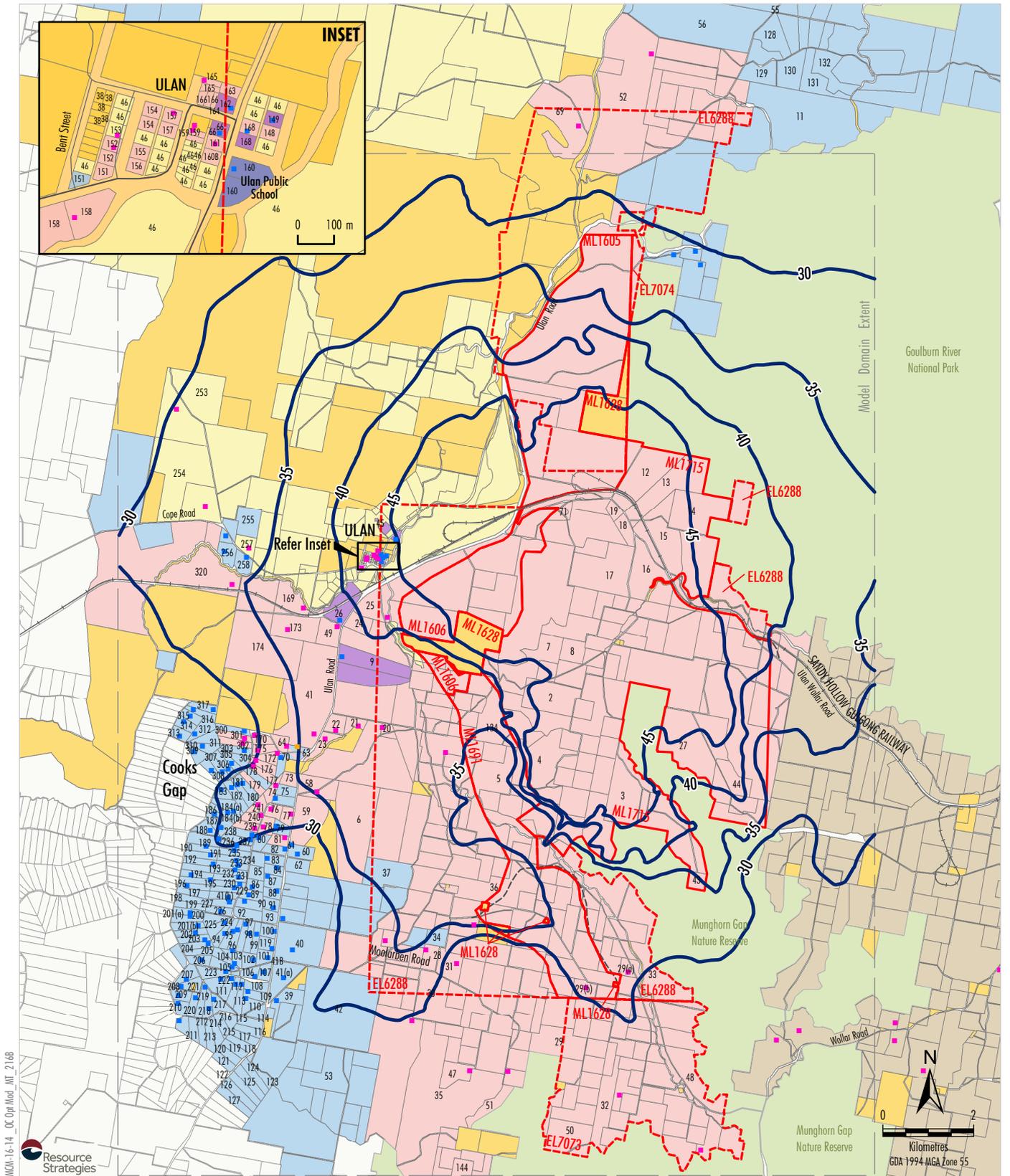
MOA-16-14_OC OpMod_MT_2148
Resource Strategies

- LEGEND**
- Exploration Licence Boundary
 - Mining Lease Boundary
 - Railway
 - National Park/Nature Reserve
 - Moolarben Coal Operations Pty Ltd
 - Moolarben Coal Operations Pty Ltd – Under Contract/Purchase Agreement
 - Ulan Coal Mines Limited
 - Wilpinjong Coal Mine
 - Commercial
 - Minister for Education
 - Crown/State of NSW
 - Privately Owned
 - Mine Owned Receiver
 - Private Receiver (Under Contract to MCO)
 - Private Receiver
 - 2019 Night-time Noise Contour (dBA)

Source: MCC (2017); NSW Dept of Industry (2017);
NSW Land & Property Information (2017);
Office of Environment and Heritage NSW (2017)

MOOLARBEN COAL
MOOLARBEN COAL COMPLEX
Night-time Noise Contours
2019

Figure 13



MOA-16-14_OC Op/MoA_MT_2168



LEGEND

- Exploration Licence Boundary
- Mining Lease Boundary
- Railway
- National Park/Nature Reserve
- Moolarben Coal Operations Pty Ltd
- Moolarben Coal Operations Pty Ltd – Under Contract/Purchase Agreement
- Ulan Coal Mines Limited
- Wilpinjong Coal Mine
- Commercial
- Minister for Education
- Crown/State of NSW
- Privately Owned
- Mine Owned Receiver
- Private Receiver (Under Contract to MCO)
- Private Receiver
- 2026 Night-time Noise Contour (dBA)

Source: MCC (2017); NSW Dept of Industry (2017);
NSW Land & Property Information (2017);
Office of Environment and Heritage NSW (2017)

MOOLARBEN COAL
MOOLARBEN COAL COMPLEX
Night-time Noise Contours
2026

Figure 15

Cumulative Noise Impacts

Cumulative noise impacts with the Wilpinjong Coal Mine and Ulan Mine Complex were assessed by SLR (2017). No exceedances of the amenity noise limits were predicted at any privately-owned receiver.

In addition, no exceedance of the maximum amenity noise limits is predicted on greater than 25% of privately-owned land.

Rail Noise

The Modification would increase the number of product coal rail movements by one additional train per day on average and two additional trains per day at peak (i.e. total of eight trains per day on average and eleven trains per day at peak).

SLR (2017) has undertaken an assessment of potential cumulative rail noise impacts along the Sandy Hollow-Gulgong Railway in accordance with the *Rail Infrastructure Noise Guideline (RING)* (EPA, 2013).

The predicted noise impacts have been assessed against the RING (EPA, 2013) rail noise assessment trigger levels.

The predicted increase in cumulative rail noise impacts due to the Modification would result in an increase in the distance at which compliance with RING criteria is predicted from:

- 34 m to 36 m for average daytime, and 57 m to 61 m for peak daytime rail noise; and
- 63 m to 73 m for average night-time, and 105 m to 115 m for peak night-time rail noise.

The predicted increase in cumulative rail noise levels due to the Modification is:

- 0.2 to 0.3 A-weighted decibels (dBA) equivalent continuous noise level ($L_{Aeq(15\text{hour})}$) for the daytime; and
- 0.4 to 0.7 dBA $L_{Aeq(9\text{hour})}$ for the night-time.

The predicted increase in noise levels due to the Modification is less than 2 dBA for all scenarios, and as such, is unlikely to be perceptible (Appendix A).

4.1.3 Mitigation Measures, Management and Monitoring

MCO would continue to mitigate, monitor and manage potential noise impacts from the Moolarben Coal Complex in accordance with the Noise Management Plan, which would be reviewed and updated to incorporate the Modification.

4.2 AIR QUALITY

An Air Quality Assessment for the Modification has been undertaken by Todoroski Air Sciences (TAS) (2017) (Appendix B).

4.2.1 Background

Previous Assessment

A number of air quality assessments have been undertaken since 2006 to assess the potential impacts of Stages 1 and 2 of the Moolarben Coal Project. The most recent assessment of potential air quality impacts associated with the approved Moolarben Coal Complex was undertaken by TAS as part of the UG1 Optimisation Modification (TAS, 2015a).

TAS (2015a) predicted concentrations of total suspended particulate (TSP) matter, particulate matter 10 micrometres (μm) (PM_{10}) and particulate matter 2.5 μm ($\text{PM}_{2.5}$) and dust deposition levels for the Moolarben Coal Complex incorporating the UG1 Optimisation Modification.

With the implementation of proactive and reactive management measures, there were no predicted exceedances of the 24-hour average PM_{10} criteria, or annual TSP, PM_{10} or dust deposition criteria at any privately-owned receiver due to emissions from the project only (i.e. the Moolarben Coal Complex incorporating the UG1 Optimisation Modification) (TAS, 2015a).

24-hour average and annual average $\text{PM}_{2.5}$ concentrations were predicted to be below applicable air quality standards at all privately-owned receivers (TAS, 2015a).

The assessment concluded an increase in potential cumulative air quality impacts was unlikely (TAS, 2015a).

Air Quality Management and Monitoring

The approved Air Quality Management Plan describes the air quality management and monitoring regime at the Moolarben Coal Complex.

The Air Quality Management Plan describes:

- Project Approval air quality criteria.
- Dust monitoring locations and frequency, comprising (Figure 12):
 - Tapered Element Oscillating Mass Balances (TEOMs) measuring PM₁₀ continuously (i.e. real-time monitors);
 - High Volume Air Samplers measuring PM₁₀ once every six days; and
 - dust deposition gauges.
- Ongoing dust management measures.
- Real-time response triggers (set below Project Approval air quality criteria) which trigger the implementation of additional dust management measures.

Operational air quality management measures at the Moolarben Coal Complex include (but are not limited to):

- employing appropriate dust suppression methods at the coal handling facilities;
- use of water carts and/or sprays on coal-handling and stockpile areas to minimise dust generation as necessary and practicable;
- use of water carts as necessary and practicable on all trafficked areas to minimise excessive visible dust;
- use of constructed roads only, minimisation of access roads and removal of obsolete access roads;
- partial enclosure of raw coal transfer and reject conveyors where possible; and
- modification of operations during periods of adverse weather conditions.

A comprehensive air quality management system including predictive meteorological forecasting, predictive air quality forecasting and real-time air quality monitoring data (i.e. real-time response triggers) has been implemented at the Moolarben Coal Complex.

In accordance with the requirements of Project Approval (05_0117) and Project Approval (08_0135), MCO co-ordinates air quality management with the Ulan Mine Complex and Wilpinjong Coal Mine to minimise cumulative air quality impacts.

MCO reports air quality monitoring results in its Monthly Environmental Monitoring Report and Annual Review.

Air quality monitoring results reported in the 2016 Annual Review show two exceedances of Project Approval PM₁₀ concentrations during 2016. These exceedances were attributed to hazard reduction burns in the nearby Goulburn River National Park and were not associated with the Moolarben Coal Complex.

A summary of air quality monitoring results and air quality compliance for the period 2011 to 2016 is provided in Appendix B.

MCO maintains a complaints register in accordance with Project Approval (05_0117) and Project Approval (08_0135). All dust related complaints received by MCO are responded to and investigated. Two dust related complaints were received in 2016.

4.2.2 Environmental Review

Air quality dispersion modelling has been conducted by TAS (2017) to assess potential impacts for the Moolarben Coal Complex incorporating the Modification.

Modelling Scenarios

TAS (2017) modelled and assessed the same key scenarios (2019, 2021 and 2026) as the noise modelling (Section 4.1.2).

These scenarios were selected as they are representative of maximum proposed open cut ROM coal mining rates for the Stage 1 open cuts (10 Mtpa), Stage 1 and Stage 2 open cuts combined (16 Mtpa), and Stage 2 open cut (16 Mtpa).

Modelling Methodology

The dispersion modelling methodology applied by TAS (2017) is consistent with the methodology applied by TAS for the Stage 1 Optimisation Modification, OC4 South-West Modification and UG1 Optimisation Modification assessments, using the CALPUFF modelling suite (TAS, 2013; 2015b; 2015a).

The CALMET meteorological modelling has been revised to incorporate changes to the local mine terrain for the proposed modelling scenarios, which affects the local wind flows of the area (e.g. to account for the updated sequencing of the open cut pits).

Dust emissions from each activity were represented by a series of volume sources and included in the CALPUFF model via an hourly varying emission file. Meteorological conditions associated with dust generation (such as wind speed) and levels of dust generating activity were considered in calculating the hourly varying emission rate for each source.

As a conservative measure, the effect of rainfall in reducing dust emissions has not been considered by TAS (2017).

Predicted Impacts

Project-only

Concentrations of TSP, PM_{2.5} and PM₁₀ and dust deposition rates were predicted for the Moolarben Coal Complex incorporating the Modification (TAS, 2017).

The predictions were compared against applicable air quality assessment criteria outlined in *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA, 2017), *Voluntary Land Acquisition and Mitigation Policy* (NSW Government, 2014), Project Approval (05_0117) and Project Approval (08_0135).

No exceedances of criteria for TSP, PM_{2.5}, PM₁₀ or dust deposition criteria are predicted at any privately-owned receiver due to project-only emissions from the Moolarben Coal Complex incorporating the Modification, or on greater than 25% of privately-owned land.

Contours showing predicted project-only 24-hour PM₁₀ concentrations for the 2019, 2021 and 2026 modelling scenarios are provided on Figures 16, 17 and 18, respectively.

Cumulative

TAS (2017) modelled the cumulative 24-hour PM_{2.5} and PM₁₀ impacts due to the Modification, Wilpinjong Coal Mine, Ulan Mine Complex and background (non-mining) sources.

The assessment predicted no additional days above the average 24-hour PM_{2.5} criteria, and the potential for 1 or 2 additional days per year above the average 24-hour PM₁₀ criteria at the closest sensitive receiver locations.

Additional modelling conducted by TAS (2017) demonstrates these additional predicted exceedances of cumulative 24-hour average PM₁₀ impacts could be avoided in practice through the continued implementation of predictive and reactive measures (e.g. through real-time dust monitoring and the modification of mining operations during periods of adverse weather conditions).

No exceedances of the annual average criteria for TSP, PM₁₀, PM_{2.5} or dust deposition were predicted at any privately-owned receiver or on greater than 25% of privately-owned land (Appendix B).

4.2.3 Mitigation Measures, Management and Monitoring

MCO would continue to implement air quality management measures in accordance with the Air Quality Management Plan, which would be reviewed and updated to incorporate the Modification.

4.3 BIODIVERSITY

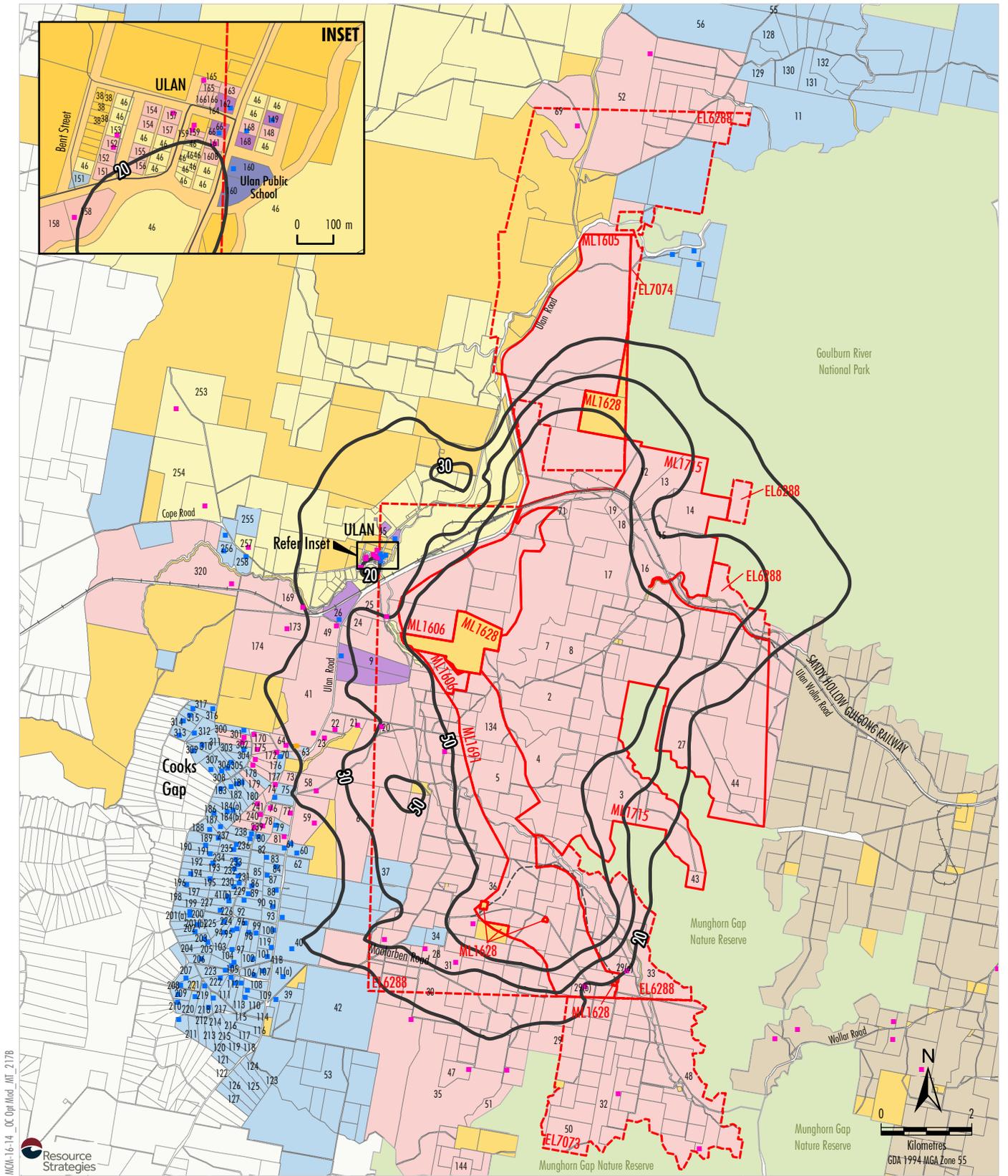
A Biodiversity Assessment Review and Biodiversity Offset Strategy has been prepared by ELA (2017) in accordance with the reporting requirements of the NSW *Biodiversity Offsets Policy for Major Projects* and underlying FBA and is presented in Appendix C.

A description of the existing environment relating to the biodiversity values of the Modification areas is provided in Section 4.3.1. Section 4.3.2 describes the potential impacts of the Modification, and Section 4.3.3 outlines mitigation measures, management, monitoring and the biodiversity offset strategy.

4.3.1 Background

Detailed ecological impact assessments were prepared by Moolarben Biota (2006) and Ecovision (2008) for Stages 1 and 2 of the Moolarben Coal Project respectively. An ecological impact assessment was also undertaken in 2012 for the Moolarben Coal Project Stage 1 Optimisation Modification EA (EMGA Mitchell McLennan, 2013a).

The extent of approved disturbance is shown on Figure 2. In accordance with Project Approvals (05_0117) and (08_0135), a Biodiversity Offset Strategy is in place for the Moolarben Coal Complex to compensate for impacts associated with approved disturbance.



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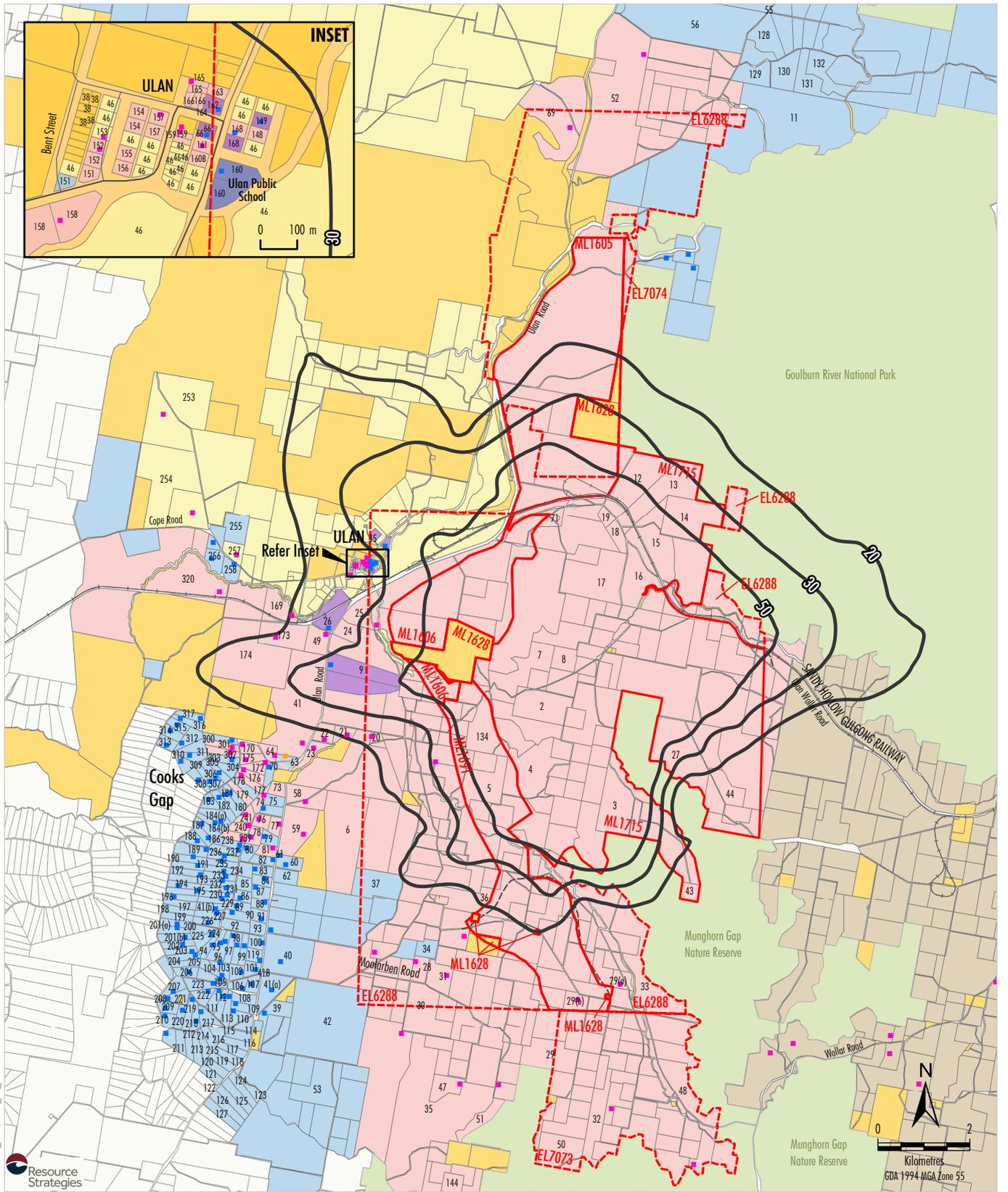


- LEGEND**
- Exploration Licence Boundary
 - Mining Lease Boundary
 - Railway
 - National Park/Nature Reserve
 - Moolarben Coal Operations Pty Ltd
 - Moolarben Coal Operations Pty Ltd – Under Contract/Purchase Agreement
 - Ulan Coal Mines Limited
 - Wilpinjong Coal Mine
 - Commercial
 - Minister for Education
 - Crown/State of NSW
 - Privately Owned
 - Mine Owned Receiver
 - Private Receiver (Under Contract to MCC)
 - Private Receiver
 - 24 Hour PM₁₀ Contour

Source: MCC (2017); NSW Dept of Industry (2017);
NSW Land & Property Information (2017);
Office of Environment and Heritage NSW (2017)

MOOLARBEN COAL
MOOLARBEN COAL COMPLEX
24 Hour PM₁₀ Contours
2019 (Project-only)

Figure 16



MOL-16-14_OC OpnMod_INT_2198



LEGEND

- Exploration Licence Boundary
- Mining Lease Boundary
- Railway
- National Park/Nature Reserve
- Moolarben Coal Operations Pty Ltd
- Moolarben Coal Operations Pty Ltd – Under Contract/Purchase Agreement
- Ulan Coal Mines Limited
- Wilpinjong Coal Mine
- Commercial
- Minister for Education
- Crown/State of NSW
- Privately Owned
- Mine Owned Receiver
- Private Receiver (Under Contract to MCO)
- Private Receiver
- 24 Hour PM₁₀ Contour

Source: MCC (2017); NSW Dept of Industry (2017);
NSW Land & Property Information (2017);
Office of Environment and Heritage NSW (2017)

MOOLARBEN COAL COMPLEX
 24 Hour PM₁₀ Contours
 2026 (Project-only)

Figure 18

Surveys for the Modification

Specific flora surveys were conducted in the Modification areas (i.e. associated with surface disturbance) and surrounds to identify the Plant Community Types (PCTs), Biometric Vegetation Types (BVTs), and target potentially occurring threatened flora species and ecological communities. These surveys were undertaken in November and December 2016, and March, April and October 2017 by ELA (Appendix C).

Fauna surveys were undertaken in February and March 2017. Survey techniques included diurnal bird surveys, microbat detection surveys, remote camera surveys, nocturnal surveys, reptile surveys, opportunistic sightings, Koala feed tree mapping and cliff line feature mapping.

Vegetation Communities

Vegetation communities were mapped within the Modification areas based on BVTs. Vegetation communities are described in Appendix C and include (Figures 19a and 19b):

- Rough-Barked Apple - Red Gum - Yellow Box Woodland on Alluvial Clay to Loam Soils on Valley Flats in the Northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (HU714);
- White Box - Grey Box - Red Gum - Rough-Barked Apple Grassy Woodland on Rich Soils on Hills in the Upper Hunter (HU730);
- Slaty Box - Grey Gum Shrubby Woodland on Foothills of the Upper Hunter Valley, Sydney Basin Bioregion (HU618);
- White Box - Narrow-leaved Ironbark - Blakely's Red Gum Shrubby Open Forest of the Central and Upper Hunter (HU820);
- Narrow-leaved Stringybark – Grey Gum Shrubby Open Forest on Sandstone Ridges of the Sydney Basin (HU843);
- Narrow-leaved Ironbark - Black Pine - Sifton Bush Heathy Open Forest on Sandstone Ranges of the Upper Hunter and Sydney Basin (HU875);
- Blakely's Red Gum - Rough-barked Apple Shrubby Woodland of Central and Upper Hunter (HU910); and
- Red Ironbark - Grey Gum - Narrow-leaved Stringybark - Brown Bloodwood Shrubby Open Forest on Sandstone Ranges of the Sydney Basin (HU883).

Threatened Flora Species and Populations

No threatened flora species or populations listed under the NSW *Biodiversity Conservation Act, 2016* (BC Act) and/or EPBC Act were recorded within the Modification areas during the recent surveys (Appendix C).

Threatened Ecological Communities

Two threatened ecological communities are present within the Modification areas (Appendix C), namely:

- *White Box - Yellow Box - Blakely's Red Gum Woodland*, listed as an Endangered Ecological Community (EEC) under the BC Act and Critically Endangered Ecological Community (CEEC) under the EPBC Act¹ (HU714 and HU730) (Box-Gum Woodland).
- *Central Hunter Valley Eucalypt Forest and Woodland* listed as a CEEC under the EPBC Act (HU618) (Central Hunter Eucalypt Woodland).

The conditions of these communities vary within the Modification areas. Better quality vegetation is associated with the ridge areas, while along drainage lines and areas of derived native grassland (DNG) it is generally of poor to moderate condition with obvious signs of previous disturbance (e.g. clearing, cultivation and existing roads).

Representative photos of threatened ecological communities present within the Modification area are provided in Plates 1, 2 and 3.

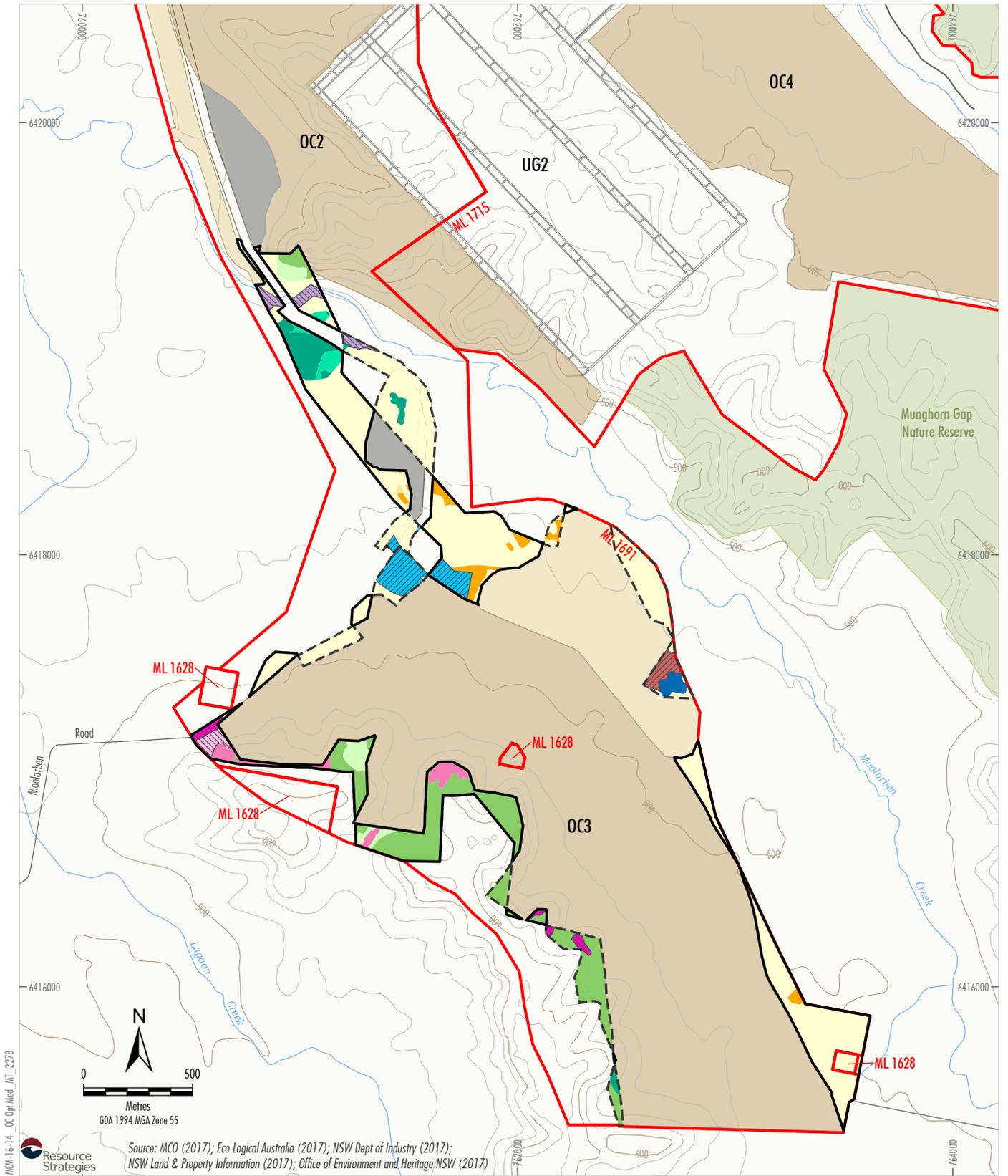
Fauna Habitat

Fauna habitat in the Modification areas consists of a suite of broad habitat elements including:

- exotic grassland/pasture;
- woodlands;
- creekline and riparian habitat; and
- cliffline features (e.g. rocky outcrops).

A description of each habitat type is provided in Appendix C.

¹ Listed under the EPBC Act as *White Box – Yellow Box – Blakely's Red Gum Woodland and Derived Native Grassland*.



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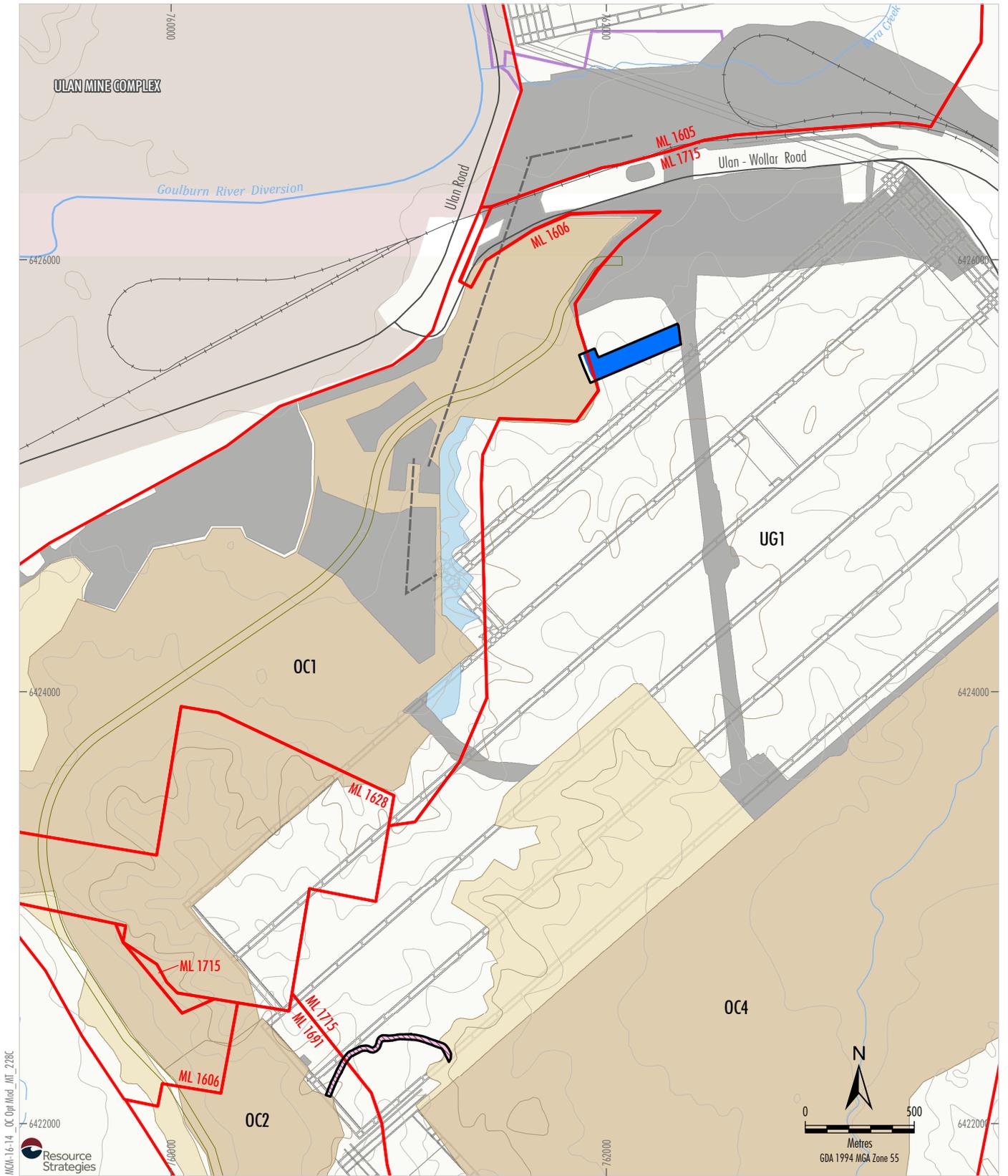


Source: MCO (2017); Eco Logical Australia (2017); NSW Dept of Industry (2017);
NSW Land & Property Information (2017); Office of Environment and Heritage NSW (2017)

<p>LEGEND</p> <ul style="list-style-type: none"> NSW National Parks and Wildlife Service Mining Lease Boundary Existing/Approved Development Open Cut Mining Area Out-of-pit Emplacement Surface Infrastructure Area Underground Longwall Layout Haul Road Open Cut Optimisation Modification Approximate Extent of Additional Surface Development Approved Open Cut Mining Area, Out-of-pit Emplacement and Surface Infrastructure to be Relinquished EPBC Act Listed Threatened Communities Central Hunter Valley Eucalypt Forest and Woodland CEEC White Box - Yellow Box - Blakely's Red Gum Grassy Woodlands and Derived Native Grassland CEEC 	<p>Vegetation Communities</p> <ul style="list-style-type: none"> HU603: Rough-barked Apple - Silvertop Stringybark - Red Stringybark Grassy Open Forest of the Upper Hunter Valley HU618: Slaty Box - Grey Gum Shrubby Woodland on Footslopes of the Upper Hunter Valley, Sydney Basin Bioregion HU618: Derived Grassland HU714: Rough-barked Apple - Red Gum - Yellow Box Woodland on Alluvial Clay to Loom Soils on Valley Flats in the Northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion HU730: White Box x Grey Box - Red Gum - Rough-barked Apple Grassy Woodland on Rich Soils on Hills in the Upper Hunter Valley HU730: Derived Grassland HU820: White Box - Narrow-leaved Ironbark - Blakely's Red Gum Shrubby Open Forest of the Central and Upper Hunter HU843: Narrow-leaved Stringybark - Grey Gum Shrubby Open Forest on Sandstone Ranges of the Sydney Basin HU843: Derived Grassland HU875: Narrow-leaved Ironbark - Black Pine - Sifton Bush Heathy Open Forest on Sandstone Ranges of the Upper Hunter and Sydney Basin HU875: Derived Grassland 	<ul style="list-style-type: none"> HU905: Narrow-leaved Ironbark - Grey Box Grassy Woodland of the Central and Upper Hunter Valley HU910: Blakely's Red Gum - Rough-barked Apple Shrubby Woodland of Central and Upper Hunter HU910: Derived Grassland Cleared Land
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MOOLARBEN COAL COMPLEX
Vegetation Communities - OC2/OC3

Figure 19a



Resource Strategies
 1601-16-14_OC OpnMod_INT_22BC

- LEGEND**
- Other Mining Operation
 - Mining Lease Boundary
 - Existing/Approved Development
 - Open Cut Mining Area
 - Out-of-pit Emplacement
 - Surface Infrastructure Area
 - Pipeline and Borefield Infrastructure
 - Clean Water Diversion Infrastructure
 - Underground Longwall Layout
 - Haul Road
 - Open Cut Optimisation Modication
 - Approximate Extent of Additional Surface Development

- EPBC Act Listed Threatened Communities**
- White Box - Yellow Box - Blakely's Red Gum Grassy Woodlands and Derived Native Grassland CEEC
 - HU883: Red Ironbark - Grey Gum - Narrow-leaved Stringybark - Brown Bloodwood Shrubby Open Forest on Sandstone Ranges of the Sydney Basin
 - HU730: Derived Grassland
 - Cleared Land

Source: MCO (2017); NSW Dept of Industry (2017); Eco Logical Australia (2017); NSW Land & Property Information (2017); Office of Environment and Heritage NSW (2017)

MOOLARBEN COAL
 MOOLARBEN COAL COMPLEX
 Vegetation Communities -
 Bypass Conveyor/Internal Road

Figure 19b



Plate 1: Central Hunter Eucalypt Woodland



Plate 2: Box-Gum Woodland



Plate 3: Box-Gum Woodland (DNG)

Threatened Fauna Species and Populations

The Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) and Large-eared Pied Bat (*Chalinolobus dwyeri*) (both listed as Vulnerable under the BC Act and the Large-eared Pied Bat is also listed as Vulnerable under the EPBC Act) were the only threatened fauna species positively identified within the Modification areas (Appendix C).

Despite these species having been recorded, the surveys did not identify any roosts within the Modification areas (Appendix C).

Further to this, 10 threatened fauna species have been recorded during surveys in the wider surrounds (Appendix C), namely:

- Glossy Black-Cockatoo (*Calyptorhynchus lathamii*);
- Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*);
- Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*);
- Turquoise Parrot (*Neophema pulchella*);
- Speckled Warbler (*Chthonicola sagittata*);
- Dusky Woodswallow (*Artamus cyanopterus cyanopterus*);
- Varied Sittella (*Daphoenositta chrysoptera*);
- Hooded Robin (*Melanodryas cucullata cucullata*);
- Diamond Firetail (*Stagnopleura guttata*); and
- Koala (*Phascolarctos cinereus*).

These species are all listed as Vulnerable under the BC Act. In addition, the Koala is listed as Vulnerable under the EPBC Act.

Possible calls of five threatened bat species (listed as Vulnerable under the BC Act) were recorded within the wider surrounds, but are unable to be identified to a species level based on call data alone.

These include:

- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*);
- Little Bentwing-bat (*Miniopterus australis*);
- Southern Myotis (*Myotis macropus*);
- Corben's Long-eared Bat (*Nyctophilus spp.*); and
- Greater Broad-nosed Bat (*Scoteanax rueppellii*).

The threatened fauna species listed above are all 'ecosystem credit species' (i.e. species that can be predicted to be present based on a habitat assessment as defined in the FBA) with the exception of the Koala, which generates 'species credits'. No threatened fauna species that are species credit species have been recorded within the Modification areas.

Potential habitat for two other threatened species credit species considered likely to occur was identified within the Modification area, namely the Regent Honeyeater and Brush-tailed Rock Wallaby.

Introduced Flora and Noxious Weeds

The Class 4 Noxious Weed *Hypericum perforatum* (St John's Wort) was recorded in high abundance within a DNG portion of HU730 in the southern section of the Modification areas (Appendix C).

Introduced Fauna

Two introduced fauna species were recorded during the surveys for the Modification, namely the Feral Cat and Red Fox (Appendix C).

4.3.2 Environmental Review

The Modification includes:

- Disturbance of approximately 81 ha in the Modification area, comprising:
 - 39 ha of native vegetation (including 7 ha of threatened ecological communities); and
 - 41 ha of previously cleared land.
- Relinquishment of approximately 15 ha of native vegetation, 12 ha of which comprises vegetation communities equivalent to those in the Modification area.
- Residual impact of 27 ha (i.e. 39 ha minus 12 ha) of native vegetation.

Native Vegetation Clearance

The Modification would require the clearance of native woodland and grassland communities along with areas of exotic vegetation. This would include areas of threatened ecological communities listed under the BC Act and EPBC Act.

As part of the Modification, native vegetation within the Relinquishment areas (Figure 19a) would no longer be disturbed.

Table 6 presents the relative areas of native vegetation present within the Modification areas and Relinquishment areas, including the residual areas that require consideration for offsetting as part of this Modification. Table 7 identifies the areas of threatened ecological communities located within the Modification areas and Relinquishment areas.

Indirect Impacts

Potential indirect impacts from the Modification on terrestrial biodiversity (e.g. noise, dust and light spill) have been assessed in Appendix C.

ELA (2017) concludes there would be no significant indirect impacts on biodiversity as a result of the Modification.

Ecosystem Credit Species under the NSW Offset Policy

The FBA (OEH, 2014a) requires the use of an online program (the *Credit Calculator for Major Projects and BioBanking* [the Credit Calculator]) to assess biodiversity impacts and determine the biodiversity offset requirements for those impacts.

The result of running the Credit Calculator is that the Modification requires a Biodiversity Offset Strategy that accounts for a total of 1,437 ecosystem credits (Table 6).

Species Credit Species under the NSW Offset Policy

The Modification requires a Biodiversity Offset Strategy that accounts for species credits for the Koala, Regent Honeyeater and Brush-tailed Rock Wallaby as there is potential for these species to occur based on habitat within the Modification area (Table 6) (Appendix C).

Pest Species

The potential impacts from pest species associated with the Modification are not considered to be significantly greater than those for the approved mining operations (Appendix C).

Potential impacts from pest species associated with the Modification would be mitigated as described in Section 4.3.3.

**Table 6
Modification Credit Reconciliation**

Credit Type	Credits Required by the Modification						Credits Potentially Generated by the Proposed Offset Strategy [^]				
	Modification Areas		Relinquishment Areas		Residual Impact		Relevant Credits Generated by the Gilgal Property*	Rehabilitation		Net Credit Used	Offset Liability Met?
	Area (ha)	Credits	Area (ha)	Credits	Area (ha)	Credits		Area (ha)	Credits		
Ecosystem Credits											
HU618 ¹	2	108	3.5	188	0	0	N/A	N/A	N/A	N/A	N/A
HU714 ²	1.5	53	0.5	18	1	35	> 35	-	-	35	Yes
HU730 ²	3.5	112	0.5	39	3	73	0	27	73	73	Yes
HU820	3	190	1 ³	40	2	150	> 150	-	-	150	Yes
HU843	13	827	6.5	416	7	411	> 411 ⁴	-	-	411	Yes
HU875	4	237	1	33	3	204	> 204 ⁵	-	-	204	Yes
HU883	4.5	233	0	0	4.5	233	> 233 ⁶	-	-	233	Yes
HU910	7.5	354	0.4	23	7.1	331	0	123	331	331	Yes
HU905	0	0	1.5	57	0	0	N/A	N/A	N/A	N/A	N/A
Total	39	2,114	15^{^^}	814^{^^}	27^{^^}	1,437^{^^}	1,033	150	404	1,437	Yes
Regent Honeyeater	31	2,371	10.5	803	20.5	1,568	> 1,568	-	-	1,568	Yes
Koala	4	94	0.5	17	3.5	77	64	4	13	77	Yes
Brush-tailed Rock Wallaby	37	960	10.5	267	26.5	693	> 693	-	-	693	Yes

Note: Totals may not sum due to rounding.

[^] Credits are indicative only. The final offset strategy would be subject to approval of the additional disturbance proposed by the Modification.

^{^^} Only 12 ha of native vegetation (equating to 677 credits) within the Relinquishment areas can be associated with the vegetation communities within the Modification area.

* The area of a number of the communities/fauna habitats on the Gilgal property provide excess credits to that required by the Modification. MCO would only retire the credits required to offset the Modification (as identified in this table) and would hold any residual credits for future use, as required.

¹ Central Hunter Eucalypt Woodland CEEC (EPBC Act). Note, the DNG does not meet the criteria to be listed as the CEEC.

² Box-Gum Woodland EEC (BC Act)/CEEC (EPBC Act).

³ HU603 (located in the Relinquishment areas) is identified as an 'Offset Option' within the Credit Calculator report (Appendix C).

⁴ HU874 (located on Gilgal) is identified as an 'Offset Option' within the Credit Calculator report (Appendix C).

⁵ HU702 (located on Gilgal) is identified as an 'Offset Option' within the Credit Calculator report (Appendix C).

⁶ HU618 (located on Gilgal) is identified as an 'Offset Option' within the Credit Calculator report (Appendix C).

**Table 7
Reconciliation of Threatened Ecological Communities**

Threatened Ecological Community	Conservation Status		Modification Areas (ha)	Relinquishment Areas (ha)	Residual Disturbance (ha)
	BC Act	EPBC Act			
Central Hunter Eucalypt Woodland	V	CE	2.0	3.5	0.0
Box-Gum Woodland	E	CE	5.0	1.0	4.0

V = Vulnerable, E = Endangered, CE = Critically Endangered.

Threatened Species Assessments of Significance

Assessments of Significance have been prepared for the Modification in accordance with the EPBC Act *Significant Impact Guidelines 1.1 - Matters of National Environmental Significance*, section 5A of the EP&A Act and the *Threatened Species Assessment Guidelines - the Assessment of Significance* (NSW Department of Environment and Climate Change [DECC] [now OEH], 2007) on the threatened species and communities known or predicted to occur in the Modification areas (Appendix C).

In summary, ELA (2017) concluded the Modification is not likely to have a significant impact on any threatened species and/or communities listed under the BC Act and/or EPBC Act.

Cumulative Impacts

The Modification would result in a net increase of approximately 27 ha of native vegetation clearance beyond the approved disturbance of the Moolarben Coal Complex.

The change in potential cumulative impacts on threatened species and communities arising from the Modification is considered to be minimal because:

- the clearance is localised compared to the wider distribution of the species (their habitats) and communities;
- the loss of approximately 27 ha of native vegetation would be short-term as the Modification involves progressive re-establishment of native woodland/forest on mine rehabilitation (Section 5); and
- the Biodiversity Offset Strategy would compensate for the loss and increase movement corridors for genetic exchange, foraging habitat and increased breeding resources for threatened fauna species in the medium and long-term (Appendix C).

4.3.3 Avoidance, Mitigation Measures, Management and Biodiversity Offset

Avoidance

The Modification areas were refined following the vegetation validation field survey and preparation of the vegetation mapping.

The Modification areas were minimised as far as practicable to avoid some areas of threatened ecological communities, including a section of Central Hunter Eucalypt Woodland (listed under the EPBC Act).

In addition, the northern portion of the Modification area was refined to exclude habitat features such as cliffline habitat containing rocky outcrops and overhangs (Appendix C).

Avoidance – Areas to be Relinquished

Approximately 34.5 ha of areas approved to be developed for surface infrastructure, emplacement areas and/or open cut mining would be relinquished as part of the Modification, including approximately 15 ha of native woodland (of which, approximately 12 ha can be associated with the vegetation communities in the Modification area).

The biodiversity credits associated with the Relinquishment areas are provided in Table 6.

Minor ancillary infrastructure may still be required in these areas (e.g. above ground pipeline or light vehicle track), however, any minor disturbance would be limited to areas mapped as cleared land.

The Relinquishment areas provide compensation for the vegetation clearance within the Modification areas given:

- the vegetation communities are the same as, or are identified within the Credit Calculator report as “offset options” for, the communities within the Modification areas;
- the vegetation communities are in a similar condition to the communities within the Modification areas; and
- the woodlands would provide suitable habitat for a similar suite of threatened species.

The relinquishment of these areas would require a variation to the EPBC Act decision for Stage 1 (EPBC 2007/3297), which MCO is seeking from the DEE under the EPBC Act in parallel to this application.

Mitigation and Management Measures

MCO would continue to implement management and mitigation measures at the Moolarben Coal Complex in accordance with the approved Biodiversity Management Plan, including:

- implementation of a vegetation clearance protocol including delineation of areas to be cleared, pre-clearing surveys, management of impacts to fauna, vegetation clearance procedures, collection and reuse of habitat features (where feasible);
- collection and use of locally sourced native seeds and supplementary tubestock planting;
- preparation of Ground Disturbance Permits to be approved by the Environment and Community Manager prior to the commencement of clearing activities;
- collection and stockpiling of habitat features important to threatened fauna species for reinstatement in rehabilitation areas or adjoining areas of remnant vegetation where practical and feasible;
- progressive rehabilitation of the Modification landforms;
- management measures for weeds and pests; and
- topsoil removed during construction works would be stockpiled and used in rehabilitation areas.

The Biodiversity Management Plan would be updated to incorporate the Modification.

Biodiversity Offset

The existing Biodiversity Offset Strategy for the Moolarben Coal Complex would be augmented with an additional Biodiversity Offset Strategy for the Modification to account for additional residual impacts on flora and fauna.

Table 6 provides a summary of the credit requirements and how the requirements could be satisfied.

Land-based Offset Area

MCO can choose to establish new land-based offset areas, to generate the credits required. The credits generated from new land-based offset areas for the Modification would be calculated using the *Biobanking Assessment Methodology 2014* (OEH, 2014b).

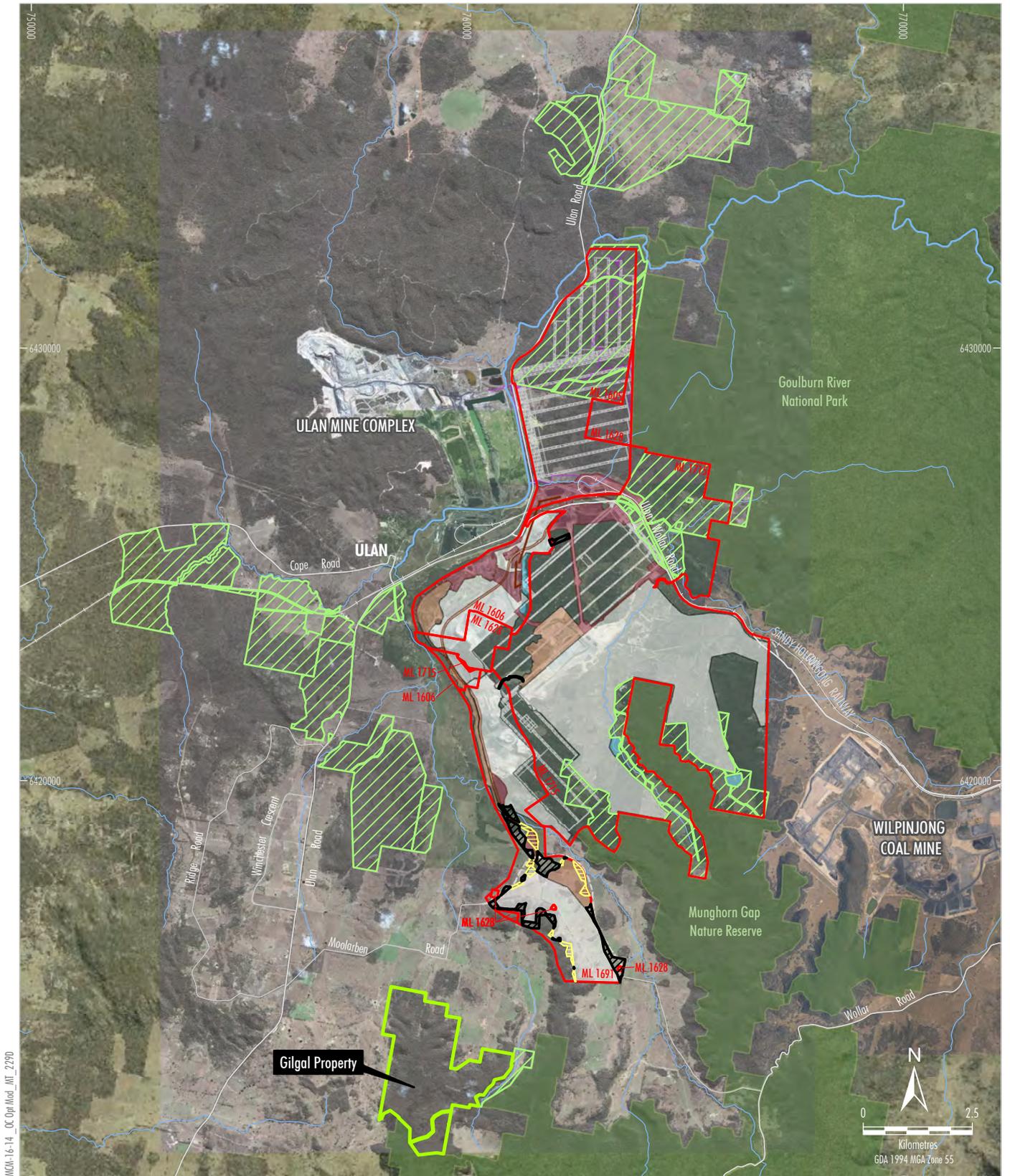
MCO has recently undertaken ecological surveys over the Gilgal property, a property which MCO owns and is located to the south-east of the Modification areas (Figure 20). MCO is proposing to secure this property (or a portion of it) to satisfy a portion of the offset requirement.

An estimate of the credits that could be generated by this property has been made using benchmark values. Additional survey data will be used to confirm the credit calculations (Appendix C).

The overall condition of the vegetation within the Gilgal Property is moderate/good and it is estimated that at least 1,033 ecosystem credits required by the Modification could be generated (Table 6).

In addition, the property provides species credits for the Koala, Regent Honeyeater and Brush-tailed Wallaby (Table 6) (Appendix C).

The estimated number of ecosystem credits generated at the Gilgal property exceed the credit requirement for some communities. The Gilgal property also contains additional areas not described in Table 6, which would provide further credits. MCO would only retire the credits needed to offset the Modification. Any excess credits would be held by MCO for future use, as required.



MOL-16-14_OC Opr/Moat_MIT_229D

LEGEND

- Mining Lease Boundary
- Existing/Approved Development
- Open Cut Mining Area
- Out-of-pit Placement
- Surface Infrastructure Area
- Pipeline and Borefield Infrastructure
- Clean Water Diversion Infrastructure
- Underground Longwall Layout
- Haul Road
- Road Realignment (not yet constructed)
- Existing Biodiversity Offset Area

Open Cut Optimisation Modification

- Approximate Extent of Additional Surface Development
- Approved Open Cut Mining Area, Out-of-pit Placement and Surface Infrastructure to be Relinquished
- Proposed Offset Area

Source: MCO (2017); NSW Dept of Industry (2016);
Office of Environment and Heritage NSW (2016)
Orthophoto Mosaic: MCO (April 2016 - May 2014);
Department Finance, Services & Innovation (2017)

MOOLARBEN COAL
MOOLARBEN COAL COMPLEX
Gilgal Property

Figure 20

Rehabilitation

The NSW Biodiversity Offsets Policy for Major Projects (NSW Offset Policy) (OEH, 2014c) (and associated FBA [OEH, 2014a]) enables credits to be generated through mine site rehabilitation. MCO can generate ecosystem credits for the Modification including from:

- establishing additional woodland/forest on the post mine landforms associated with the Modification (Figure 9); and
- establishing additional woodland/forest on the post mine landforms associated with portions of the already approved Moolarben Coal Complex in areas previously proposed to be revegetated to pasture (Figure 9).

Rehabilitation of the post mine landforms could, in accordance with the FBA (OEH, 2014a) and the OEH Calculator for "Framework for Biodiversity Assessment (FBA) Section 12.2: Generating biodiversity credits for ecological rehabilitation of previously mined land", generate in the order of approximately 1,550 ecosystem credits associated with the BVTs that are targeted for rehabilitation.

The residual credit requirement for the Modification, once relevant credits associated with the Gilgal property have been retired, could be met using a portion of these credits (i.e. only 404 ecosystems credits and 13 species credits for the Koala are needed to fulfil the residual requirement) (Table 6). As per the additional credits associated with the Gilgal property, any credits generated by rehabilitation commitments not required for the Modification would be held by MCO for future use, as required.

The Rehabilitation Strategy for the Modification is provided in Section 5.

Other Offset Options

OEH describes an objective of the NSW Offset Policy is to provide greater flexibility for proponents to meet their offset requirements while ensuring the best and most credible offsets are provided.

Should residual offset requirements, beyond those described above (e.g. the Gilgal property), be required, these credits would be offset using one, or a combination, of the following (OEH, 2014c):

- acquiring or retiring credits under the biobanking scheme in the BC Act;
- making payments into an offset fund once established by the NSW Government; and/or

- providing supplementary measures as outlined in the NSW Offset Policy (OEH, 2014c).

The final Biodiversity Offset Strategy for the Modification is expected to comprise a combination of credits generated by land-based offset areas, rehabilitation and potentially other mechanisms.

Finalisation and security of the Biodiversity Offset Strategy would be subject to approval of the Modification.

4.4 ABORIGINAL HERITAGE

An ACHA has been prepared for the Modification by Niche Environment and Heritage (2017) and is presented in Appendix D.

4.4.1 Background

The ACHA for the Modification has been undertaken in consideration of the following codes, guidelines and regulations (Appendix D):

- *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW Department of Environment, Climate Change and Water [DECCW], 2010a);
- *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW, 2010b);
- *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW, 2010c);
- *NSW Minerals Industry Due Diligence Code of Practice for the Protection of Aboriginal Objects* (NSW Minerals Council, 2010);
- *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH, 2011);
- *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance* (Australia ICOMOS, 2013); and
- *NSW National Parks and Wildlife Regulation, 2009*.

Previous Archaeological Investigations

A number of Aboriginal cultural heritage surveys, assessments and salvage programs have been undertaken within the Moolarben Coal Complex area and surrounds, including the Modification area.

Key Aboriginal cultural heritage surveys and assessments were undertaken for Stages 1 and 2 of the Moolarben Coal Project in 2006, 2008, 2009, 2011, 2012 and 2015 (Hamm, 2006, 2008, 2009; AECOM, 2011; South East Archaeology, 2013; Niche Environment and Heritage, 2015a, 2015b). Various other minor surveys and assessment have also been undertaken.

A detailed description of previous archaeological assessments and surveys undertaken at the Moolarben Coal Complex and surrounds is provided in Appendix D.

At the time of drafting the ACHA (Appendix D), a total of 871 Aboriginal sites had been identified at the Moolarben Coal Complex and surrounds, of which 454 were located within the Moolarben Coal Complex. Identified sites include artefact scatters, isolated finds, grinding grooves and rock shelters (with or without artefacts, art and/or potential archaeological deposits).

Aboriginal Cultural Heritage Management

The management of Aboriginal heritage at the Moolarben Coal Complex is currently conducted in accordance with the measures outlined in the approved Heritage Management Plan.

4.4.2 Environmental Review

Consultation and Assessment Program

The ACHA prepared for the Modification included consultation with eight RAPs, identified via a previous registration process consistent with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW, 2010a) (Appendix D).

Consultation with RAPs regarding the existing Moolarben Coal Complex has been extensive and involved various methods of communication including public notices, meetings, written and verbal correspondence, archaeological survey attendance and site inspections.

A detailed description of the consultation undertaken with the RAPs for the Modification is provided in Appendix D.

An Aboriginal Heritage Information Management System (AHIMS) search was undertaken on 15 May 2017 (Appendix D) for the Modification area and surrounds. Based on the AHIMS search and the Moolarben Coal Complex Aboriginal Heritage Sites Database, one previously recorded Aboriginal site is located within the Modification area (S1MC140) (Figure 21). This site comprises an artefact scatter of low scientific significance.

Archaeological surveys for the Modification were undertaken in February and March 2017 in consultation with representatives of the RAPs including North-East Wiradjuri Company Ltd, Mudgee Local Aboriginal Land Council, Murong Gialinga Aboriginal and Torres Strait Islanders Corporation and Warrabinga Native Title Claimants Aboriginal Corporation (i.e. consistent with the protocols outlined in the Heritage Management Plan).

The survey provided an opportunity to inspect areas for open sites, as well as inspect ridge slopes and tops for closed sites such as rock shelters and overhangs.

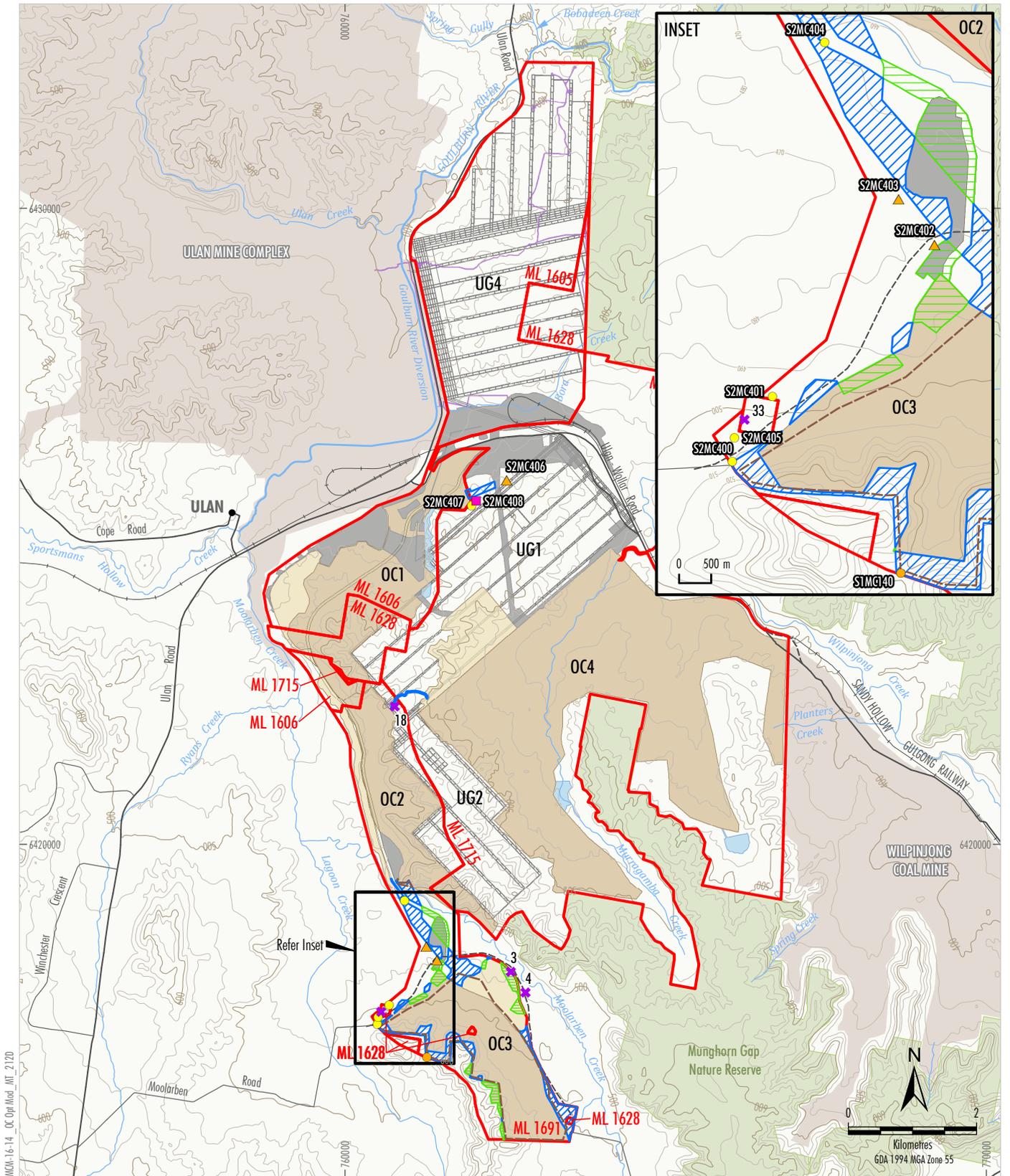
Archaeological Findings

Nine new Aboriginal heritage sites were identified during the February and March 2017 surveys comprising three isolated finds, five stone artefact scatters and a rock shelter with potential archaeological deposit. In addition to these sites the survey also reinspected the previously recorded artefact scatter site (S1MC140). Detailed descriptions of these sites are presented in Appendix D and shown on Figure 21.

The area subject to survey for this assessment was larger than the current Modification area. Detailed mine planning and refinement of the final proposed disturbance area has resulted in the avoidance of direct impact to some identified heritage sites. Two of the ten sites identified are within the Modification area (i.e. S1MC140 and S2MC404).

Archaeological and Cultural Heritage Values

One site located within the Modification area has been assessed as being of moderate scientific significance (S2MC404) while the second site has been assessed as having low scientific significance (S1MC140) (Appendix D). These sites are both artefact scatters and are shown on Figure 21.



MOL-16-14_OC Opi Mod_AIT 2/20

LEGEND

- NSW National Parks and Wildlife Service
- Other Mining Operations
- Mining Lease Boundary
- Existing/Approved Development
- Open Cut Mining Area
- Out-of-pit Emplacement
- Surface Infrastructure Area
- Pipeline and Borefield Infrastructure
- Clean Water Diversion Infrastructure
- Underground Longwall Layout
- Haul Road
- Road Realignment (not yet constructed)

- Open Cut Optimisation Modification
- Approximate Extent of Revised Open Cut Mining Area
 - Approximate Extent of Additional Surface Development
 - Approved Open Cut Mining Area, Out-of-pit Emplacement and Surface Infrastructure to be Relinquished
- Historic Heritage Sites
- ✖ Historic Heritage Site
 - ✖ Aboriginal Cultural Heritage Sites (March 2017)
 - ✖ Isolated Find
 - ▲ Shelter with PAD
 - Artefact Scatter
 - Open Artefact Site

Source: MCO (2017); NSW Dept of Industry (2017);
NSW Land & Property Information (2017);
Office of Environment and Heritage NSW (2017)

MOOLARBEN COAL
MOOLARBEN COAL COMPLEX
Recorded Aboriginal Cultural Heritage
and Historic Heritage Sites

Figure 21

No Aboriginal heritage sites of high scientific significance were recorded during the February and March surveys, or are located within the Modification area (Appendix D).

There were no specific areas or places of cultural value identified by the RAPs during the archaeological survey undertaken for the Modification. Previous assessments and surveys have identified and documented cultural values for the Moolarben Coal Complex and surrounds, which are summarised in Appendix D.

Potential Direct Impacts

Findings from the February and March 2017 surveys have been used to inform the proposed locations of infrastructure for the Modification, with identified heritage sites avoided where possible.

The final extent of surface disturbance for the Modification has the potential to directly impact two Aboriginal heritage sites (S1MC140 and S2MC404) (Figure 21).

While these sites may be avoided during the detailed design phase of the surface infrastructure, it has been conservatively assumed that they would be disturbed.

Management of these two sites within the Modification area would be conducted consistent with the management protocols of the Heritage Management Plan (i.e. salvage).

Potential Indirect Impacts

The Modification involves blasting within the open cut pit extension areas. Aboriginal heritage sites in close proximity to the Modification area are open sites including artefact scatters and isolated finds.

There is minimal risk to this type of site from vibration from blasting. Dust modelling conducted for the Modification indicates dust emissions would be similar to those associated with the approved operations. As such, potential indirect impacts to Aboriginal sites from dust deposition due to the Modifications are limited.

Other potential indirect impacts, such as accidental disturbance by peripheral activities, and inappropriate visitation of known Aboriginal cultural heritage sites, would be avoided and managed as per the protocols of the existing Heritage Management Plan.

4.4.3 Management and Mitigation Measures

MCO would implement the management and mitigation measures described in Appendix D, which are consistent with the protocols of the Heritage Management Plan.

The Heritage Management Plan would be reviewed and updated to incorporate the Modification (e.g. to include additional sites identified during the February and March 2017 survey).

Previously unrecorded Aboriginal heritage sites identified during the Modification will be managed consistent with the requirements outlined in the Heritage Management Plan.

MCO will continue to liaise with the RAPs throughout surface disturbance activities for the Modification.

4.5 GEOCHEMISTRY

A Geochemistry Review for the Modification has been undertaken by RGS Environmental Pty Ltd (RGS) (2017) (Appendix H).

4.5.1 Background

Previous Assessment

Environmental Geochemistry International Pty Ltd (EGI) (2006; 2008) undertook Geochemical Assessments to assess the potential impacts of Stages 1 and 2 of the Moolarben Coal Complex. A summary of these assessments is provided below.

Stage 1 EA

EGI (2006) assessed the acid rock drainage (ARD) (now referred to as Acid and Metalliferous Drainage [AMD]), salinity and sodicity hazards associated with the development of Stage 1 of the Moolarben Coal Project through the testing of representative samples.

Results of AMD investigations indicated over 90% of overburden material was likely to be non-acid forming (NAF), with the remaining 10% expected to be potentially acid forming – low capacity (PAF-LC) (EGI, 2006).

Testing of samples also indicated overburden, coal seam floor and coal reject material were likely to be non-saline, with coal samples moderately saline to saline (EGI, 2006).

Sodicity testing indicated possible sodicity hazard for topsoil, Quaternary/Tertiary alluvials and weathered Permian material (EGI, 2006).

No significant enrichment of metals/metalloids was detected in overburden, coal or reject solids (EGI, 2006).

Stage 2 EA

EGI (2008) assessed the AMD potential associated with development of Stage 2 of the Moolarben Coal Project through the testing of representative samples.

Results of AMD investigation indicated the majority of the overburden and coal seam floor material from Stage 2 operations was likely to be NAF, with some potentially acid forming (PAF) overburden/interburden material mainly associated with the Moolarben Seam and roof and floor of the Ulan Seam (EGI, 2008).

Management and Monitoring

MCO manages PAF materials in accordance with the approved Surface Water Management Plan and Rehabilitation Management Plan.

4.5.2 Environmental Review

A review of the geochemical nature of mine materials at the Moolarben Coal Complex has been conducted by RGS (2017).

The purpose of the review was to consider potential impacts associated with an increased rate of reject material production, inform treatment requirements for licensed discharges and make recommendations for ongoing water quality monitoring.

Methodology

RGS reviewed the Stage 1 and Stage 2 geochemical assessments, geochemical data on mining by-products (including overburden, interburden and coal reject materials) collected during operations, and water quality data from existing water storages and groundwater monitoring bores (RGS, 2017).

This information was used to determine the likely salinity and potential for specific enriched/soluble metals to occur in mine water that would be treated for release, and to inform if changes to current reject material management strategies were required (RGS, 2017).

Conclusions of Review

In regard to water quality in on-site storages, RGS (2017) concluded:

- water quality is generally pH neutral, with elevated salinity;
- concentrations of major ions (e.g. Calcium and Magnesium) are relatively low and within applicable guideline values;
- concentrations of some dissolved metals/metalloids (i.e. Aluminium, Cadmium, Copper, Manganese, Nickel and Zinc) can be slightly elevated compared to freshwater aquatic ecosystem guidelines, consistent with predictions in EGI (2006); and
- Iron and Sulfate salt concentrations can be elevated.

Based on the above, to achieve licensed discharge water quality concentration limits and/or Australian and New Zealand Environment and Conservation Council (ANZECC) (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* trigger levels (either site specific or default), water stored on-site may require treatment to:

- reduce salinity; and
- reduce/control metals (e.g. Aluminium, Cadmium, Copper, Manganese, Nickel, Zinc and Iron).

The proposed Water Treatment Facility would be designed in consideration of the findings of RGS (2017).

In regard to the management of reject material, RGS (2017) concluded that current management practices should continue for the Modification.

It is noted that while peak annual rejects may increase for the Modification, total rejects produced over the life of the mine would decrease with the installation of the proposed open cut bypass conveyor system (i.e. bypassed coal would not produce rejects).

4.5.3 Mitigation Measures, Management and Monitoring

Based on the recommendations of the Geochemistry Review, the following management and monitoring would be conducted:

- geochemical testing would continue;

- rejects would continue to be co-disposed with waste rock in the open cut mining voids, at least 5 m below the surface of the final landform; and
- water quality monitoring would continue in on-site storages and in the receiving environment, including pH and salinity monitoring on at least a quarterly basis and major ion and trace metal monitoring at least on an annual basis.

4.6 SURFACE WATER

Updated water balance modelling undertaken by WRM (2017) for the Modification indicates the Moolarben Coal Complex (incorporating the Modification) would be a surplus water site in some years and under certain climatic conditions.

To assist with managing excess water on-site, the volume of water to be discharged from the relocated EPL discharge point (ID1) (Figure 10) is proposed to increase to 20 ML/day (EPL 12932 currently permits discharge of up to 10 ML/day from EPL ID1) (Section 3.8). An associated increase in the combined discharge volume from EPL ID1 (relocated), EPL ID2 and EPL ID28 to 20 ML/day would also be required.

No change is proposed to the existing discharge volume limits for EPL ID2 and EPL ID28.

There would be no change to existing water quality concentration limits currently authorised by EPL 12932 for licensed discharges.

Advisian (2017) has assessed the potential impacts of the proposed increased volume of licensed discharge on downstream flows and quality.

4.6.1 Background

Surface Water Drainage Network

The Goulburn River forms part of the Hunter River catchment (Figure 22). It commences on the eastern slopes of the Great Dividing Range at the confluence of Moolarben Creek and Sportsmans Hollow Creek, near the village of Ulan, flows through the Goulburn River National Park and discharges into the Hunter River south of Denman, approximately 150 km downstream of the Moolarben Coal Complex.

The Goulburn River runs along the north-western boundary of the Moolarben Coal Complex, flowing in a north easterly direction in the vicinity of the Moolarben Coal Complex.

The expansion of the Ulan Mine Complex in 1982 included the diversion of the Goulburn River to provide access to the coal resource. Construction of the Diversion (Figure 23) commenced in 1981 and was completed in 1982, diverting 3.6 km of the Goulburn River approximately 700 m east of its original flow-path.

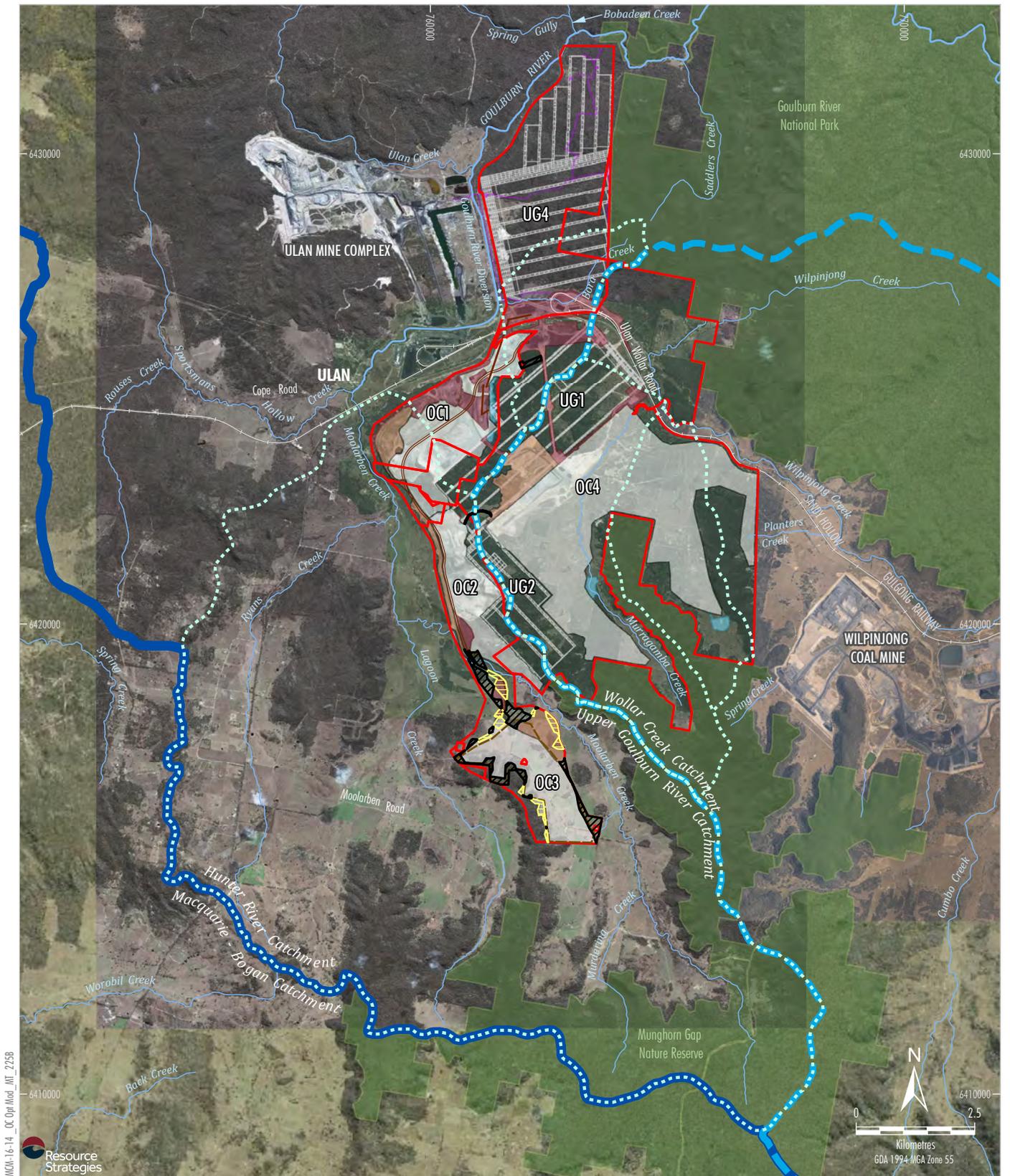
The Diversion channel now covers 4.2 km. The bed of the Diversion generally comprises a bedrock base with an average gradient of 0.3 to 1% (Hunter Land Management, 2006). The Diversion has a trapezoidal channel cross section along most of its length and has sufficient capacity to convey the 100 year Average Recurrence Interval flood event within its banks (Appendix F).

Moolarben Creek (Figure 23) is a tributary of the upper Goulburn River catchment and flows in a northerly direction along the eastern boundary of OC3 and the western boundary of OC2/OC1. The Moolarben Creek Dam is located on Moolarben Creek, approximately 1.5 km upstream of the confluence with Sportsmans Hollow Creek. It was constructed between 1955 and 1957 to supply cooling water for the Ulan Power Station (Appendix F).

Bora Creek (Figure 23) is an ephemeral stream that discharges into the Goulburn River Diversion approximately 4 km downstream from the town of Ulan. It drains a small catchment that extends to the north-east of the Goulburn River and the Moolarben Coal Complex. EPL ID1 is currently permitted to discharge to Bora Creek.

Ulan Creek (Figure 23) joins the Goulburn River downstream of the Moolarben Coal Complex. Ulan Creek is an ephemeral creek that runs through the Ulan Mine Complex in a southerly then easterly direction. Water has been discharged into Ulan Creek from the Ulan Mine Complex in accordance with EPL 394 since 2004.

Wilpinjong Creek and its tributaries (including Murragamba and Eastern Creeks) (Figure 23) drain in a south-easterly direction along the eastern boundary of the Moolarben Coal Complex. Wilpinjong Creek joins Wollar Creek, before draining into the Goulburn River approximately 26 km downstream of the Moolarben Coal Complex.



MOL-16-14_OC Opr Mod_INT 2258



- LEGEND**
- Mining Lease Boundary
 - Existing/Approved Development
 - Open Cut Mining Area
 - Out-of-pit Emplacement
 - Surface Infrastructure Area
 - Pipeline and Borefield Infrastructure
 - Clean Water Diversion Infrastructure
 - Underground Longwall Layout
 - Haul Road
 - Open Cut Optimisation Modication
 - Approximate Extent of Revised Open Cut Mining Area
 - Approximate Extent of Additional Surface Development
 - Approved Open Cut Mining Area, Out-of-pit Emplacement and Surface Infrastructure to be Relinquished
 - Local Catchment Boundary
 - Sub-catchment Divide (Upper Goulburn River and Wollar Creek)
 - Catchment Divide (Hunter River and Macquarie-Bogan)

Source: MCO (2017); NSW Dept of Industry (2017); NSW Land & Property Information (2017)
 Office of Environment and Heritage NSW (2017); NSW Office of Water (2017)
 Orthophoto Mosaic: MCO (April 2016 - May 2012); Department Finance, Services & Innovation (2017)

MOOLARBEN COAL
MOOLARBEN COAL COMPLEX
 Local Drainage Network

Figure 23

Existing EPL Limits

EPL 12932 (version 26 May 2016) permits discharge of water from three existing licensed discharge points (Figure 24), subject to stringent water quality concentration limits:

- EPL ID1 – to Bora Creek from Cockies Dam – maximum 10 ML/day;
- EPL ID2 – to Goulburn River from Sediment Dam 6 – maximum 10 ML/day; and
- EPL ID28 – to Moolarben Creek from OC2 Dam – maximum 1 kL/day.

The EPL also specifies that the maximum combined discharge from the licensed discharge points must not exceed 10 ML/day.

The existing water quality concentration limits in the EPL are the same for each licensed discharge point and are summarised in Table 8.

Table 8
Existing EPL Water Quality Concentration Limits

Parameter	Limit
EC (100%ile) ($\mu\text{S}/\text{cm}$)	900
EC (50%ile) ($\mu\text{S}/\text{cm}$)	800
Oil & Grease (mg/L)	10
pH	6.5 – 8.5
TSS (mg/L)	50
Turbidity (NTU)	14

EC = Electrical Conductivity, TSS = Total Suspended Solids, mg/L = milligrams per litre, $\mu\text{S}/\text{cm}$ = microSiemens per centimetre, NTU = Nephelometric Turbidity Units.

EPL 12932 also permits discharge of water from sediment dams following gravity settlement of sediment, or periods of significant rainfall, subject to compliance with water quality limits for releases from sediment dams.

Ulan Mine Complex

Water is discharged from the Ulan Mine Complex under the conditions of EPL 394. The Ulan Mine Complex has a number of EPA licensed discharge points located on Ulan Creek (EPL ID3, EPL ID6 and EPL ID19), which joins the Goulburn River downstream of the Moolarben Coal Complex.

The Ulan Mine Complex has historically discharged into Ulan Creek from EPL ID3 since April 2004, from EPL ID6 since June 2007, and from EPL ID19 since December 2011.

Since May 2012, when a discharge limit of 30 ML/day was approved, an average volume of 10.7 ML/day has been discharged into Ulan Creek (Appendix F). However, UCML monitoring records indicate discharges have increased recently with average daily discharges of approximately 20 ML/day in 2016.

Water Quality

MCO undertakes routine monthly surface water quality monitoring in the Goulburn River in accordance with the Surface Water Management Plan (Figure 24). Water quality data is also collected by UCML at Ulan Mine Complex flow gauges UMC SW01 and UMC SW02 on the Goulburn River (Figure 24).

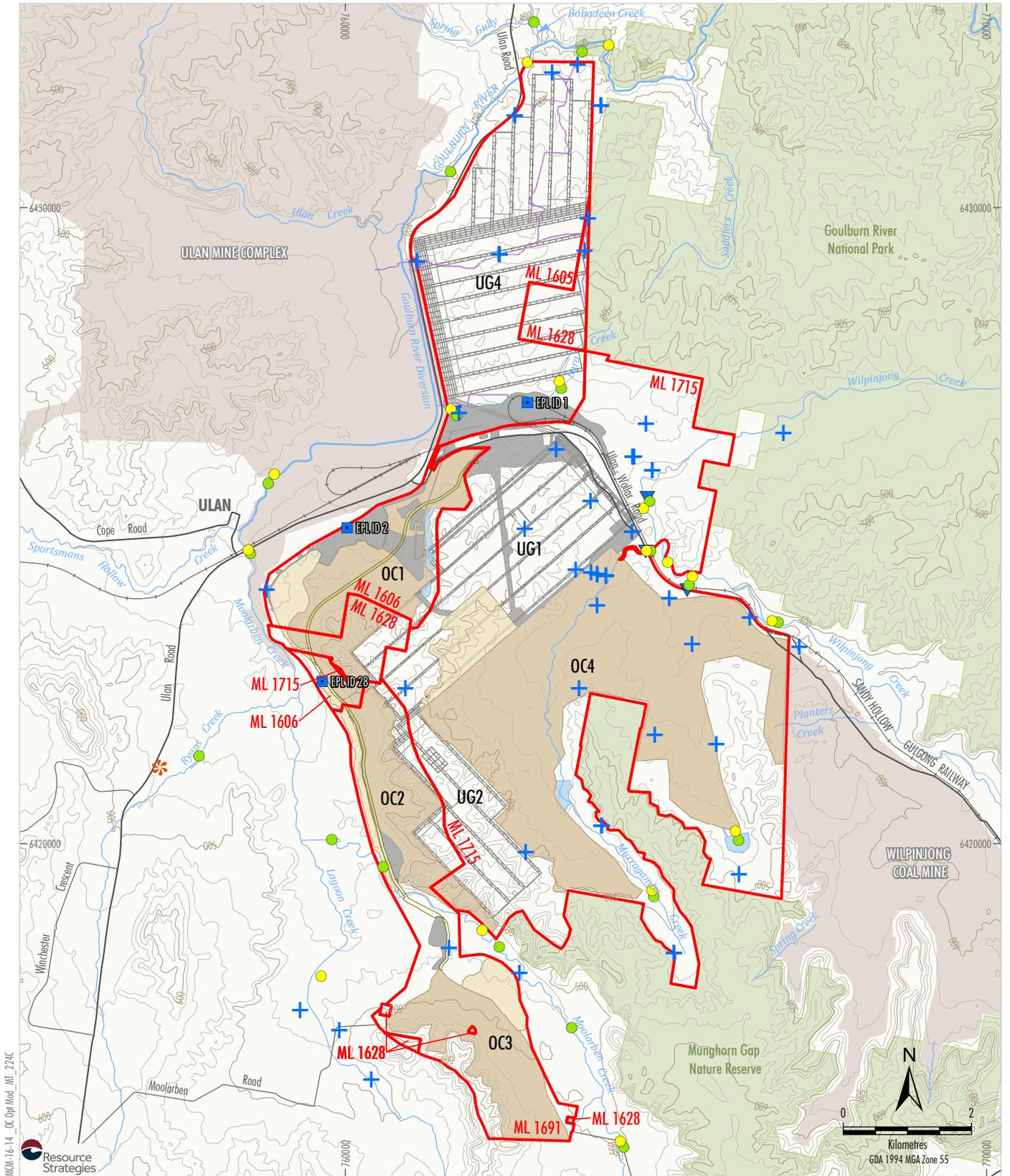
Advisian (2017) has reviewed the baseline water quality data for the Goulburn River and Moolarben Creek and makes the following key observations (Appendix F):

- EC is elevated in Moolarben Creek (average of 3,135 $\mu\text{S}/\text{cm}$) upstream of the Moolarben Coal Complex due to non-mining factors in the catchment (e.g. sub-cropping coal seams).
- Key water quality indicators (pH, EC and turbidity) have remained within adopted trigger levels downstream of the Moolarben Coal Complex².
- TSS concentrations are generally low.
- Mean and 80th percentile Dissolved Aluminium and Dissolved Zinc exceed ANZECC 95% species protection trigger levels at all monitoring sites (including upstream of the Moolarben Coal Complex).
- Average Dissolved Iron concentrations range from 1.69 mg/L in Moolarben Creek to 5.62 mg/L in the Goulburn River upstream of the Diversion with a decreasing trend downstream.
- Mean and 80th percentile Dissolved Copper exceeds ANZECC 95% species protection trigger levels at all monitoring sites on the Goulburn River (including upstream of the Moolarben Coal Complex).

Channel Stability

A site inspection of Bora Creek, the Goulburn River Diversion and the Goulburn River was carried out by Dr Steve Perrens of Advisian on 28 and 29 March 2017 to identify the existing channel characteristics.

² Trigger levels are described in the Surface Water Management Plan submitted for approval in 2016.



MOL-16-14_OC Opr/Mon_INT 224C
Resource Strategies

- LEGEND**
- NSW National Parks and Wildlife Service
 - Other Mining Operations
 - Mining Lease Boundary
 - Existing/Approved Development
 - Open Cut Mining Area
 - Out-of-pit Emplacement
 - Surface Infrastructure Area
 - Pipeline and Borefield Infrastructure
 - Clean Water Diversion Infrastructure
 - Underground Longwall Layout
 - Haul Road
 - Road Realignment (not yet constructed)

- Environmental Monitoring**
- Licensed Discharge Point
 - Surface Water Monitoring Site
 - Stream Health Monitoring Site
 - Streamflow Gauge
 - Groundwater Monitoring Site
 - Meteorological Station

Source: MCO (2017); NSW Dept of Industry (2017);
NSW Land & Property Information (2017);
Office of Environment and Heritage NSW (2017)

MOOLARBEN COAL
MOOLARBEN COAL COMPLEX
Moolarben Coal Complex
Surface Water, Groundwater and
Stream Health Monitoring Sites

Figure 24

Pre-mining inspections of Bora Creek indicated areas of deeply eroded steep but stable banks (Appendix F). The recent site inspection indicates that Bora Creek continues to show signs of varying degrees of erosion along the sandy channel bed (Plate 4). Active erosion, including significant scour holes, was observed at some locations (Appendix F).

During the site inspection it was observed that the Goulburn River Diversion downstream of the Moolarben Coal Complex is a generally uniform, well vegetated channel with trapezoidal channel dimensions. The channel bed is formed in the natural sandstone bedrock and has a rocky base covered with a layer of sediment. The channel is well vegetated with reeds and grass as shown on Plates 5 and 6 (Appendix F).



Plate 4: Bora Creek Showing Sandy Channel Bed (Advisian, 2017)



Plate 5: Goulburn River Diversion at the confluence with Bora Creek, looking downstream (Advisian, 2017)



Plate 6: Goulburn River Diversion at the confluence with Bora Creek, looking upstream (Advisian, 2017)

4.6.2 Environmental Review

Advisian (2017) has assessed the potential impacts of the proposed increased volume of licensed discharges on the Goulburn River in terms of:

- flow regime;
- channel stability; and
- water quality (including analysis of salt loads and potential impacts on the HRSTS).

Flow Regime

Advisian (2017) has developed a HEC-RAS hydraulic model to determine the potential impacts of the increased discharge volume on water levels and velocities downstream of the proposed relocated EPL discharge point.

The model extends approximately 7.4 km from the proposed relocated EPL discharge point downstream to the 'Drip'. The model comprises eight surveyed river cross-sections obtained from the *Goulburn River Diversion Baseline Assessment Final Report* (Hunter Land Management, 2006) and two cross-sections (at chainages 8400 and 9400) estimated from 1:25,000 topographic mapping (Appendix F).

The locations of the modelled cross-sections are shown on Figure 25.

Flows for input to the model were obtained from the flow duration curves for gauge 210046 (upstream of the relocated EPL discharge point) and flow gauge UMC SW02 (downstream of the relocated EPL discharge point).

A flow change location was added downstream of chainage 5050 (the approximate location that Ulan Creek enters the Goulburn River) in the HEC-RAS Model, to increase flows at this location based on the flows recorded downstream at UMC SW02 (Figure 25).

Three flow regimes were considered in the modelling, with flows determined based on high (90th percentile), medium (mean) and low (10th percentile) historic flows in the Goulburn River. For each of the three flow regimes the following scenarios were modelled:

- existing flows;
- approved flows – incorporating discharges from the Moolarben Coal Complex in accordance with the existing EPL limits (10 ML/day); and
- proposed flows – incorporating the proposed discharge from relocated EPL ID1 (20 ML/day).

During low flows, when the contribution of the proposed discharges to total flow is greatest, the proposed 20 ML/day licensed discharge is predicted to result in the following at the Goulburn River National Park (Chainage 9400):

- Increase in water depth of approximately 0.05 m (and 0.02 m when compared to approved 10 ML/day licensed discharges).
- Increase in average velocity of 0.3 m/s (and <0.1 m/s compared to 10 ML/day licensed discharges) (Advisian, 2017).

These minor changes in river conditions are not predicted to result in any significant additional scour (Appendix F).

Based on the results of the HEC-RAS analysis, Advisian (2017) concludes:

- The key potential change to flow regime associated with the proposed increased volume of discharges is a decrease in low to very low flow periods.
- Predicted changes in average velocity would be minor, and not expected to result in any significant additional scour.
- Predicted increases in water levels in the Diversion and the Goulburn River would be minimal, and easily contained within the channel's capacity.

Channel Stability

The relocated EPL discharge point would be situated at the confluence of Bora Creek and the Goulburn River Diversion.

This location was chosen following site inspection by Advisian (2017) based on the stability provided by the rock platform at the edge of the Goulburn River Diversion (Plate 5).

Discharge water would be piped from the water treatment facility to the rock platform at the relocated EPL discharge point via a flow spreader/diffuser, and would then drain into the Goulburn River Diversion.

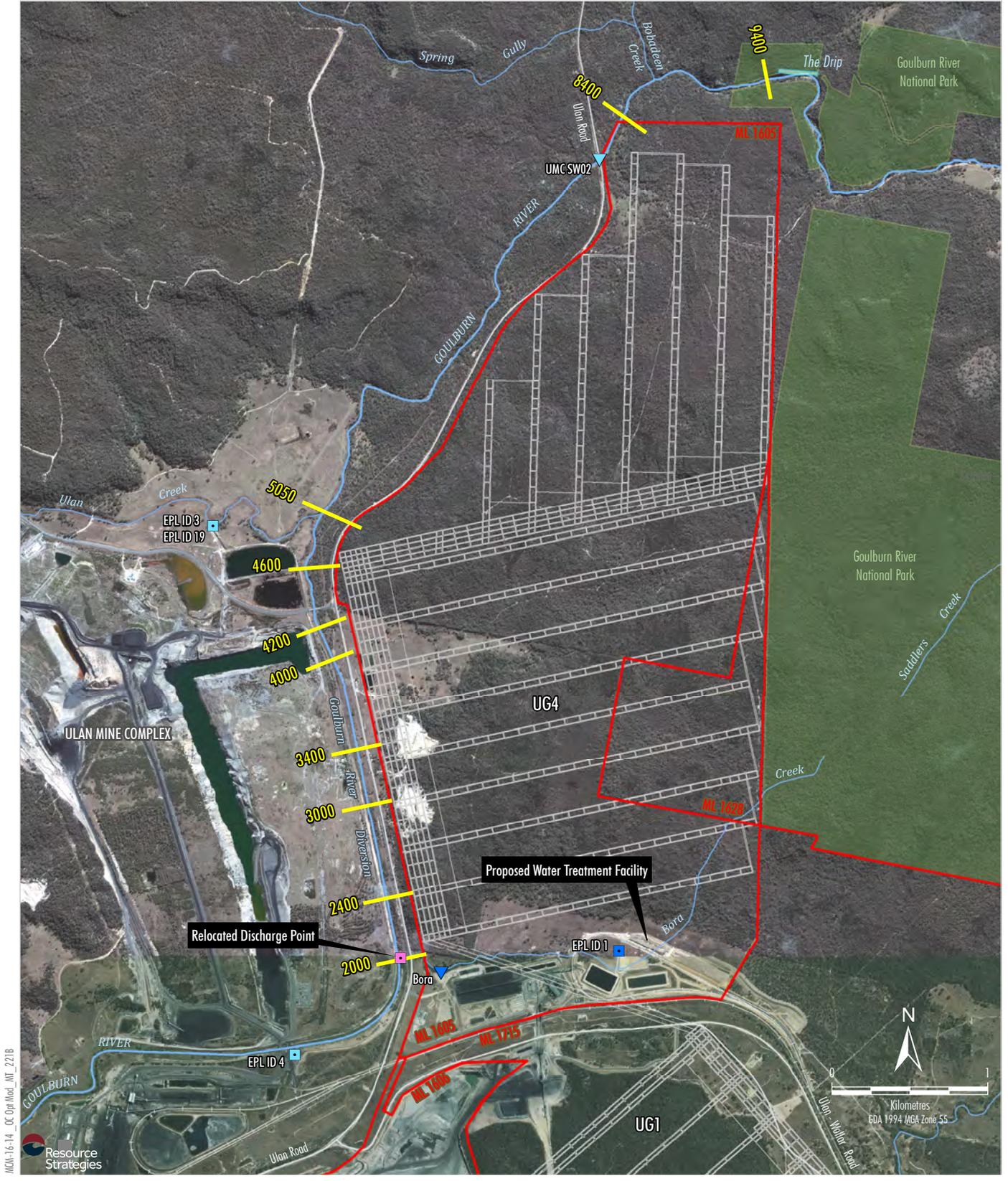
The relocation of EPL ID1 is considered to be beneficial (in comparison to the discharge regime currently authorised by EPL 12932), as potential increases in erosion along the sandy channel bed of Bora Creek (Plate 4) would be avoided (Appendix F).

The HEC-RAS modelling results indicates minor increases in velocity that are not expected to lead to scour at or downstream of the relocated EPL discharge point (Appendix F).

Water Quality

On-site Water Quality

The Geochemistry Review (Appendix H) prepared for the Modification indicates water stored on-site is likely to have neutral pH with potentially elevated salinity.



MOL-16-14_OC Cpr/Moat_MIT_2218



- | | |
|--|--|
| <p>LEGEND</p> <ul style="list-style-type: none"> Mining Lease Boundary Existing/Approved Development Underground Longwall Layout Cross Section Location | <ul style="list-style-type: none"> ▼ Surface Water Monitoring ▼ Moolarben Coal Complex Streamflow Gauge ▼ Ulan Mine Complex Streamflow Gauge ■ Licensed Discharge Points ■ Moolarben Coal Complex ■ Ulan Mine Complex ■ Proposed Discharge Point ■ Moolarben Coal Complex |
|--|--|

Source: MCO (2017); NSW Dept of Industry (2017); NSW Land & Property Information (2017); Office of Environment and Heritage NSW (2017)
 Orthophoto Mosaic: MCO (April 2016 - May 2012)

MOOLARBEN COAL
MOOLARBEN COAL COMPLEX
HEC-RAS Model Cross Section Locations

Figure 25

Concentrations of the following dissolved metals may also be slightly elevated in some on-site water storages, when compared to ANZECC 95% species protection trigger values (Section 4.5):

- Aluminium;
- Cadmium;
- Copper;
- Manganese;
- Nickel; and
- Zinc.

Of these metals, it is noted that surface water quality monitoring data shows Aluminium, Copper and Zinc concentrations are also naturally elevated in the Goulburn River (when compared to the 95th percentile freshwater aquatic ecosystem guideline values) (Appendix F).

Water Treatment Facility

The water treatment facility proposed for the Modification would be used to treat water to a quality that enables water released from the site via licensed discharge to comply with EPL 12932 water quality concentration limits (Table 8).

The water treatment facility would also be designed to control dissolved metal concentrations, particularly Cadmium, Manganese and Nickel, which may be elevated in on-site storages, and are not naturally elevated in the Goulburn River.

The design criteria for metal concentrations in the water treatment facility would be to meet ANZECC trigger levels at the point of release (i.e. either 'default' 95% species protection trigger levels, or where metal concentrations in the Goulburn River naturally exceed the 95% species protection level, 'site specific' trigger levels would be developed based on the 80th percentile concentration of historic monitoring data).

The water treatment facility is subject to detailed design, however, it would likely include:

- pre-treatment (e.g. control of pH, suspended solids and metals);
- reverse osmosis to reduce salinity;
- blending and brine dams; and
- other associated infrastructure.

Relocated EPL Discharge Point

In comparison to the current EPL licensed discharge regime, it is likely relocating the EPL ID1 discharge point to the confluence of Bora Creek and the Goulburn River Diversion would reduce downstream TSS, as increased erosion along the sandy channel bed of Bora Creek would be avoided (Appendix F).

Downstream Water Quality

Advisian (2017) modelled and assessed the proposed licensed discharges of 20 ML/day from the relocated EPL discharge point and concluded:

- There would be negligible adverse change in downstream pH levels, EC or TSS concentrations (i.e. when compared to historic water quality, ANZECC trigger levels).
- As metal concentrations would be controlled by the water treatment process, the proposed licensed discharges would not result in downstream exceedances of ANZECC trigger levels.

Hunter River Salinity Trading Scheme

The Moolarben Coal Complex is located in the upper reaches of the Hunter River catchment (Figure 22).

The HRSTS was originally established by the then Department of Land and Water Conservation and Hunter River Trust in 1995 as a pilot trial to manage salinity discharges to the Hunter River, such that salt concentrations would be held below irrigation and environmental standards.

The scheme is now managed by the EPA under a statutory regulation attached to the *Protection of Environmental Operations Act, 1997*. The regulation came into effect on 1 December 2002. The stated objectives of the HRSTS are:

- a) *to minimise the impact of discharges of saline water on irrigation, other water uses and on aquatic ecosystems in the Hunter River catchment ...*

The HRSTS achieves these objectives by controlling releases of saline water during periods of high/flood flow in the Hunter River such that salinity targets are not exceeded.

The HRSTS does not apply to the Moolarben Coal Complex in accordance with clause 7 of the *Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002*, which excludes Goulburn River upstream of Kerrabee from the catchment of the Hunter River for the purposes of the HRSTS.

While the HRSTS does not apply to the Moolarben Coal Complex, it is considered the proposed increase in the volume of discharges is consistent with the objectives of the HRSTS, given:

- The salinity of licensed discharges would be controlled by treatment in the water treatment facility.
- The salt load from the proposed discharges would represent a negligible portion of the total salt load in the Hunter River during high flow and flood conditions (when participants discharge saline water under the HRSTS).
- The median (800 $\mu\text{S}/\text{cm}$) and maximum (900 $\mu\text{S}/\text{cm}$) salinity levels at the point of discharge are lower/equal to the EC targets of the HRSTS downstream of the confluence of the Hunter and Goulburn Rivers (900 $\mu\text{S}/\text{cm}$).
- A portion of the water proposed to be discharged would be removed from the Goulburn River via licensed extraction from the Lower Goulburn River Water Source (in the 2015/2016 water year, entitlements for licensed extraction amounted to approximately 14,000 megalitres per year [according to the Water NSW online water licensing register]).
- Advisian (2017) and Marine Pollution Research Pty Ltd (MPR) (2017) have assessed the potential impacts of the proposed releases and conclude there would be negligible adverse impacts to water quality or aquatic ecology, and as such, it is considered the proposed licensed discharges (and associated water treatment facility) would have negligible impacts on irrigation, other water uses and on aquatic ecosystems in the Hunter River catchment.

Based on the above, negligible impact to entities discharging under the HRSTS is expected.

Other Potential Impacts

WRM (2017) has considered the potential impacts of the additional disturbance for the Modification and concluded the Modification would have an insignificant additional impact to surface flows and quality in the downstream environment, given:

- the additional disturbance areas would be within the catchment of the water management system, which would prevent sediment laden runoff flowing off-site; and
- as the disturbance areas for the Modification are generally located immediately adjacent to approved disturbance areas, a large portion of the Modification would already be within the catchment of the water management system (i.e. there would be limited additional catchment excision).

4.6.3 Mitigation Measures, Management and Monitoring

A summary of key treatment and management measures for the proposed increase in licensed discharges shown on Figure 26.

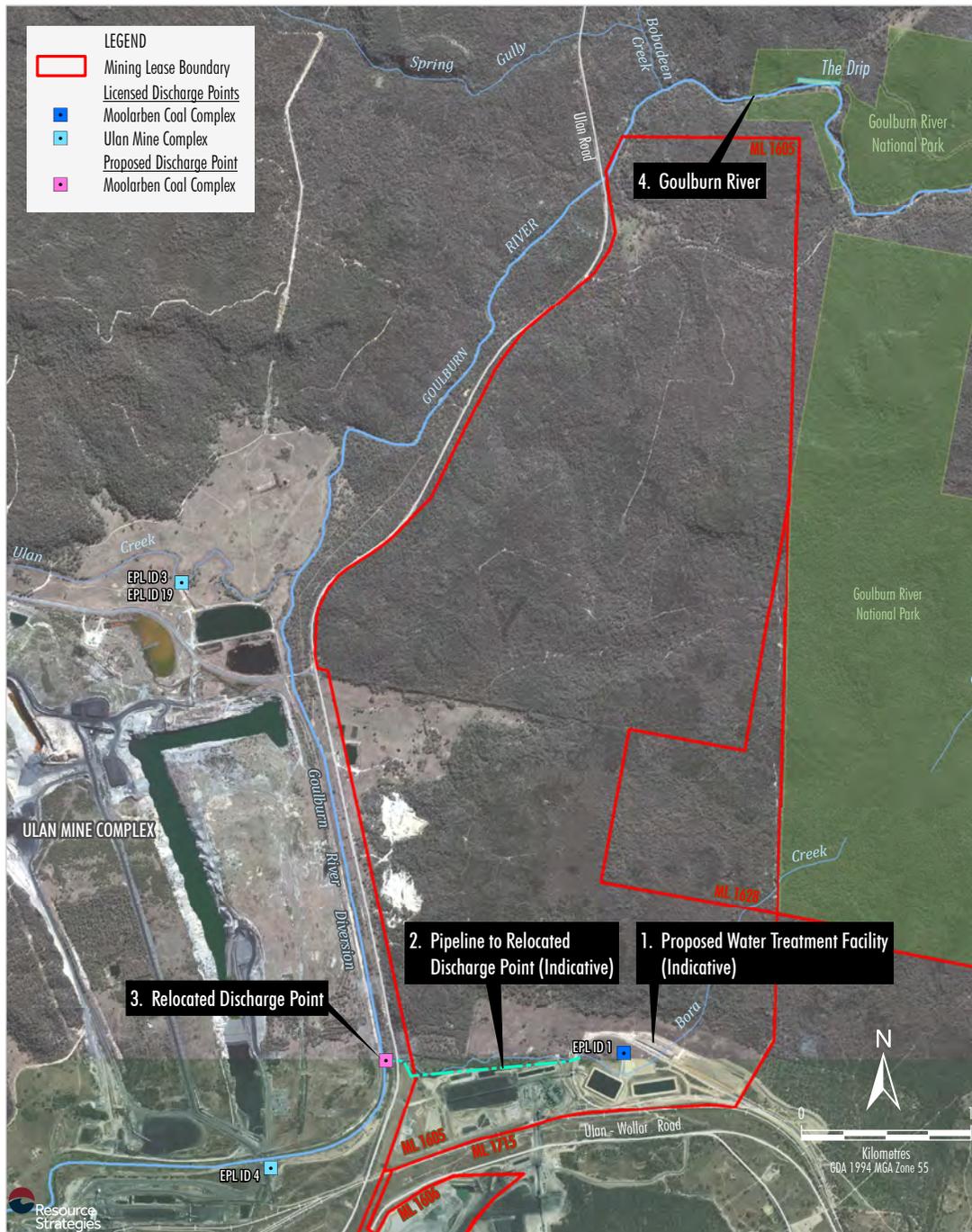
Water Treatment Facility

The water treatment facility proposed for the Modification would be used to treat water to a quality that enables water released from the site via licensed discharge to comply with EPL 12932 water quality concentration limits.

In addition the water treatment facility would treat water such that dissolved metal concentrations are at or below ANZECC trigger levels (default or site specific) at the point of discharge.

Relocation of EPL Discharge Point

To avoid erosion potential along the length of Bora Creek, water from the water treatment facility would be piped to the relocated EPL discharge point at the confluence of Bora Creek and the Goulburn River Diversion.



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Proposed Water Treatment Plant and Management Measures

1. Proposed Water Treatment Facility

- Treatment of water prior to licensed discharge.

2. Pipeline to Relocated Discharge Point

- Piping water to relocated discharge point to avoid potential erosion along Bora Creek.

3. Relocated Discharge Point

- Relocated discharge point at stable rock shelf.
- Spreader/diffuser at discharge outlet to minimise scour potential.
- Direct discharge to Bora Creek confluence with Goulburn River Diversion.
- The diversion channel is well vegetated with reeds and grass.



Potential Impacts

4. Goulburn River

- Negligible adverse impacts to water quality.
- Proposed 20 ML/day discharges well within historic range of flows (up to 4,905 ML/day).
- Discharges predicted to result in increase in water depth of approximately 0.05 m.
- Discharges predicted to result in minor increase in average velocity of 0.3 m/s.
- Negligible adverse impacts to aquatic ecology.

Scour Protection at Outlet of Relocated Discharge Point

The need for scour protection at the outlet of the relocated EPL discharge point (i.e. rock shelf) is expected to be minimal. However, the inclusion of a flow spreader/diffuser at the relocated EPL discharge point would minimise the likelihood of any scour from occurring at the base of the Diversion. Discharged water would then be diffused over the rock shelf before it drains into the Goulburn River Diversion (Appendix F).

Routine inspection of the outlet would be undertaken to identify the need for any further scour protection, should any bed or bank erosion start to occur.

Water Quality Monitoring

Regular monthly water quality monitoring of Moolarben Coal Complex Goulburn River surface water monitoring sites SW12, SW02, and SW01 would continue in accordance with the Surface Water Management Plan.

Monitoring of all licensed discharge events would be undertaken in accordance with EPL requirements.

The surface water quality trigger levels adopted for the Goulburn River would be expanded to include the key metals identified by the Geochemistry Review (Aluminium, Cadmium, Copper, Manganese, Nickel, and Zinc) (Section 4.5.2).

Any exceedances of the surface water quality trigger levels would be managed in accordance with the 'Surface Water Response and Contingency Plan', which is described in the Surface Water Management Plan. The Surface Water Management Plan would be revised for the Modification.

4.7 AQUATIC ECOLOGY

An Aquatic Ecology Assessment for the Modification has been undertaken by MPR (2017) to assess potential impacts of the proposed increases in licensed discharges to the Goulburn River (Appendix G).

4.7.1 Background

Stream-health aquatic ecology sampling of the upper Goulburn River has been undertaken for the Moolarben Coal Complex since 2004.

Stream-health surveys have been undertaken using the National River Process and Management Program River Bio-assessment Manual methods (NRPMP, 1994) as adapted for the National River Health Program, now referred to as the Australian Rivers Assessment System (AusRivAS) method (Turak *et. al.*, 1999).

Sampling and taxa identification for aquatic macroinvertebrates conform to the AusRivAS methods for 'edge' sampling and data are analysed for site aquatic macroinvertebrate Diversity (number of taxa) and site Stream Invertebrate Grade Number Average Level (SIGNAL) index.

The upper section of the Goulburn River, upstream of the Goulburn River National Park, has been modified by historic development, including the construction of the Moolarben Dam (constructed in the 1960s) and the Goulburn River Diversion (constructed in the 1980s), and grazing and cropping activities in the catchment.

Review of baseline aquatic ecology data shows that prior to the commencement of the Moolarben Coal Complex, aquatic ecology diversity and abundance was reflective of a disturbed environment, as evidenced by SIGNAL and Diversity scores (Appendix G).

Threatened species database searches also show the upper Goulburn River catchment does not provide habitat for threatened aquatic ecology species (Appendix G).

Review of Historic Licensed Discharges

MPR collated and analysed aquatic ecology data for the Goulburn River collected over the period 2011 to 2017 to establish if licensed discharges from the Ulan Mine Complex have resulted in a deterioration of aquatic ecology diversity and abundance (i.e. by comparison to data collected pre-2011). The analysis considered four aquatic ecology indices:

- Diversity – score based on the number of taxa.
- SIGNAL-2 – a pollution tolerance index for macro invertebrates based on correlation analysis of aquatic invertebrate survey information with water chemical analysis.
- EPT Taxa – a diversity index where only insect families from pollution sensitive Orders (Ephemeroptera, Plecoptera and Trichoptera) are counted (Lenat, 1988).
- Salinity Index – similar to the SIGNAL-2 index, but based on aquatic invertebrate relative sensitivity to increased water conductivity (Horrigan *et. al.*, 2005).

MPR (2017) concluded no significant change in aquatic ecology diversity or abundance has been observed during 2011 to 2017 (when compared to pre-2011 data) and on this basis considers licensed discharges from the Ulan Mine Complex have not resulted in adverse impacts to aquatic ecology over this period.

4.7.2 Environmental Review

Modelling undertaken by Advisian (2017) indicates the key potential change associated with the proposed discharges is decreases in the frequency of low to very low flow periods.

These low to very low flow periods generally result in adverse water quality conditions in the Goulburn River during prolonged drought periods which are detrimental for aquatic macroinvertebrate and fish assemblages (Appendix G). This is due to the increased relative contribution of saline groundwater baseflow from Moolarben Creek (Section 4.6) and the development of shallow and isolated stagnating ponded water with consequent evapo-concentration effects (low dissolved oxygen concentrations, elevated dissolved metal and nutrient concentrations) during prolonged low flow periods.

Analysis of existing aquatic ecology data indicates historic discharges from the Ulan Mine Complex, which have reduced low and no-flows in the Goulburn River, have not resulted in adverse impacts to aquatic ecology in the Goulburn River (Appendix G).

MPR (2017) considers the loss of prolonged periods of low flow is a beneficial potential impact that offsets the loss of low-flow variation. As a result, potential changes to the low flow regime associated with the proposed licensed discharges are considered neutral on balance to aquatic ecology in the Goulburn River (Appendix G).

Based on the findings of Advisian (2017) and analysis of aquatic ecology monitoring data (Section 4.7.1), MPR (2017) concluded potential impacts to aquatic ecology associated with the licensed discharges would be negligible, given:

- No adverse impacts to downstream water quality concentrations are predicted, given water to be released via licensed discharge would meet EPL water quality concentration limits (Table 8) and ANZECC trigger values for dissolved metals at the point of discharge.
- No significant adverse impacts to aquatic ecology have been observed over the period 2011 to 2017 due to licensed discharges from the Ulan Mine Complex.

- Negligible impacts on aquatic ecology habitat are predicted, as the minor changes in velocity and river levels associated with the proposed licensed discharges are predicted to result in negligible impacts to downstream channel stability.

4.7.3 Mitigation Measures, Management and Monitoring

MPR (2017) recommends the following management measures for the Moolarben Coal Complex (incorporating the Modification):

- Minimisation of potential physical impacts of licensed discharges on the Goulburn River Diversion through the use of a flat spreader/diffuser structure at the relocated EPL discharge point.
- Continued monitoring and implementation of trigger action response plans (as defined in the Water Management Plan) in the event that monitoring indicates an exceedance of downstream water quality trigger levels.
- The Water Management Plan be reviewed and updated as follows:
 - Review of the trigger levels in the Surface Water Management Plan to reflect the latest available data and analysis.
 - Update the trigger action response plans in the Surface Water Management Plan to include the Salinity and EPT Taxa indices.
 - Update the stream-health monitoring methodology to incorporate consideration of monthly water quality data, stream-flow and rainfall data in the interpretation of stream-health monitoring results.

These recommended measures would be implemented and potential impacts to aquatic ecology would continue to be managed in accordance with the approved Water Management Plan (and Surface Water Management Plan), which would be revised as necessary.

4.8 GROUNDWATER

A Groundwater Assessment for the Modification has been undertaken by HydroSimulations (2017) (Appendix I).

4.8.1 Background

A number of groundwater investigations, assessments and reviews have been undertaken since 2006 to assess the potential impacts of the approved Moolarben Coal Complex. Recent groundwater assessments undertaken for the approved Moolarben Coal Complex include:

- Moolarben Coal Complex Stage 2 PPR Groundwater Impact Assessment November 2011 (RPS Aquaterra, 2011);
- Moolarben Coal Project Stage 1 Optimisation Modification Groundwater Assessment (Australian Groundwater and Environmental Consultants Pty Ltd, 2013);
- Moolarben Coal Complex Stage 2 PPR Response to Submissions Additional Groundwater Impact Assessment (RPS Aquaterra, 2012); and
- Moolarben Coal Complex UG1 Optimisation Modification Groundwater Assessment prepared by Dundon Consulting (2015), with supporting groundwater modelling undertaken by HydroSimulations (2015).

Groundwater monitoring and management at the Moolarben Coal Complex is conducted in accordance with the Groundwater Management Plan.

Hydrogeological Regime

The Moolarben Coal Complex area is located in the Western Coalfields on the north western edge of the Sydney Basin, which contains sedimentary rocks, including coal measures, of Permian and Triassic age. The dominant outcropping lithologies over the Moolarben Coal Complex are the Triassic Narrabeen Group (Wollar Sandstone) and the Permian Illawarra Coal Measures. The siltstones and sandstones of the Triassic Narrabeen Group form elevated, mesa-like incised plateaus associated with the Goulburn River National Park and the Munghorn Gap Nature Reserve.

Alluvial Aquifers

Quaternary alluvial deposits in the vicinity of the Moolarben Coal Complex are associated with Lagoon Creek, Goulburn River, Moolarben Creek and Wilpinjong Creek (Appendix I).

There is no 'highly productive' groundwater, as defined under the Aquifer Interference Policy, mapped in the vicinity of the Moolarben Coal Complex (Appendix I). The nearest 'highly productive' groundwater is a portion of the alluvial aquifer associated with Wilpinjong Creek downstream of the Wilpinjong Coal Mine (Appendix I).

Tertiary Palaeochannel Deposits

Tertiary palaeochannel deposits have been recognised in the Goulburn River diversion (at Ulan) and in the Murrumbidgee and Wilpinjong creek valleys, with a maximum thickness of 40 m to 50 m. The infill sediments consist of poorly-sorted semi-consolidated quartzose sands and gravels in a clayey matrix (Appendix I).

Tertiary palaeochannel deposits have also been recognised on the western side of Moolarben Creek (i.e. along the eastern edge of OC3).

Porous Rock Aquifers

The porous rock aquifers consist of the Narrabeen Group sandstones and the Illawarra Coal Measures, consisting of coal seams, conglomerate, mudstones and siltstones (Appendix I).

None of the identified groundwater systems are significant aquifers (Appendix I). The most permeable units are the Ulan Seam and Marrangaroo Conglomerate, while the sandstones of the Narrabeen Group are of lower permeability and are elevated above the Moolarben Coal Complex. The Illawarra Coal Measures also include low permeability mudstones and siltstones (Appendix I).

Recharge to the groundwater systems would occur primarily from direct rainfall and runoff infiltration through outcropping strata. It is likely the Ulan East Pit provides a lateral recharge source to the downgradient Permian coal measures to the north-east, such as at UG4 (Appendix I).

A spring known as The Drip is a local dripping sandstone feature located on the northern side of the Goulburn River to the north of UG4. The groundwater discharges are derived from perched groundwater in zones that are exposed in the cliff face at a height of approximately 10 m above the river water level. The perched aquifers are in the Triassic Narrabeen Group sediments, and are formed by accumulations of groundwater above less permeable horizons in the Triassic sequence. The groundwater seepages are only observed on the northern side of the Goulburn River (Appendix I).

Groundwater Use

There is limited private groundwater use in the Moolarben Coal Complex area (Appendix I).

A bore census was conducted that investigated groundwater use on private property holdings within and close to the Moolarben Coal Complex. This census identified bores, wells and farm dams in the vicinity of the Moolarben Coal Complex (RPS Aquaterra, 2011). The DPI Water groundwater bore database identifies 130 registered bores and wells within approximately 10 km of the Moolarben Coal Complex, the majority of which are coal exploration bores (Appendix I).

There were two bores identified during the census survey that are located on private property (Appendix I):

- GW800279; and
- GW064580.

Both bores are located in the Triassic Narrabeen Group (Appendix I).

Bores located on private properties to the west of the Moolarben Coal Complex that are developed in the outcropping basement rocks or associated regolith that underlie the Permian Coal Measures are hydraulically disconnected from the hydrogeological regimes of the Permian sedimentary strata and associated alluvial sediments and are therefore not included in the Groundwater Assessment (Appendix I).

4.8.2 Environmental Review

Groundwater Model

A new groundwater model has been developed for this Modification using the previous groundwater models and MCO's latest geological model.

Numerical modelling has been conducted using MODFLOW-USG Beta (Panday *et al.*, 2013) with the AlgoMesh v1.2 user interface (HydroAlgorithmics, 2017) (Appendix I).

The model extends approximately 55 km from west to east and approximately 60 km from north to south, covering an area of approximately 3,000 square kilometres. The groundwater model extent was designed to be large enough to include the neighbouring mines of Ulan and Wilpinjong to allow cumulative effects to be modelled, and to prevent boundary influence on modelled drawdown associated with these mines (Appendix I).

The model comprises 11 layers discretised into 848,753 individual model cells. The model mesh has been developed as an unstructured grid to allow refinement (greater number of cells) in areas of interest (Appendix I).

Transient model calibration was conducted from January 2005 to March 2017. Calibration of hydraulic conductivity and storage was conducted based on historical groundwater levels and mine inflows (Appendix I).

The recalibrated model achieved a scaled Root Mean Square (SRMS) value of 4.6%, which is better than the Australian Groundwater Modelling Guideline (Barnett *et al.*, 2012) value of 5 to 10% for acceptable model calibration (Appendix I).

The groundwater model was used to assess the potential incremental impacts of the Modification by comparison between modelling results for approved and modified modelling scenarios.

The Australian Groundwater Modelling Guideline (Barnett *et al.*, 2012) identifies that, compared to predictions of absolute impacts, there is less uncertainty associated with predicted incremental impacts calculated by subtraction of model outputs for two scenarios (Appendix I).

Key Findings

The key findings of the Groundwater Assessment (Appendix I) are:

- The Modification may result in changes in the timing of local drawdown effects of the approved mining operations (e.g. mining of OC3 earlier in the mine life).
- At the end of mining at the Moolarben Coal Complex, the Modification is predicted to result in minimal changes in drawdown of the water table or drawdown in the Ulan Seam.
- Potential impacts to private groundwater users, groundwater dependent ecosystems (GDEs) and watercourses and drainage lines due to the Modification are predicted to be negligible.
- There would be no change to peak inflows due to the Modification, however, there would be changes in the timing of inflows (e.g. to account for mining of OC3 earlier in the mine life).

Mine Inflows

Revised groundwater modelling of the Moolarben Coal Complex (both with and without the Modification) indicates that total inflows would be greater than those predicted by RPS Aquaterra (2011) and HydroSimulations (2015) (Appendix I).

The reasons for the increase in total inflows include numerical model revision and recalibration, changes related to the Modification (e.g. increased mining rate) and changes related to approved operations (e.g. differences in the timing of advanced dewatering of the UG4 area via the approved borefield).

The site water balance modelling conducted for the Modification by WRM (2017) has considered the revised groundwater inflow predictions.

Groundwater Users

There were two bores identified during the census survey that are located on private property relevant to potential impacts from the Moolarben Coal Complex (Section 4.8.1).

The Modification is predicted to result in negligible change in maximum drawdown at these two privately owned bores (Appendix I).

Aquifer Interference Policy

There is no mapped highly productive groundwater in the vicinity of the Moolarben Coal Complex (Appendix I). It follows that the remaining alluvial and porous rock aquifers in the vicinity of the Moolarben Coal Complex are less productive.

The NSW Aquifer Interference Policy (AIP) minimal harm criterion requires consideration of cumulative drawdown impacts at private bores. Cumulative drawdowns (incorporating the Modification) would remain less than 2 m at the two privately-owned bores in the vicinity of the Moolarben Coal Complex (Appendix I). The closest high priority GDE is 140 km away and would not be impacted by the Moolarben Coal Complex.

Predicted changes in drawdown due to the Modification are within Level 1 minimal harm criterion for water table and water pressure attributes (Appendix I).

The predicted impacts of the Modification are within the Level 1 criterion for water quality (Appendix I).

The minor predicted changes in drawdown would lead to very minor changes in groundwater flow directions, and consequently no mechanism for changes in beneficial use of groundwater (noting also there is limited use of groundwater in the vicinity of the Moolarben Coal Complex) (Appendix I).

4.8.3 Mitigation Measures, Management and Monitoring

Groundwater monitoring and management for the Moolarben Coal Complex would continue to be conducted in accordance with the Water Management Plan.

The Water Management Plan would be reviewed and, where necessary, updated to incorporate the Modification.

Groundwater Licensing

Additional licence requirements resulting from the proposed changes in open cut mining operations for the Modification have been estimated by HydroSimulations (2017).

No change in peak licensing requirements would occur as a result of the Modification, however, the timing when inflows would need to be licensed may change (e.g. to account for mining of OC3 earlier in the mine life).

MCO would hold groundwater licences to account for mining at the Moolarben Coal Complex incorporating the Modification, as required.

4.9 OTHER ENVIRONMENTAL ASPECTS**4.9.1 Historic Heritage**

Historic heritage sites relevant to the Moolarben Coal Complex are managed in accordance with the Heritage Management Plan.

Non-Aboriginal Heritage Assessments were prepared for Stages 1 and 2 of the Moolarben Coal Complex. Collectively, these studies assessed the impacts associated with the current Modification areas.

Previous surveys conducted in 2005, 2008 and 2013 (Veritas Archaeology and History Service, 2005; Heritas Architecture, 2008; EMGA Mitchell McLennan, 2013b) identified 25 historic heritage sites within or in immediate proximity to the Moolarben Coal Complex requiring some level of management and/or monitoring. Of these sites, 13 have previously been managed in accordance with the Stage 1 and/or Stage 2 Project Approvals, and 12 remain *in situ* at the Moolarben Coal Complex (MCO, 2016).

Historic Heritage Sites within Proximity of the Modification

No known historic heritage sites are located within the Modification area (Figure 21). The two closest historic heritage sites (Carr's Gap Road [Site 18] and a recreation ground [Site 33]) are located approximately 23 m and 170 m away, respectively. All remaining historic heritage sites are located further than 290 m away from the Modification area.

Site 18 (Carr's Gap Road) is located adjacent to the proposed OC2 to OC4 internal road and comprises the stone foundations of a road to Wollar via Carr's Gap. Site 18 has been previously assessed as being of moderate local significance. In accordance with the Stage 1 and Stage 2 Project Approvals, historic research and archival recording has been undertaken for this site. The site is currently conserved *in situ*.

Site 33 (recreation ground) is adjacent to OC3 and comprises a tennis court, toilet and shed of moderate local significance. In accordance with the Stage 1 and Stage 2 Project Approvals archival recording has been undertaken for the site and *in situ* conservation continues for the recreation ground (Site 33).

Potential Impacts of the Modification

The Modification would avoid direct impacts to all historic heritage sites, including Sites 18 and 33. These sites will continue to be managed in accordance with the Heritage Management Plan.

Historic Heritage Sites No Longer Being Impacted

Historic Heritage Site 3 (Burial Site) and Site 4 (House and Burial Site) are located within the Relinquishment area and would no longer be impacted (Figure 21).

Site 3 (Burial Site) comprises two burial areas marked with field stones. Site 4 (House and Burial Site) comprises of the base of a chimney, stone floor and exotic plants, as well as a rose marking a possible burial site.

Management recommendations for both Sites 3 and 4 involved exhumation in consultation with related family. Due to the revision of the disturbance area of OC3, MCO would fence these sites to avoid disturbance when construction/operation activities are occurring in close proximity. Exhumation of these sites is no longer expected to be required and would only be undertaken where impacts are unavoidable.

The Heritage Management Plan would be reviewed and updated to incorporate the Relinquishment areas.

4.9.2 Transport

Road Transport

There would be no increase in the peak workforce or deliveries due to the Modification.

Accordingly, there would be no change to the peak road traffic movements previously assessed for the Moolarben Coal Complex, and no additional impacts on the capacity, condition, safety or efficiency of the surrounding road network are expected.

Rail Transport

Rail movements between the Moolarben Coal Complex and the Port of Newcastle are managed by the ARTC. MCO consulted with ARTC in regard to the proposed increases in average and peak daily rail movements for the Modification. The ARTC advised in correspondence dated 20 October 2017 that ARTC "can enable sufficient capacity to be made available for the Moolarben Coal Complex Modification".

4.9.3 Visual

A number of visual impact assessments have been prepared for the approved Moolarben Coal Complex, including detailed assessments for the Stage 1 EA (O'Hanlon Design, 2006), Stage 2 EA (O'Hanlon Design, 2008) and Stage 1 Optimisation Modification EA (EMGA Mitchell McLennan, 2013c).

The assessments considered the impacts of the Moolarben Coal Complex on the visual amenity from sensitive viewpoints.

The additional disturbance and infrastructure proposed for the Modification would be viewed in the context of the existing/approved Moolarben Coal Complex.

In comparison to the approved Moolarben Coal Complex, potential visual impacts of the Modification from sensitive viewpoints (e.g. residences and public roads) would be negligible, given:

- the proposed minor changes in pit limits would not change the maximum elevations of mining landforms;
- the natural vegetated ridgelines adjacent to OC2 and OC3 would continue to be higher than the OC2 and OC3 mining landforms (i.e. these ridgelines would continue to form part of the horizon for sensitive viewpoints to the west of the Moolarben Coal Complex);
- the additional infrastructure from the Modification would be located adjacent to existing/approved infrastructure; and
- the Modification areas would be rehabilitated progressively, or at the end of the mine life (i.e. for surface infrastructure).

4.9.4 Land Resources

Soils

Soil landscapes are mapped across the Moolarben Coal Complex in the *Soil Landscapes of Dubbo 1:250,000 Sheet* (Murphy and Lawrie, 1998).

The three soil landscapes within the Modification area are the Ulan, Lees Pinch and Bald Hill Soil Landscapes (Murphy and Lawrie, 1998).

Approximately 80% of the Modification area is situated within the Ulan Soil Landscape, which is typically found in association with low undulating rises and creek flats on slopes between 2% and 10% gradient.

The Lees Pinch Soil Landscape, situated on the lower to mid-slopes and occasionally on ridges, covers approximately 15% of the Modification area. This soil landscape is typically found in association with sandstone plateau and hillslopes with boulder debris and rock outcrops, and slopes between 15% and 40%.

The ridgeline around the proposed internal road between OC2 and OC4 is dominated by the Bald Hill Soil Landscape, which is typically characterised by low hillocks with moderately steep slopes between 10% and 35%. The Bald Hill Soil Landscape includes euzozems on crests, euzozems-chocolate soils intergrades on mid slopes with brown clays on lower slopes.

The Modification would result in net additional disturbance of approximately 49 ha. The majority of the net additional disturbance for the Modification is associated with additional/realigned infrastructure areas, rather than open cut mining areas.

No change to the existing soil management and monitoring measures described in the Rehabilitation Management Plan would be required for the Modification.

These measures, as outlined in the Rehabilitation Management Plan, include:

- Soil stripping at depths specific to each soil type (based on soil type and site verification).
- Stockpiling of stripped soil resources for re-use in rehabilitation.
- Management of stockpiles to optimise the overall quality of growth media resources.
- Geochemical monitoring of soils used in rehabilitation areas to measure soil chemical characteristics (including pH, EC and cation exchange capacity) to confirm if soils in the rehabilitation areas:
 - have the desired chemical properties required to support the intended post-mining land use; and
 - are trending toward self-sustaining soils with similar geochemical properties to those of undisturbed soils without the need for additional ameliorants.

Agriculture

To improve biodiversity and connectivity of the final landform of the Moolarben Coal Complex, the proportion of OC2 to be rehabilitated to native vegetation would increase. As a result, the total area of land to be returned to agricultural land post-mining at the Moolarben Coal Complex would reduce.

The additional disturbance in the Modification areas would be rehabilitated to a combination of agricultural land and native vegetation.

The majority of additional disturbance for the Modification is located in the areas of lower elevation adjacent to OC3. Consistent with current final landuse objectives, these areas would be rehabilitated to agricultural land.

No significant impacts to agriculture in the region are expected due to the Modification, given:

- The reduction in area to be returned to agricultural land post-mining would be insignificant in comparison to the total area used for agriculture in the region.
- The areas within OC2 to be returned to native vegetation are within the active mining area, and are not currently used for agriculture. Therefore, returning these areas to native vegetation would not contribute to any loss of agricultural production in comparison to current practices.
- The areas now proposed to be rehabilitated to native vegetation were previously proposed to be returned to agricultural land suitable for grazing/pasture post-mining (i.e. minimum Land Capability Class VI), as opposed to higher value agricultural land suitable for cultivation.

Landforms and Topography

The Modification would not have a significant impact to landforms or topography given:

- The majority of additional net disturbance for the Modification is associated with additional/realigned infrastructure areas, rather than open cut mining areas. Following decommissioning of this infrastructure, there would be negligible residual impacts to landforms or topography.
- While the minor extension to the OC2 pit limits (Figure 8) would remove a small hill, this is required to avoid leaving a potentially geotechnically unstable section of the hill in the final landform (Section 3.2).
- The minor extensions and reductions to the western pit limits of OC3 (Figure 8) would not change the maximum elevation of the ridgeline to the west of OC3 (i.e. the natural ridgeline [as opposed to mining landform] would continue to have the maximum elevation on the western side of OC3).

- While cliffline features (e.g. rocky outcrops) have been identified in the proposed disturbance areas associated with the extension to the western pit limit of OC3, these features are also present in the Relinquishment areas (i.e. would no longer be disturbed for the Modification), and numerous cliffline features have been identified outside the proposed disturbance areas in the immediate vicinity of OC3.

Temporary Stockpiles

Material excavated during construction activities would be temporarily stockpiled for use in final landform shaping and rehabilitation.

Any such stockpiles would be developed within approved disturbance areas and would be stabilised and temporarily rehabilitated until such time as the material is used for final landform shaping. Rehabilitation may include soil amelioration to promote vegetation growth and hydroseeding.

The rehabilitated stockpiles may be visible from public roads. Potential visible impacts are expected to be minor given the stockpiles would be located within approved surface infrastructure areas, surrounded by the existing mine infrastructure of the Moolarben Coal Complex and may partially screen views of product coal stockpiles and other mine infrastructure.

As the stockpiles would be located within approved disturbance areas, they would be located within the catchment of the existing water management system. Erosion and sediment controls would be implemented for each stockpile to direct surface water runoff to on-site storages. Erosion potential would be minimised through design and rehabilitation of the stockpiles.

Establishment of the stockpiles would be conducted during daytime hours. Noise sources during stockpile establishment would be minor compared to the concurrent operation of approved mining activities. Attended noise monitoring conducted in accordance with the Noise Management Plan would confirm compliance with Project Approval noise limits.

Dust sources during stockpile establishment would be minor compared to concurrent mining operations, and rehabilitation of the stockpiles would control potential wind erosion emissions. Real-time air quality monitoring conducted in accordance with the Air Quality Management Plan would confirm compliance with Project Approval air quality limits.

The Rehabilitation Management Plan and MOP would be updated as required to include temporary stockpiles of construction material.

Geotechnical Stability

No new permanent mining landforms are proposed for the Modification. The minor extensions to the OC2 and OC3 pit limits are proposed to improve geotechnical stability; as informed by ongoing mine planning and investigations conducted by MCO.

Monitoring, Mitigation and Management

Management of potential impacts to land resources would continue to be conducted in accordance with the Rehabilitation Management Plan, which would be updated as necessary for the Modification.

The Rehabilitation Strategy for the Modification is presented in Section 5.

4.9.5 Greenhouse Gas Emissions

Greenhouse gas emissions from the Moolarben Coal Complex are currently managed in accordance with the Greenhouse Gas Minimisation Plan and measured and reported annually in accordance with the National Greenhouse Gas and Energy Reporting Scheme (NGERS).

TAS (2017) has conducted an assessment of the greenhouse gas emissions from the Moolarben Coal Complex incorporating the Modification (Appendix B).

The greenhouse gas emissions are categorised into three scopes (Scopes 1, 2 and 3) based on the source of the emissions. Scope 1 emissions encompass direct sources from a project, Scope 2 emissions encompass indirect sources from a project associated with the generation of purchased and consumed electricity, and Scope 3 emissions encompass indirect sources from a project associated with other indirect greenhouse gas emissions, including the downstream combustion of coal (TAS, 2017).

Potential Impacts

There would be negligible change in total life-of-mine Scope 1, 2 and 3 greenhouse gas emissions from the Moolarben Coal Complex due to the Modification, as the changes in open cut pit limits for the Modification would marginally increase total open cut coal production by approximately 1%.

Due to the proposed increase in maximum annual extraction rates, there would be a proportional increase in the annual Scope 1, 2 and 3 greenhouse gas emissions.

TAS (2017) estimated that the proposed increase in open cut ROM coal extraction of 3 Mtpa (i.e. from 13 Mtpa to 16 Mtpa) would result in an increase in the maximum intensity of greenhouse gas emissions (Scope 1 and Scope 2) from the Moolarben Coal Complex of approximately 38,000 tonnes of carbon dioxide equivalent (CO₂-e) per annum.

Assuming the product coal from the Moolarben Coal Complex is combusted following export, the Scope 3 emissions of this additional 3 Mtpa of coal combustion would be approximately 7.3 Mt of CO₂-e per annum (based on 2017 National Greenhouse Account Factors for bituminous coal).

These Scope 3 emissions would not physically occur in NSW or Australia as product coal would be exported to overseas customers.

Mitigation Measures, Management and Monitoring

MCO would continue to monitor and manage greenhouse gas emissions in accordance with the Greenhouse Gas Minimisation Plan, which would be updated to incorporate the Modification as required.

Reporting of energy consumption and Scope 1 and 2 greenhouse gas emissions would continue in accordance with NGERS.

4.9.6 Blasting

Blasting at the Moolarben Coal Complex is managed in accordance with the Blast Management Plan.

The Blast Management Plan describes the blast monitoring program, which consists of monitoring sites recording blast overpressure and/or vibration for every blast (Figure 12).

SLR (2017) has undertaken an assessment of the predicted ground vibration and airblast emissions due to blasting at the Moolarben Coal Complex incorporating the Modification (Appendix A).

The assessment considers the impacts of blasting in the open cut pit extension areas proposed as part of the Modification.

Potential Impacts

The impacts of blasting at the Moolarben Coal Complex incorporating the Modification were assessed against human comfort airblast and vibration criteria. These criteria were derived from the Australian and New Zealand Environment Council (ANZEC) (1990) *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* and AS 2187: Part 2 – *Explosives – Storage and Use – Part 2: Use of Explosives*.

The predicted blast emission levels show no exceedance of the human comfort criteria for vibration or airblast overpressure (Appendix A).

SLR (2017) also assessed blast impacts on public infrastructure, structures on private property and Aboriginal rock shelters. Vibration criteria were derived from German Standard DIN 4150-3: 1999 *Structural Vibration Part 3: Effects of vibration in structures* and *Blast Vibration Monitoring and Control* (Dowding, 1985).

The predicted blast emission levels show (Appendix A):

- no exceedance of the public infrastructure vibration criteria;
- no exceedance of the building damage criteria for structures on private property; and
- no exceedance of the Aboriginal rock shelter damage vibration criteria.

Mitigation Measures, Management and Monitoring

MCO would continue to mitigate, monitor and manage potential blasting impacts from the Moolarben Coal Complex in accordance with the Blast Management Plan, which would be updated to incorporate the Modification.

4.9.7 Socio-Economic

The Modification involves optimisations to the approved Moolarben Coal Complex, which has been operating since 2010.

The Modification would not change the peak workforce or approved mine life at the Moolarben Coal Complex. As such, no additional demand for services (e.g. housing and health services) in the region is expected.

Potential amenity impacts have been considered in Appendices A and B. It is predicted the Moolarben Coal Complex incorporating the Modification would continue to comply with Project Approval limits relating to noise, air quality and blasting.

MCO would continue to make financial contributions to the MWRC in accordance with Moolarben Coal Complex Planning Agreements, Project Approval (05_0117) and Project Approval (08_0135), and also continue to support a number of non-Government and community organisations in the region (Section 2.16).

The Modification would improve efficiency of resource recovery, which would result in an increase in Government royalties of approximately \$82M. The NPV of this Government royalty increase is approximately \$69M. The increase is as a result of:

- minor increases in ROM coal from the OC2 and OC3 pit limit extensions;
- inclusion of a CHPP bypass circuit for open cut ROM coal enabling open cut yield increases (and associated reduced production of reject material); and
- increased rate of recovery of the resource.

The increased production limits allow annual revenue from the Moolarben Coal Complex to increase, to offset rising operational costs (e.g. electricity consumption) and fluctuating coal prices and exchange rates. This improves the ability of the Moolarben Coal Complex to remain profitable, which improves the security of the continued employment of the existing workforce and ongoing expenditure in the State and local economies.

The modifications and additions to infrastructure for the Modification would create construction employment at the Moolarben Coal Complex.

No other specific socio-economic mitigation measures are considered to be required as a result of the Modification.

4.9.8 Hazard and Risk

Preliminary Hazard Analyses (PHAs) were conducted for the Stage 1 EA and Stage 2 EA to assess the potential hazard and risk associated with the approved Moolarben Coal Complex (Sinclair Knight Merz, 2006, 2008). It is considered that the Modification would not change the existing potential risks or hazard consequences identified in the PHAs as the proposed activities associated with the Modification (e.g. drilling and blasting) are consistent with those for the approved Moolarben Coal Complex.

Environmental management plans and monitoring programs would be reviewed, and where necessary, updated to include the Modification and manage any associated additional or varying environmental risks.

The Modification would not increase risks to public safety. Consistent with the measures specified in the Rehabilitation Management Plan, public safety would continue to be managed (e.g. through the construction of safety berms, fences and signage).

5 REHABILITATION STRATEGY

Of relevance to rehabilitation at the Moolarben Coal Complex, the Modification involves:

- Change in the final land use in portions of OC2 and OC3 to native vegetation, rather than agricultural areas (Figure 27).
- Additional disturbance for surface infrastructure and minor changes to the OC2 and OC3 pit limits (Figures 2 and 8).
- Relinquishment of portions of approved disturbance areas, which therefore would no longer require rehabilitation (Figure 8).

5.1 REHABILITATION OF THE APPROVED MOOLARBEN COAL COMPLEX

MCO's commitments and requirements relating to the rehabilitation of the Moolarben Coal Complex are stated in Project Approval (05_0117), Project Approval (08_0135) and the Rehabilitation Management Plan.

A summary of these commitments and requirements is provided below.

5.1.1 Project Approval Requirements

Project Approval (05_0117) (Stage 1) and Project Approval (08_0135) (Stage 2) provide rehabilitation objectives, including for the mine site (as a whole), final voids, water quality, surface infrastructure, agricultural land, other land and the community.

The proposed changes to OC2 and OC3 final land use and disturbance limits are relevant to the Stage 1 Project Approval. The rehabilitation objectives specific to the "mine site (as a whole)" in Table 13 of Project Approval (05_0117) are as follows:

- *Safe, stable and non-polluting.*
- *Constructed landforms are to drain to the natural environment (excluding the final voids).*
- *Final landforms are to be consistent with the surrounding topography of the area, taking into account relief patterns and principles; and*
- *Minimise visual impact of final landforms as far as is reasonable and feasible.*

5.1.2 Rehabilitation Management Plan

Rehabilitation at the Moolarben Coal Complex is undertaken in accordance with its contemporary Rehabilitation Management Plan, which was approved November 2016.

Rehabilitation objectives for the Moolarben Coal Complex are described in the Rehabilitation Management Plan including:

- Creating natural looking, stable and adequately drained post-mining landforms that are visually consistent with surrounding areas.
- Creating a self-sustaining and ecologically diverse post-mining landscape that includes areas compatible with the conservation values of the adjacent Munghorn Gap Nature Reserve and Goulburn River National Park and areas suitable for sustainable grazing, which are comparable to selected analogue sites.
- Revegetating and enhancing remnant vegetation on non-mined MCO-owned land with endemic native species so as to increase the amount and diversity of native woodlands.
- Creating effective wildlife corridors and habitat links between existing remnant vegetation in the Munghorn Gap Nature Reserve, Goulburn River National Park and other surrounding areas by increasing the continuity of woodland vegetation.
- Maintaining the diversity and genetic resource of flora currently existing within the locality.
- Maintaining and enhancing habitat for native fauna, including threatened fauna.
- Rehabilitating degraded riparian areas along (inter alia) Moolarben Creek downstream from mined areas within MCO-owned land.
- Reinstating subsidiary surface drainage.
- Improving soil condition and the native soil seed bank.
- Minimising soil erosion and sedimentation.
- Providing access for monitoring and adaptive management, control of competitive native and exotic flora and fauna species and suppression of fires.
- Progressing towards meeting closure and post-mining land use objectives (to be developed in consultation with stakeholders and described in a Mine Closure Plan) in a timely and cost-effective manner.

In consideration of contemporary rehabilitation guidelines, including the *Mining Operations Plan (MOP) Guidelines* (Division of Resources and Energy [now DRG], 2013), conceptual rehabilitation domains have been developed for the Moolarben Coal Complex (Table 9).

The domains consist of primary domains (i.e. land use during mining operations) and secondary domains (i.e. post-mining land use).

Table 9 lists the secondary domains and relevant post-mining rehabilitation objectives as presented in the current Rehabilitation Management Plan. These objectives guide the rehabilitation of the Moolarben Coal Complex.

For each secondary domain listed in Table 9, the Rehabilitation Management Plan describes performance indicators and completion criteria relating to:

- landform establishment;
- growth medium development;
- ecosystem and land use establishment; and
- ecosystem and land use sustainability.

5.2 PROPOSED CHANGES TO OC2 AND OC3 FINAL LANDUSE

To improve biodiversity and connectivity in the final landform, the proportion of OC2 to be rehabilitated to native vegetation would increase for the Modification (Figure 27).

The flatter areas adjacent to Moolarben Creek would continue to be rehabilitated to agricultural areas (i.e. no change to the approved final land use in this area). The steeper areas where the final landform approaches the ridge to the west of OC3 would be rehabilitated to native vegetation (Figure 27).

Ongoing rehabilitation experience at the Moolarben Coal Complex has identified that the soil properties and topography of the steeper areas of OC2 and OC3 are suitable for rehabilitation to native vegetation.

The areas proposed to be rehabilitated to native vegetation are areas of sloped land, which are adjacent to either existing woodland or mining areas currently approved to be rehabilitated to native woodland or forest.

The change of rehabilitation domains would allow for improved biodiversity outcomes, better integration with surrounding rehabilitated and undisturbed land, improved connectivity with the Moolarben Coal Complex biodiversity offset areas and provide additional habitat for native flora and fauna species.

5.2.1 Rehabilitation and Revegetation Implementation

The final landforms at OC2 and OC3 would continue to be progressively established in accordance with the existing Rehabilitation Management Plan and Project Approval requirements, namely to create final landforms that meet the following Project Approval objectives:

- safe, stable and non-polluting;
- drain to the natural environment (excluding the final voids);
- consistent with the surrounding topography of the area, taking into account relief patterns and principles; and
- minimise visual impacts as far as is reasonable and feasible.

Following final landform establishment, the areas of OC2 and OC3 to be returned to native vegetation would be rehabilitated to a combination of the following secondary domains (Table 9):

- Rehabilitation Area – Woodland;
- Rehabilitation Area – Forest; or
- Rehabilitation Area – Grassy Woodland.

Indicative revised final rehabilitation for the Modification is shown on Figure 27.

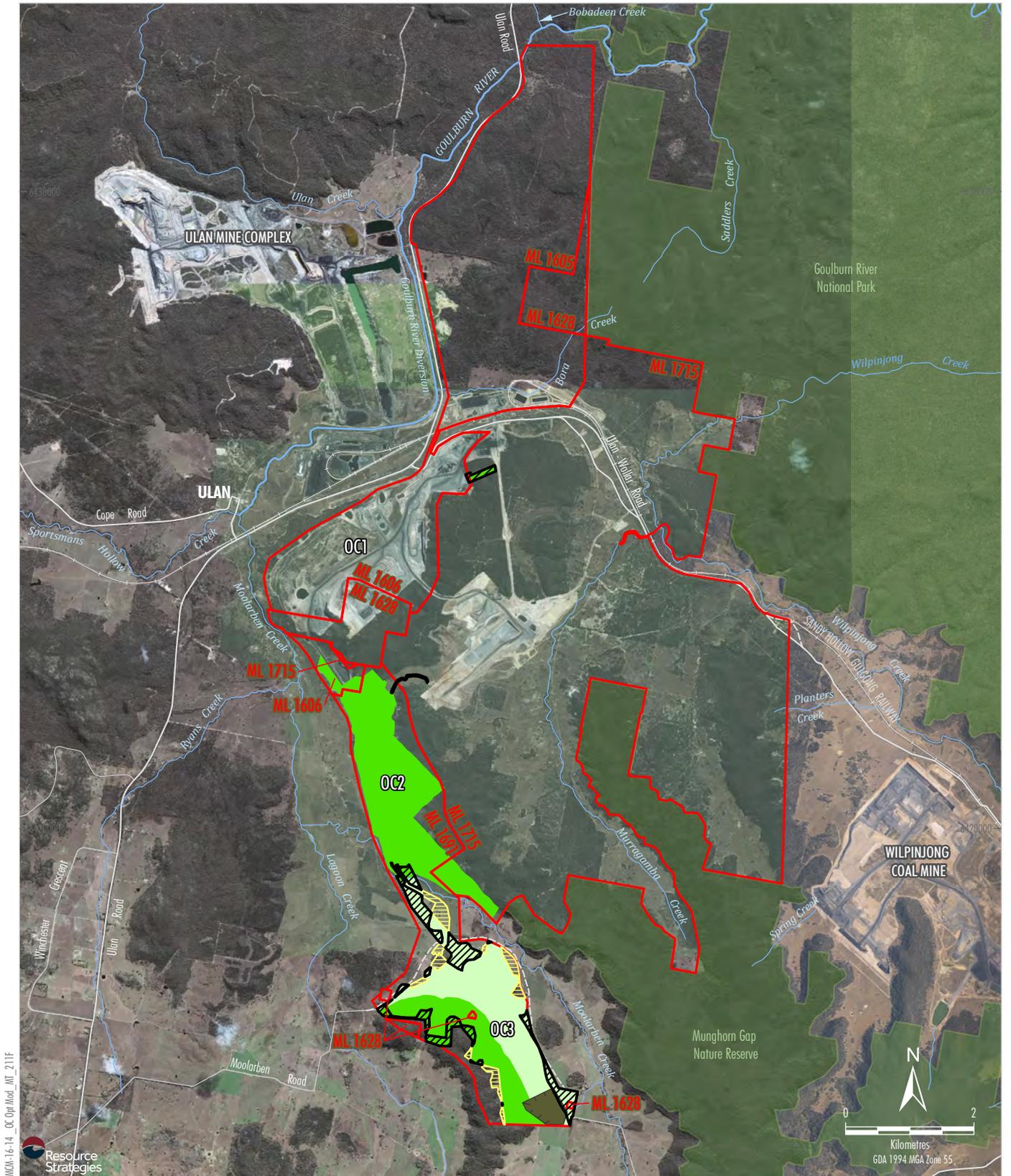
Typical overstorey, understorey and ground cover revegetation species for each of these secondary domains are specified in the Rehabilitation Management Plan.

In addition, rehabilitation areas to be included in the biodiversity offset strategy for the Modification (Section 4.3) would target revegetation to species typical of vegetation communities HU730 (*White Box x Grey Box - red gum - Rough-barked Apple grassy woodland on rich soils on hills in the upper Hunter Valley*) and HU910 (*Blakely's Red Gum - Rough-barked Apple Shrubby Woodland of Central and Upper Hunter*).

Table 9
Moolarben Coal Complex Rehabilitation Secondary Domains and Objectives

Secondary Domain (Post-mining Land Use)	Code	Rehabilitation Objective
Rehabilitation Area – Woodland	A	<p>Establish native vegetation consistent with Box Gum Shrubby Woodland associations cleared by development of the Moolarben Coal Complex, and which include stands of <i>Allocasuarina</i>.</p> <p>Box Gum Shrubby Woodland associations will be generally consistent with the Box Gum Woodland EEC.</p> <p>Box Gum Shrubby Woodland rehabilitation areas will contribute to habitat linkages between Munghorn Gap Nature Reserve and Goulburn River National Park.</p>
Rehabilitation Area – Forest	B	<p>Establish native vegetation comparable to Sedimentary Ironbark Forest communities in adjacent undisturbed areas, including stands of <i>Allocasuarina</i>.</p> <p>Sedimentary Ironbark Forest rehabilitation areas will contribute to habitat linkages between Munghorn Gap Nature Reserve and Goulburn River National Park.</p>
Rehabilitation Area – Grassy Woodland	C	<p>Establish native vegetation comparable to Western Slopes Grassy Woodland communities in adjacent undisturbed areas.</p> <p>Box Gum Grassy Woodland rehabilitation areas will contribute to habitat linkages between Munghorn Gap Nature Reserve and Goulburn River National Park.</p>
Rehabilitation Area – Agricultural	D	<p>Agricultural rehabilitation areas will be rehabilitated to achieve a minimum Land Capability Class VI that is capable of supporting sustainable grazing.</p> <p>Pasture rehabilitation areas will be top-dressed with appropriate topsoil (or topsoil substitutes), rock raked where required and ameliorated to produce a growth medium with properties capable of sustaining long-term pasture growth.</p> <p>Pasture areas will be vegetated with a mix of native and non-invasive perennial pasture species.</p> <p>Management inputs required to sustain grazing will not be significantly greater than analogue sites.</p>
Post Mining Water Management Area	E	<p>The final landform drainage (inter alia) will integrate with the surrounding catchments and be comparable to selected creek analogue sites.</p> <p>Sediment dams/water storages identified for retention in the final landform landscape (to provide water resources for fauna habitat or for agricultural purposes) will be de-silted and stabilised (if required).</p> <p>Permanent final landform drainage structures will be designed and constructed in accordance with best practice guidelines including Landcom (2004) <i>Managing Urban Stormwater: Soils and Construction Volume 1</i> and the DECC (2008) <i>Managing Urban Stormwater: Soils and Construction Volume 2</i>.</p>
Final Void	F	<p>Final voids will be safe, profiled for long-term stability, and non-polluting.</p> <p>Low walls will be battered back generally to between 10 degrees (°) and 18°.</p> <p>High walls will be constructed and stabilised in accordance with design criteria developed by geotechnical engineers.</p> <p>Final void batters will be rehabilitated with suitable vegetation.</p>
Retained Infrastructure (subject to agreement with relevant regulatory authorities)	G	<p>Retain some infrastructure (e.g. water supply and distribution structures and access tracks) for future exploration/mining purposes or for passive recreation, educational and transport purposes.</p>

After: Moolarben Coal Complex – Rehabilitation Management Plan (November 2016).



MOL-16-14_OC Opt Mod_AIT_211F



- LEGEND**
- Mining Lease Boundary
 - Road Realignment (not yet constructed)
 - Open Cut Optimisation Modification
 - Approximate Extent of Additional Surface Development
 - Approved Open Cut Mining Area, Out-of-pit Emplacement and Surface Infrastructure to be Relinquished
 - Rehabilitation Agricultural
 - Rehabilitation Native Vegetation
 - Final Void

Source: MCO (2017); NSW Dept of Industry (2017); NSW Land & Property Information (2017); Office of Environment and Heritage NSW (2017)
 Orthophoto Mosaic: MCO (April 2016 - May 2012)


MOOLARBEN COAL COMPLEX
 Indicative Areas of
 Modified Final Rehabilitation

Figure 27

5.3 REHABILITATION OF ADDITIONAL DISTURBANCE AREAS

The minor additional disturbance areas proposed by the Modification would be rehabilitated consistent with the rehabilitation principles, objectives and implementation methods of the surrounding areas of the Moolarben Coal Complex.

OC2 to OC3 Internal Haul Road and Mine Infrastructure Area

The alignment of the OC2 to OC3 internal haul road and the location of the OC3 MIA would be revised for the Modification.

The haul road and MIA would be decommissioned prior to mine closure, and the area would be rehabilitated to agricultural land (Secondary Domain D [Table 9]), consistent with the final land use for the approved haul road alignment and MIA (Figure 27).

OC2 Additional Disturbance

The minor additional disturbance area at OC2 is required to improve long term geotechnical stability of the final landform in this area (Figure 8).

This additional disturbance area would be rehabilitated progressively (i.e. as part of progressive rehabilitation of OC2) to Secondary Domain A (Woodland) (Figure 27).

OC3 Additional Disturbance

The proposed additional disturbance areas at OC3 would be rehabilitated progressively to native vegetation for the western upper slopes and to agricultural land in the flatter eastern areas (Figure 27).

OC2 to OC4 Internal Road

The proposed internal road from OC2 to OC4 would be decommissioned prior to mine closure, and the disturbed area rehabilitated to native vegetation (Figure 27).

Bypass Conveyor

The bypass conveyor would be decommissioned prior to mine closure, and the additional disturbance area associated with the bypass conveyor rehabilitated to native vegetation, consistent with the current vegetation and adjacent final land uses in this area (Figure 27).

5.4 RELINQUISHMENT AREAS

Portions of land approved to be developed for surface infrastructure, emplacement areas and/or open cut mining would be relinquished as part of the Modification (Figure 8). These relinquishment areas include approximately 15 ha of native vegetation, 12 ha of which comprises vegetation communities equivalent to those in the Modification area.

The relinquishment areas, which would no longer be required for open cut mining activities, would no longer require rehabilitation.

5.5 MITIGATION MEASURES, MANAGEMENT AND MONITORING

Monitoring of progressive rehabilitation would continue in accordance with the Rehabilitation Management Plan. The monitoring results would be used to confirm rehabilitation is achieving the performance indicators and completion criteria specified in the Rehabilitation Management Plan relating to:

- landform establishment;
- growth medium development;
- ecosystem and land use establishment; and
- ecosystem and land use sustainability.

The Rehabilitation Management Plan would be reviewed and revised as necessary for the Modification for the proposed change in final land use in areas of OC2 and OC3, the additional disturbance areas and relinquishment areas.

These changes would also be included in the MOP for the Moolarben Coal Complex.

6 STATUTORY CONTEXT

This section outlines the planning framework and statutory context relevant to the assessment of the Modification. It also provides a consideration of the Modification against the objects of the EP&A Act.

6.1 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

The Moolarben Coal Project (Stage 1) was approved under Part 3A of the EP&A Act by the NSW Minister for Planning on 6 September 2007 (Project Approval [05_0117] [Attachment 2]).

The Moolarben Coal Project Stage 2 was approved under Part 3A of the EP&A Act by the Planning Assessment Commission (as delegate of the NSW Minister for Planning) on 30 January 2015 (Project Approval [08_0135] [Attachment 3]).

Stage 1 and Stage 2 are 'transitional Part 3A projects' under clause 2 of Schedule 6A of the EP&A Act and, therefore, section 75W of the EP&A Act continues to apply to modifications to Project Approvals (05_0117 and 08_0135), despite its repeal³.

Approval for the Modification will be sought as a modification to Project Approval (05_0117) and Project Approval (08_0135) under section 75W of the EP&A Act. Section 75W of the EP&A Act relevantly provides:

75W Modification of Minister's Approval

(1) *In this section:*

Minister's approval means an approval to carry out a project under this Part, and includes an approval of a concept plan.

modification of approval means changing the terms of a Minister's approval, including:

- (a) *revoking or varying a condition of the approval or imposing an additional condition of the approval, and*
- (b) *changing the terms of any determination made by the Minister under Division 3 in connection with the approval.*

- (2) *The proponent may request the Minister to modify the Minister's approval for a project. The Minister's approval for a modification is not required if the project as modified will be consistent with the existing approval under this Part.*
- (3) *The request for the Minister's approval is to be lodged with the Director-General. The Director-General may notify the proponent of environmental assessment requirements with respect to the proposed modification that the proponent must comply with before the matter will be considered by the Minister.*
- (4) *The Minister may modify the approval (with or without conditions) or disapprove of the modification.*

...

SEARs for the Modification were issued on 12 October 2017 pursuant to section 75W(3) of the EP&A Act (Attachment 1).

EP&A Act Objects

The EP&A Act and the *Environmental Planning and Assessment Regulation, 2000* (EP&A Regulation) set the framework for planning and environmental assessment in NSW.

Section 5 of the EP&A Act describes the objects of the EP&A Act as follows:

- (a) *to encourage:*
 - (i) *the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,*
 - (ii) *the promotion and co-ordination of the orderly and economic use and development of land,*
 - (iii) *the protection, provision and coordination of communication and utility services,*
 - (iv) *the provision of land for public purposes,*
 - (v) *the provision and co-ordination of community services and facilities, and*
 - (vi) *the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats, and*
 - (vii) *ecologically sustainable development, and*

³ Part 3A of the EP&A Act (as in force immediately before its repeal) continues to apply to, and in respect of, a transitional Part 3A project (including the Project Approvals [05_0117 and 08_0135]) under clause 3 of schedule 6A of the EP&A Act. The description and quotations of relevant references to clauses of Part 3A in this document are as if Part 3A of the EP&A Act is still in force.

- (viii) *the provision and maintenance of affordable housing, and*
- (b) *to promote the sharing of the responsibility for environmental planning between the different levels of government in the State, and*
- (c) *to provide increased opportunity for public involvement and participation in environmental planning and assessment.*

The Modification is considered to be generally consistent with the objects of the EP&A Act, because it is a modification which:

- incorporates measures for the management and conservation of natural resources (Section 4);
- would enable more efficient recovery of open cut coal and the extraction of additional coal reserves with no material change to potential environmental impacts (when considering the implementation of proposed environmental management measures);
- would result in no significant impact on threatened species, their population and ecological communities or their habitats;
- allows continued development of the State's mineral resources (i.e. coal resources) in a manner that minimises environmental impacts through the implementation of the Moolarben Coal Complex Environmental Management Strategy (Section 2.15) and other measures (Section 4); and
- allows public involvement and participation through consultation activities (Section 1.4), which would be ongoing following the public exhibition of this EA document and DPE assessment of the Modification in accordance with the requirements of the EP&A Act.

6.2 GENERAL STATUTORY REQUIREMENTS

6.2.1 Other State Legislation

In addition to the EP&A Act, the following NSW Acts may be applicable to the Moolarben Coal Complex incorporating the Modification:

- BC Act;
- *Contaminated Land Management Act, 1997*;
- *Crown Lands Act, 1989 and Crown Land Management Act, 2016*;
- *Dams Safety Act, 2015*;

- *Dangerous Goods (Road and Rail Transport) Act, 2008*;
- *Explosives Act, 2003*;
- *Fisheries Management Act, 1994*;
- *Heritage Act, 1977*;
- *Mining Act, 1992*;
- *Native Title (New South Wales) Act, 1994*;
- *National Parks and Wildlife Act, 1974*;
- PoEO Act;
- *Roads Act, 1993*;
- *Water Management Act, 2000*; and
- *Work Health and Safety (Mines and Petroleum Sites) Act, 2013*.

Relevant licences or approvals required under these Acts would continue to be obtained for the Moolarben Coal Complex as required. Key plans and licences that would require revision to incorporate the Modification are outlined in Section 6.4.

Additional detail on the likely requirements under some of the key Acts is provided below.

Mining Act, 1992

Under the *Mining Act, 1992*, environmental protection and rehabilitation are regulated by conditions of MLs, including requirements for the submission of a MOP prior to the commencement of operations, and subsequent Annual Environmental Management Reports (or Annual Reviews).

The Moolarben Coal Complex MOP would be updated to incorporate the Modification (Section 6.4).

Protection of the Environment Operations Act, 1997

Operations at the Moolarben Coal Complex are currently undertaken in accordance with an existing Environment Protection Licence (EPL 12932) issued under the PoEO Act.

The existing Moolarben Coal Complex is currently licensed under EPL 12932 to conduct "mining for coal", "extractive activities" and "coal works" as defined in Schedule 1 of the PoEO Act.

The location and volume limits of water discharges from the Moolarben Coal Complex licensed by EPL 12932 would require variation as a result of the Modification (Section 6.5.3).

Water Management Act, 2000

The *Water Management Act, 2000* contains provisions for the licensing, allocation, capture and use of water resources.

Under the *Water Management Act, 2000*, water sharing plans establish rules for sharing water between different users and between the various environmental sources (namely rivers or aquifers).

The Groundwater Assessment (Appendix I) prepared for the Modification considers the additional licensing requirements for the Moolarben Coal Complex incorporating the Modification.

MCO would continue to obtain and hold licences required under the *Water Management Act, 2000*.

Biodiversity Conservation Act, 2016

The BC Act came into effect in NSW in August 2017 and replaces the *Threatened Species Conservation Act, 1995*.

The status of threatened species and community listings as per the BC Act has been considered in the Biodiversity Assessment Review (Appendix C) and Aquatic Ecology Assessment (Appendix G).

ELA (2017) prepared the Biodiversity Assessment Review in accordance with the FBA, as required by the SEARs.

Roads Act, 1993

Under section 138 of the *Roads Act, 1993*, consent from the appropriate roads authority (i.e. MWRC) is required to:

- erect a structure or carry out a work in, on or over a public road;
- dig up or disturb the surface of a public road; or
- remove or interfere with a structure, work or tree on a public road.

MCO would seek consent from the MWRC for the proposed pipeline to the relocated EPL discharge point at the Goulburn River Diversion (i.e. where the pipeline crosses the Ulan Road corridor).

6.2.2 Environmental Planning Instruments

State environmental planning policies and local environmental plans that may be relevant to the Modification are discussed below.

State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007

The *State Environmental Planning Policy (Mining Petroleum Production and Extractive Industries) 2007* (Mining SEPP) regularises the various environmental planning instruments that previously controlled mining activities.

Part 3 of the Mining SEPP outlines some of the matters to be considered when determining development applications (noting that State Environmental Planning Policies are but one of a number of considerations that are required to be taken into account). Relevant clauses are discussed further below.

Clause 2

Clause 2 sets out the aims of the Mining SEPP as follows:

- (a) *to provide for the proper management and development of mineral, petroleum and extractive material resources for the purpose of promoting the social and economic welfare of the State, and*
- (b) *to facilitate the orderly and economic use and development of land containing mineral, petroleum and extractive material resources, and*
- (b1) *to promote the development of significant mineral resources, and*
- (c) *to establish appropriate planning controls to encourage ecologically sustainable development through the environmental assessment, and sustainable management, of development of mineral, petroleum and extractive material resources, and*
- (d) *to establish a gateway assessment process for certain mining and petroleum (oil and gas) development:*

...

Clause 7

Clause 7(1) of the Mining SEPP states that development for any of the following purposes may be carried out only with development consent:

- (a) *underground mining carried out on any land,*
- (b) *mining carried out:*
 - (i) *on land where development for the purposes of agriculture or industry may be carried out (with or without development consent), or*
 - (ii) *on land that is, immediately before the commencement of this clause, the subject of a mining lease under the Mining Act 1992 or a mining licence under the Offshore Minerals Act 1999,*

The Modification is on land where industry or agriculture may be carried out under the *Mid-Western Regional Local Environmental Plan 2012* (MWR LEP).

Clause 12

Clause 12 of the Mining SEPP requires that, before determining an application for consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must:

- (a) *consider:*
 - (i) *the existing uses and approved uses of land in the vicinity of the development, and*
 - (ii) *whether or not the development is likely to have a significant impact on the uses that, in the opinion of the consent authority having regard to land use trends, are likely to be the preferred uses of land in the vicinity of the development, and*
 - (iii) *any ways in which the development may be incompatible with any of those existing, approved or likely preferred uses, and*
- (b) *evaluate and compare the respective public benefits of the development and the land uses referred to in paragraph (a) (i) and (ii), and*
- (c) *evaluate any measures proposed by the applicant to avoid or minimise any incompatibility, as referred to in paragraph (a) (iii).*

Land use in the vicinity of the Moolarben Coal Complex is characterised by a combination of coal mining operations, agricultural land, rural residences and the village of Ulan. The Modification areas are contained entirely within MCO's existing mining leases.

As such, the Modification is considered compatible with existing and approved land uses.

The potential impact of the Modification on surrounding land uses are described in Appendices A to I and summarised in Section 4.

MCO would, where practicable, implement a range of measures to avoid or minimise incompatibility of the Modification with existing and future land uses in the area.

This would be achieved through the implementation of the existing Moolarben Coal Complex Environmental Management Strategy and management plans (Section 2.15) and other measures for the Modification (Section 4).

Clause 13

Clause 13(2) of the Mining SEPP requires that, before granting consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must:

- (a) *consider:*
 - (i) *the existing uses and approved uses of land in the vicinity of the development, and*
 - (ii) *whether or not the development is likely to have a significant impact on current or future extraction or recovery of minerals, petroleum or extractive materials (including by limiting access to, or impeding assessment of, those resources), and*
 - (iii) *any ways in which the development may be incompatible with any of those existing or approved uses or that current or future extraction or recovery, and*
- (b) *evaluate and compare the respective public benefits of the development and the uses, extraction and recovery referred to in paragraph (a) (i) and (ii), and*
- (c) *evaluate any measures proposed by the applicant to avoid or minimise any incompatibility, as referred to in paragraph (a) (iii).*

The existing and approved use of the land in the vicinity of the Modification includes coal mining.

The Modification involves optimisations to improve the efficiency of resource recovery at the Moolarben Coal Complex and is considered compatible with existing and approved surrounding land uses.

There would be no direct interaction with the Ulan or Wilpinjong Coal Mines for the Modification. As such, no measures to avoid or minimise incompatibility with existing and approved surrounding land uses is considered to be required. Potential cumulative impacts associated with the Modification and the Ulan and Wilpinjong Coal Mines have been considered in Section 4.

Public benefits of the Modification include ongoing employment at the Moolarben Coal Complex, ongoing expenditure in the local and regional economies and increased royalties paid to the NSW Government.

Clause 14

Clause 14(1) of the Mining SEPP requires that, before granting consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must consider whether or not the approval should be issued subject to conditions aimed at ensuring that the development is undertaken in an environmentally responsible manner, including conditions to ensure the following:

- (a) *that impacts on significant water resources, including surface and groundwater resources, are avoided, or are minimised to the greatest extent practicable,*
- (b) *that impacts on threatened species and biodiversity, are avoided, or are minimised to the greatest extent practicable,*
- (c) *that greenhouse gas emissions are minimised to the greatest extent practicable.*

In addition, clause 14(2) requires that, without limiting clause 14(1), in determining a development application for development for the purposes of mining, petroleum production or extractive industry, the consent authority must consider an assessment of the greenhouse gas emissions (including downstream emissions) of the development, and must do so having regard to any applicable State or national policies, programs or guidelines concerning greenhouse gas emissions.

The potential impact of the Modification on groundwater and surface water resources are described in Sections 4.5 to 4.8, along with measures to minimise potential impacts.

The potential impact of the Modification on threatened species and biodiversity are described in Section 4.3 and Section 4.7, along with measures to avoid and minimise potential impacts.

The potential changes in annual greenhouse gas emissions associated with the Modification and associated measures to minimise greenhouse gas emissions at the Moolarben Coal Complex are described in Section 4.9.5.

Clause 15

Clause 15 of the Mining SEPP requires that:

- (1) *Before granting consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must consider the efficiency or otherwise of the development in terms of resource recovery.*
- (2) *Before granting consent for the development, the consent authority must consider whether or not the consent should be issued subject to conditions aimed at optimising the efficiency of resource recovery and the reuse or recycling of material.*
- (3) *The consent authority may refuse to grant consent to development if it is not satisfied that the development will be carried out in such a way as to optimise the efficiency of recovery of minerals, petroleum or extractive materials and to minimise the creation of waste in association with the extraction, recovery or processing of minerals, petroleum or extractive materials.*

A key element of the Modification is to increase efficiency of resource recovery through the proposed increase in annual open cut ROM coal production, and bypassing of suitable quality open cut ROM coal (which would also reduce the production of reject material).

Clause 16

Clause 16(1) of the Mining SEPP requires that, before granting consent for development for the purposes of mining that involves the transport of materials, the consent authority must consider whether or not the consent should be issued subject to conditions that do any one or more of the following:

- (a) *require that some or all of the transport of materials in connection with the development is not to be by public road,*
- (b) *limit or preclude truck movements, in connection with the development, that occur on roads in residential areas or on roads near to schools,*

- (c) *require the preparation and implementation, in relation to the development, of a code of conduct relating to the transport of materials on public roads.*

Product coal would continue to be transported from site by rail for the Modification.

As there would not be any increase in peak employees/contractors, there would be no change in the maximum daily operational vehicle movements for the Modification.

No specific additional traffic management or mitigation measures are considered to be warranted due to the Modification.

Clause 17

Clause 17 of the Mining SEPP requires that, before granting consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must consider whether or not the approval should be issued subject to conditions aimed at ensuring the rehabilitation of land that will be affected by the development. In particular, the consent authority must consider whether conditions of the consent should:

- (a) *require the preparation of a plan that identifies the proposed end use and landform of the land once rehabilitated, or*
- (b) *require waste generated by the development or the rehabilitation to be dealt with appropriately, or*
- (c) *require any soil contaminated as a result of the development to be remediated in accordance with relevant guidelines (including guidelines under section 145C of the Act and the Contaminated Land Management Act 1997), or*
- (d) *require steps to be taken to ensure that the state of the land, while being rehabilitated and at the completion of the rehabilitation, does not jeopardize public safety.*

The rehabilitation strategy for the Moolarben Coal Complex, incorporating the Modification, is presented in Section 5.

The Modification proposes changes to the approved final land uses and rehabilitation of the Moolarben Coal Complex. Sections of OC2 and OC3 approved to be rehabilitated to agricultural land would instead be rehabilitated to native vegetation (i.e. woodland).

The approved rehabilitation objectives for the Moolarben Coal Complex would continue for the Modification.

The Rehabilitation Management Plan and MOP would be revised to incorporate the Modification.

State Environmental Planning Policy No 33 (Hazardous and Offensive Development)

Clause 13 of the *State Environmental Planning Policy No 33 (Hazardous and Offensive Development)* requires the consent authority, in determining a development application for a potentially hazardous or a potentially offensive industry, to consider:

- ...
- (c) *in the case of development for the purpose of a potentially hazardous industry—a preliminary hazard analysis prepared by or on behalf of the applicant, and*
- (d) *any feasible alternatives to the carrying out of the development and the reasons for choosing the development the subject of the application (including any feasible alternatives for the location of the development and the reasons for choosing the location the subject of the application), and*
- ...

A review of the potential risks and hazards has been conducted for the Modification and concludes the Modification would not change existing potential risks or hazard consequences in comparison to those for the approved Moolarben Coal Complex (Section 4.9.8).

Environmental management plans and monitoring programs would be reviewed, and revised by MCO to include the Modification and continue to manage any associated environmental risks.

The Modification relates to optimisations to the approved Moolarben Coal Complex and, as such, there is limited scope for feasible alternative locations.

State Environmental Planning Policy No 44 (Koala Habitat Protection)

The *State Environmental Planning Policy No 44 (Koala Habitat Protection)* (SEPP 44) requires the consent authority for any development application in certain LGAs to consider whether land subject to the application is "potential Koala habitat" or "core Koala habitat".

ELA (2017) considers the Modification area comprises potential Koala habitat, but does not comprise core Koala habitat (Appendix C).

A consent authority is therefore not prevented from granting consent to the Modification under SEPP 44.

State Environmental Planning Policy No 55 (Remediation of Land)

The *State Environmental Planning Policy No 55 (Remediation of Land)* (SEPP 55) aims to provide a State-wide planning approach to the remediation of contaminated land. Under SEPP 55, planning authorities are required to consider the potential for contamination to adversely affect the suitability of the site for its proposed use.

The Stage 2 EA determined that potentially contaminated sites associated with prior land uses, such as sheep dips, workshops, and machinery sheds used for fuel, chemical and fertiliser storage and landfills, may be encountered within the Stage 2 Project Application Area. Where any potentially contaminated sites are found during construction or operation of Stage 2, these will be assessed and appropriate management strategies formulated to treat or remediate the site.

Under clause 7(2), before determining an application for consent to carry out development that would involve a change of use of land, the consent authority must consider a report specifying the findings of a preliminary investigation of the land concerned, carried out in accordance with the contaminated land planning guidelines.

As the Modification is within the Project Application Areas in Project Approval (05_0117) and/or Project Approval (08_0135) and no change of use is proposed, no preliminary land contamination investigation is required.

Mid-Western Regional Local Environmental Plan 2012

The Moolarben Coal Complex is located wholly within the Mid-Western Regional LGA and is covered by the MWR LEP.

Clause 2.3(2) of the MWR LEP relevantly provides:

The consent authority must have regard to the objectives for development in a zone when determining a development application in respect of land within the zone.

The consent authority for transitional Part 3A projects is the Minister for Planning.

The approved Stage 1 and Stage 2 of the Moolarben Coal Complex were considered by the relevant consent authorities to be consistent with the land-use objectives of the MWR LEP.

6.3 COMMONWEALTH LEGISLATION

6.3.1 Environment Protection and Biodiversity Conservation Act 1999

The Stage 1 operations are approved to be undertaken in accordance with Approval Decisions (EPBC 2007/3297) granted on 24 October 2007 (and varied by notice on 25 February 2009, 11 May 2010 and 20 July 2016) and (EPBC 2013/6926) granted on 13 November 2014 (and varied by notice on 20 July 2016) under the EPBC Act.

The current Stage 2 operations are approved to be undertaken in accordance with Approval Decision (EPBC 2008/4444) granted on 18 May 2015 (and varied by notice on 20 July 2016) under the EPBC Act.

Relevant components of the Modification were referred to the DEE (Reference 2017/7974). The DEE's Referral decision was that the Modification is a controlled action and, therefore, approval under the EPBC Act is required for relevant components of the Modification.

The relevant controlling provisions were:

- listed threatened species and communities (sections 18 and 18A of the EPBC Act); and
- a water resource, in relation to coal seam development and large coal mining development (sections 24D and 24E of the EPBC Act).

The controlled action will be assessed under the assessment bilateral agreement with the NSW Government and, as such, this EA has also been prepared to address the DEE's assessment requirements, which are included in the SEARs (Attachment 1).

The potential impacts of the Modification on flora and fauna have been assessed in Appendix C and summarised in Section 4.3. The assessment indicates that there would be no significant impact on threatened species, populations and communities, and migratory species listed under the EPBC Act as a result of the Modification.

The potential impacts of the Modification on water resources have been assessed in Appendices E to I and summarised in Sections 4.5 to 4.8. These assessments indicate that there would be no significant impact on water resources as a result of the Modification.

Objects of the EPBC Act

Section 3 of the EPBC Act describes the objects of the EPBC Act as follows:

- (1) *The objects of this Act are:*
- (a) *to provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance; and*
 - (b) *to promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources; and*
 - (c) *to promote the conservation of biodiversity; and*
 - (ca) *to provide for the protection and conservation of heritage; and*
 - (d) *to promote a co-operative approach to the protection and management of the environment involving governments, the community, land-holders and indigenous peoples; and*
 - (e) *to assist in the co-operative implementation of Australia's international environmental responsibilities; and*
 - (f) *to recognise the role of indigenous people in the conservation and ecologically sustainable use of Australia's biodiversity; and*
 - (g) *to promote the use of indigenous peoples' knowledge of biodiversity with the involvement of, and in co-operation with, the owners of the knowledge.*

The Modification is considered to be generally consistent with the objects of the EPBC Act, because it is a Modification which:

- incorporates a range of measures for the protection of the environment, including listed threatened species and ecological communities, water resources and heritage (Section 4);
- incorporates relevant ecologically sustainable development (ESD) considerations (refer below);
- includes the involvement and participation of the community, landholders and Indigenous people through the ongoing operational consultation and consultation regarding the Modification (Section 1.4), the public exhibition of the EA document and DPE assessment of the Modification in accordance with the requirements of the EP&A Act;

- would not result in a significant impact on migratory species protected under international agreements; and
- includes the involvement of Registered Aboriginal Parties through the Heritage Management Plan.

Ecologically Sustainable Development

In deciding whether or not to approve the proposed Action, the Commonwealth Minister must take into account the principles of ESD pursuant to section 136(2) of the EPBC Act. The relevant definition of the principles of ESD is provided in section 3A of the EPBC Act.

The objects of the EP&A Act also require encouragement of ESD. Section 6(2) of the *NSW Protection of the Environment Administration Act, 1991* provides a definition of ESD.

The principles of ESD as outlined in section 3A of the EPBC Act and clause 7(4) of Schedule 2 of the EP&A Regulation are presented and compared in Table 10.

The design, planning and assessment of the Modification have been carried out applying the principles of ESD, through:

- incorporation of risk assessment and analysis at various stages in the Modification design, environmental assessment and decision-making;
- adoption of high standards for environmental and occupational health and safety performance;
- consultation with regulatory and community stakeholders;
- assessment of potential greenhouse gas emissions associated with the Modification; and
- optimisation of the economic benefits to the community, arising from the development of the Modification.

In addition, it can be demonstrated that the Modification can be undertaken in accordance with ESD principles through the application of measures to avoid, mitigate and offset the potential environmental impacts of the Modification.

The following sub-sections describe the consideration and application of the principles of ESD to the Modification.

Table 10
Principles of Ecologically Sustainable Development – EPBC Act and EP&A Regulation

Section 3A of the EPBC Act	Clause 7(4) of Schedule 2 of the EP&A Regulation
(a) <i>decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations;</i>	-
(b) <i>if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;</i>	<p>(a) <i>the precautionary principle, namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:</i></p> <p>(i) <i>careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and</i></p> <p>(ii) <i>an assessment of the risk-weighted consequences of various options,</i></p>
(c) <i>the principle of inter-generational equity—that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;</i>	(b) <i>inter-generational equity, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,</i>
(d) <i>the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making;</i>	(c) <i>conservation of biological diversity and ecological integrity, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,</i>
(e) <i>improved valuation, pricing and incentive mechanisms should be promoted.</i>	<p>(d) <i>improved valuation, pricing and incentive mechanisms, namely, that environmental factors should be included in the valuation of assets and services, such as:</i></p> <p>(i) <i>polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,</i></p> <p>(ii) <i>the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,</i></p> <p>(iii) <i>environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.</i></p>

Precautionary Principle

Environmental assessment involves predicting the likely environmental outcomes of a development. The precautionary principle reinforces the need to take risk and uncertainty into account, especially in relation to threats of irreversible environmental damage.

An Environmental Assessment (Section 4 and Appendices A to I) has been prepared to identify potential impacts associated with the Modification and to develop appropriate mitigation measures and strategies.

Minimal uncertainty regarding the information used in the Environmental Assessment is expected, given:

- the period of operational experience and number of site-based surveys and assessments conducted at the Moolarben Coal Complex to date;
- the comprehensive nature of the assessments; and
- the consultation process conducted with key stakeholders (Section 1.4).

Mitigation and management measures would continue to be adopted for the Modification to minimise the potential for serious and/or irreversible damage to the environment, including:

- physical controls (e.g. avoidance of impacts);
- operational controls (e.g. the Vegetation Clearance Protocol);
- the implementation of environmental management and monitoring programs (Section 4); and
- identification of contingency measures and controls (Section 4).

Social Equity

Social equity is defined by inter-generational and intra-generational equity.

Inter-generational equity is the concept that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations, while intra-generational equity is applied within the same generation.

The principles of social equity are addressed through:

- the continued use of existing infrastructure and workforce;
- ongoing socio-economic benefits associated with employment and stimulus to the local and regional economies;
- increased royalty payments to the NSW Government over the life of the Moolarben Coal Complex;
- implementation of management measures and monitoring programs in relation to the potential impacts of the Modification on ecology, heritage, noise and blasting, air quality, water resources, hazards and risks and greenhouse gas emissions (Section 4);
- design of the Modification to maintain the biodiversity values of the region in the medium-to long-term with progressive rehabilitation and the ongoing implementation of the biodiversity offset strategy; and
- continued contributions to the local community through ongoing support for community initiatives.

Conservation of Biological Diversity and Ecological Integrity

Biological diversity or 'biodiversity' is considered to be the number, relative abundance, and genetic diversity of organisms from all habitats (including terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are a part), and includes diversity within species and between species as well as diversity of ecosystems (Lindenmayer and Burgman, 2005).

The assessment in Section 4.3 (and Appendix C) describes the potential impacts of the Modification on local and regional biodiversity.

The Modification addresses the conservation of biodiversity and ecological integrity by proposing that a range of impact avoidance and mitigation measures would be implemented for the Modification to maintain or improve the biodiversity values of the surrounding region in the medium- to long-term, as described in Section 4.3 and Section 5.

Valuation

One of the common broad underlying goals or concepts of sustainability is economic efficiency, including improved valuation of the environment.

Consideration of economic efficiency, with improved valuation of the environment, aims to overcome the underpricing of natural resources and has the effect of integrating economic and environmental considerations in decision-making, as required by ESD.

Environmental costs have historically been considered to be external to project development costs. Improved valuation and pricing methods attempt to internalise environmental costs and include them within project costing.

Direct environmental costs at the Moolarben Coal Complex are internalised through the adoption and funding of mitigation measures by MCO to mitigate potential environmental impacts; for example, the procurement of low noise emission fleet items, construction of environment bunds, implementation of dust mitigation measures (e.g. haul road watering), progressive rehabilitation, the purchase of water access licences and the purchase of offset properties.

6.3.2 Native Title Act, 1993

Through the operation of the Commonwealth *Native Title Act, 1993* (NT Act), an Ancillary Deed of Agreement is maintained between MCO and the North-Eastern Wiradjuri People of the Bathurst/Lithgow/Mudgee Area (Native Title Party).

The Modification does not require additional mining leases at the Moolarben Coal Complex. On this basis, no further consideration of the NT Act is required for the Modification.

6.4 NSW GOVERNMENT POLICY

6.4.1 Strategic Regional Land Use Policy

As part of the Strategic Regional Land Use Policy, the NSW Government has introduced a 'Gateway Process' for the upfront assessment of the impacts of State Significant mining and coal seam gas proposals on Strategic Agricultural Land (NSW Government, 2012a).

The Strategic Regional Land Use Policy and the 'Gateway Process' apply to new State Significant Development applications or modifications for mining projects located outside of existing mining lease areas (NSW Government, 2012a).

The Modification does not require new mining leases, and therefore a Gateway Certificate or Site Verification Certificate is not required.

6.4.2 Aquifer Interference Policy

The AIP (NSW Government, 2012b) has been developed by the NSW Government as a component of the NSW Government's Strategic Regional Land Use Policy. The AIP applies State-wide and details water licence and impact assessment requirements.

The AIP has been developed to ensure equitable water sharing between various water users and proper licensing of water taken by aquifer interference activities such that the take is accounted for in the water budget and water sharing arrangements. The AIP would also enhance existing regulation, contributing to a comprehensive framework to protect the rights of all water users and the environment in NSW.

The *Water Management Act, 2000* defines an aquifer interference activity as that which involves any of the following:

- *the penetration of an aquifer;*
- *the interference with water in an aquifer;*
- *the obstruction of the flow of water in an aquifer;*
- *the taking of water from an aquifer in the course of carrying out mining or any other activity prescribed by the regulations; and*
- *the disposal of water taken from an aquifer in the course of carrying out mining or any other activity prescribed by the regulations.*

A Groundwater Assessment (Appendix I) has been prepared in consideration of the AIP and the key conclusions are summarised below.

Drawdowns at private bores in the vicinity of the Moolarben Coal Complex are not predicted to exceed the AIP minimal impact criterion of 2 m due to the Modification (Appendix I).

Water Source

The AIP requires all water taken by aquifer interference activities to be accounted for within the extraction limits set by the relevant Water Sharing Plan.

Surface water and alluvial groundwater resources within the vicinity of the Moolarben Coal Complex are managed under the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009* (HUAWSP), with non-alluvial water sources managed under the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources*.

Licensing Requirements

The Groundwater Assessment considers licensing requirements for the Moolarben Coal Complex incorporating the Modification. MCO would continue to obtain and hold licences required under the *Water Management Act, 2000*.

Minimal Impact Considerations

The AIP establishes minimal impact considerations for highly productive and less productive groundwater.

There is no 'highly productive' groundwater, as defined under the AIP, mapped in the vicinity of the Moolarben Coal Complex (Appendix I).

The nearest 'highly productive' groundwater is a portion of the alluvial aquifer associated with Wilpinjong Creek, approximately 9 km downstream of the Moolarben Coal Complex and downstream of the Wilpinjong Coal Mine (Appendix I).

An assessment of the Modification against the minimal impact considerations in the AIP was conducted as part of the Groundwater Assessment (Appendix I).

The Groundwater Assessment concluded the Modification is within the 'Level 1' minimal impact considerations outlined in the AIP.

6.5 APPROVALS, LICENCES AND PLANS

This section describes potential changes to MCO's existing Project Approval and licence conditions that may be required should the Modification be approved.

6.5.1 Project Approval Conditions

Coal Extraction

MCO is seeking to amend Condition 6, Schedule 2 of the Stage 1 Project Approval (05_0117) as a component of the Modification as follows:

6. The Proponent shall not extract more than:
 - (a) **10 million tonnes** ~~8 million tonnes~~ of ROM coal from the open-cut mining operations in any calendar year ~~except 2015 and 2016~~;
 - (b) ~~9 million tonnes of ROM coal from the open-cut mining operations of the project in the calendar years 2015 and 2016; and~~

...

MCO is seeking to amend Condition 7, Schedule 2 of Project Approval (08_0135) as a component of the Modification as follows:

7. The Proponent shall not extract more than:
 - (a) **16 million tonnes** ~~12 million tonnes~~ of ROM coal from the open cut mining operations of the project in any calendar year; and

...

Coal Handling and Processing

MCO is seeking to amend Conditions 7 and 7A, Schedule 2 of Project Approval (05_0117) as a component of the Modification to read:

7. The Proponent shall not:
 - (a) wash more than **16 million tonnes** ~~13 million tonnes~~ of coal at the coal handling and preparation plant on site in any calendar year, ~~except in the year 2017~~;
 - (b) handle a total of more than **16 million tonnes** ~~13 million tonnes~~ of ROM coal on site that have been extracted from the open cut mining operations at the Moolarben Coal Complex in any calendar year; and

...

Coal Transport

MCO is seeking to amend Condition 8, Schedule 2 of Project Approval (05_0117) as a component of the Modification to read:

8. The Proponent shall ensure that:
 - (b) no more than **8 laden trains** ~~7 laden trains~~ leave the site each day on average when calculated over any calendar year;
 - (c) no more than **11 laden trains** ~~9 laden trains~~ leave the site each day; and
 - (d) no more than **22 million tonnes** ~~18 million tonnes~~ are transported from the site in any calendar year.

Biodiversity Offset Strategy

Table 12 (Condition 34, Schedule 3) and Appendix 8 of Project Approval (07_0117) and Table 15 (Condition 30, Schedule 3) and Appendix 7 of Project Approval (08_0135) would require amendment to incorporate the biodiversity offset strategy for the Modification.

General Updates

In addition to the above, other updates to Project Approvals (05_0117 and 08_0135) would be required, included as follows:

- updates to general arrangement and monitoring figures to reflect the Modification and updated land ownership; and
- removal of the list of Aboriginal heritage items from the appendices of the Project Approvals, as these lists are updated as part of ongoing consultation process for the Heritage Management Plan, and as a result are not considered suitable for inclusion in the Project Approvals.

6.5.2 Mining Operations Plan

The Moolarben Coal Complex MOP would be updated to incorporate the Modification.

6.5.3 Environment Protection Licence Conditions

Condition L3 of EPL 12932 provides volume and mass limits for discharges from the Moolarben Coal Complex. The current discharge volume and mass limits as stated in Condition L3 of EPL 12932 are provided in Table 11.

Table 11
Existing Volume and Mass Limits (EPL 12932)

<i>Point</i>	<i>Unit of Measure</i>	<i>Volume/Mass Limit</i>
1,2	<i>megalitres per day</i>	10
28	<i>kilolitres per day</i>	1

Note: *The combined discharge volume from points 1,2 and 28 must not exceed 10 megalitres (ML) per day.*

MCO is seeking to amend discharge volume and mass limits in Condition L3 of EPL 12932 as a component of the Modification to those provided in Table 12.

Table 12
Proposed Volume and Mass Limits

<i>Point</i>	<i>Unit of Measure</i>	<i>Volume/Mass Limit</i>
1	<i>megalitres per day</i>	20
2	<i>megalitres per day</i>	10
28	<i>kilolitres per day</i>	1

Note: *1. The combined discharge volume from points 1,2 and 28 must not exceed 20 megalitres (ML) per day.*

Condition P1.3 of EPL 12932 provides descriptions of each discharge location at the Moolarben Coal Complex. The location of EPL ID1 is described as:

Discharge to Bora Creek from "Cockies Dam" as indication on sketch no. SK3445-005 Stage 1 Open Cut and CHPP Water Management Assessment and Upgrade Proposal Report dated October 2012 and received by the EPA 26/10/12.

MCO is seeking to amend the location of EPL ID1 as presented on Figure 10.

6.5.4 Management/Monitoring Plans

Some management plans may require revision to reflect updated environmental management measures or changes to Project Approval conditions resulting from the Modification.

These are expected to include the Water Management Plan, Noise Management Plan, Blast Management Plan, Air Quality Management Plan, Biodiversity Management Plan, Heritage Management Plan, Rehabilitation Management Plan and Biodiversity Offset Management Plan.

7 CONCLUSIONS

The Modification involves optimisations to the approved Moolarben Coal Complex to facilitate the efficient and safe mining of resources, the majority of which are already approved to be recovered.

Key elements of the approved Moolarben Coal Complex would remain unchanged for the Modification, including:

- Mine life.
- OC4 and OC1 pit limits.
- Underground mining rate and layout.

The SEARs for the Modification (Attachment 1) require this EA to include reasons why the Modification should be approved, and to provide a consolidated summary of environmental mitigation, management and monitoring.

7.1 JUSTIFICATION FOR MODIFICATION APPROVAL

Approval of the proposed changes to the Moolarben Coal Complex for the Modification is considered to be justified given:

- The proposed increases in the rate of open cut ROM coal production could be achieved with no exceedances of the Project Approval limits for noise and air quality.
- The Biodiversity Offset Strategy for the Modification, which includes land-based offsets at the MCO-owned Gilgal property, would compensate for residual potential impacts to biodiversity.
- The Modification would result in an improved final landform due to the removal of the approved OC3 out-of-pit emplacement.
- The improved efficiency of resource recovery would result in an increase in Government royalties of approximately \$82M (NPV of approximately \$69M).
- The increased production limits would allow annual revenue to increase. This improves the productivity of the Moolarben Coal Complex, which improves the security of the continued employment of the existing workforce and ongoing expenditure in the State and local economies.
- The modifications and additions to infrastructure for the Modification would result in construction employment at the Moolarben Coal Complex.

- The water treatment facility would enable water to be released via licensed discharge to be treated to EPL concentration limits and reduce/control dissolved metal concentrations.
- Piping treated water to the relocated discharge point would avoid potential erosion along Bora Creek (in comparison to the current EPL discharge point).
- It is predicted the proposed increase in the daily volume of EPL discharges to 20 ML/day could occur with negligible adverse impacts to downstream water quality and aquatic ecology, and minor changes in river height and velocity.

A consolidated summary of environmental management and monitoring measures for the Modification that would be integrated into the existing environmental management strategy at the Moolarben Coal Complex, is provided in Section 7.2.

7.2 CONSOLIDATED SUMMARY OF ENVIRONMENTAL MANAGEMENT AND MONITORING MEASURES

Noise

MCO would continue to mitigate, monitor and manage potential noise impacts from the Moolarben Coal Complex in accordance with the Noise Management Plan, which would be reviewed and updated to incorporate the Modification.

Air Quality

MCO would continue to implement air quality mitigation, management and monitoring in accordance with the Air Quality Management Plan, which would be reviewed and updated to incorporate the Modification.

Biodiversity

MCO would continue to implement biodiversity mitigation, management and monitoring measures in accordance with the Biodiversity Management Plan, which would be reviewed and updated to incorporate the Modification (e.g. for the additional disturbance areas and relinquished areas).

The existing Biodiversity Offset Strategy for the Moolarben Coal Complex would be augmented with an additional Biodiversity Offset Strategy for the Modification to account for additional residual impacts to biodiversity. The final Biodiversity Offset Strategy for the Modification is expected to comprise a combination of credits generated by land-based offset areas, rehabilitation and other mechanisms.

Aboriginal Cultural Heritage

Continued implementation of monitoring and management measures through the Heritage Management Plan, including salvage of sites that would be directly impacted.

MCO would review and update the Heritage Management Plan for the Modification.

Geochemistry

MCO would continue the Moolarben Coal Complex geochemical testing program.

Rejects would continue to be co-disposed with waste rock in the open cut mining voids, at least 5 m below the surface of the final landform.

Surface Water

Water Treatment Facility

The water treatment facility would be used to treat water to a quality that enables water discharged from the site to comply with EPL 12932 water quality concentration limits for EC, pH, TSS, turbidity and oil and grease.

In addition, the water treatment facility would treat water such that dissolved metal concentrations are at or below ANZECC trigger levels (i.e. either default trigger levels for 95% species protection, or if dissolved metal concentrations in the Goulburn River naturally exceed the default trigger, site-specific ANZECC trigger levels would be developed based on 80th percentile concentrations from historic water quality monitoring data).

Relocation of Discharge Point

To avoid potential erosion along the length of Bora Creek, water from the water treatment facility would be piped to the relocated discharge point at the confluence of Bora Creek and the Goulburn River Diversion.

Scour Protection at Outlet of Relocated Discharge Point

A flow spreader/diffuser would be installed at the proposed discharge point to minimise potential scour. Routine inspections of the discharge outlet would be undertaken to identify the need for any further scour protection, should any bed or bank erosion start to occur.

Water Quality Monitoring

Regular monthly water quality monitoring (including Goulburn River sites SW12, SW02 and SW01) would continue in accordance with the Surface Water Management Plan.

Monitoring of all licensed discharge events would be undertaken in accordance with EPL requirements.

The surface water quality trigger levels adopted for the Goulburn River would be expanded to include the key metals identified by the Geochemistry Review (i.e. Aluminium, Cadmium, Copper, Manganese, Nickel and Zinc).

Any exceedances of the surface water quality trigger levels would be managed in accordance with the 'Surface Water Response and Contingency Plan', which is described in the Surface Water Management Plan.

Surface Water Management Plan

MCO would continue to mitigate, manage and monitor surface water in accordance with the Surface Water Management Plan, which would be revised for the Modification to include the measures described above.

Site Water Balance

MCO would continue to review and revise the Site Water Balance, which would be updated for the Modification.

Aquatic Ecology

MCO would continue to implement management and monitoring measures for aquatic ecology in accordance with the Surface Water Management Plan.

The Surface Water Management Plan would be revised for the Modification as follows:

- Review of aquatic ecology trigger levels to reflect the latest available data and analysis.
- Update of the trigger action response plans to include the Salinity and EPT Taxa indices.
- Update to the stream-health monitoring methodology to incorporate consideration of monthly water quality data, stream-flow and rainfall data in the interpretation of stream-health monitoring results.

Groundwater

MCO would continue to implement management and monitoring measures for groundwater in accordance with the Groundwater Management Plan. Groundwater licences would be held to account for mining at the Moolarben Coal Complex incorporating the Modification, as required.

Historic Heritage

Relinquishment of areas of approved disturbance for the Modification would result in the avoidance of impacts to two previously identified historic heritage sites.

MCO would review and update the Heritage Management Plan for the Modification to incorporate the Relinquishment areas.

Greenhouse Gas Emissions

MCO would continue to mitigate, monitor and manage greenhouse gas emissions in accordance with the Greenhouse Gas Minimisation Plan, which would be updated to incorporate the Modification.

Reporting of energy consumption and Scope 1 and 2 greenhouse gas emissions would continue in accordance with NGERs.

Blasting

MCO would continue to mitigate, monitor and manage potential blasting impacts from the Moolarben Coal Complex in accordance with the Blast Management Plan, which would be updated to incorporate the Modification (i.e. minor extensions to OC2 and OC3 pit limits).

Socio-Economics

MCO would continue to make financial contributions to the MWRC in accordance with Moolarben Coal Complex Planning Agreements, Project Approval (05_0117) and Project Approval (08_0135), and would also continue to support a number of non-Government and community organisations in the region.

Public Safety

Public safety would continue to be managed (e.g. through the construction of safety berms, fences and signage) as described in the Rehabilitation Management Plan.

Rehabilitation and Landforms

MCO would continue to manage and monitor potential impacts to land resources, and implement rehabilitation at the Moolarben Coal Complex, in accordance with the Rehabilitation Management Plan.

The Rehabilitation Management Plan would be updated for the Modification to include:

- Change in final landuse in portions of OC2 and OC3 from agricultural land to native vegetation.
- Additional disturbance areas proposed for the Modification.
- Areas to be relinquished, which would no longer be disturbed or require rehabilitation.
- Removal of the approved OC3 out-of-pit emplacement from the final landform.

8 REFERENCES AND ABBREVIATIONS

8.1 REFERENCES

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8.2 ABBREVIATIONS

		DPE	NSW Department of Planning and Environment
ACHA	Aboriginal Cultural Heritage Assessment	DPI Water	NSW Department of Primary Industries – Water
AHIMS	Aboriginal Heritage Information Management System	DRG	NSW Division of Resources and Geoscience
AIP	NSW Aquifer Interference Policy	EA	Environmental Assessment
AMD	Acid and Metalliferous Drainage	EC	Electrical Conductivity
ANZECC	Australian and New Zealand Environment and Conservation Council	EEC	Endangered Ecological Community
ANZEC	Australian and New Zealand Environment Council	EGI	Environmental Geochemistry International Pty Ltd
ARD	Acid Rock Drainage (now referred to as AMD)	EL	Exploration Licence
ARTC	Australian Rail Track Corporation	ELA	Eco Logical Australia Pty Ltd
AS	Australian Standard	EP&A Act	<i>NSW Environmental Planning and Assessment Act, 1979</i>
AusRivAS	Australian Rivers Assessment System	EPA	NSW Environment Protection Authority
AWS	Automatic Weather Station	EPBC Act	<i>Commonwealth Environment Protection and Biodiversity Conservation Act, 1999</i>
BC Act	<i>NSW Biodiversity Conservation Act, 2016</i>	EPL	Environment Protection Licence
BVT	Biometric Vegetation Type	ESD	ecologically sustainable development
CCC	Community Consultative Committee	FBA	<i>NSW Framework for Biodiversity Assessment</i>
CEEC	Critically Endangered Ecological Community	GDE	groundwater dependent ecosystem
CHPP	Coal Handling and Preparation Plant	ha	hectares
CO ₂ -e	carbon dioxide equivalent	HRSTS	Hunter River Salinity Trading Scheme
the Credit Calculator	<i>the Credit Calculator for Major Projects and BioBanking</i>	HUAWSP	<i>Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009</i>
dB(A)	A-weighted decibel	kL/day	kilolitres per day
DECC	NSW Department of Environment and Climate Change (now OEH)	km	kilometres
DECCW	NSW Department of Environment, Climate Change and Water	kV	kilovolt
DEE	Commonwealth Department of the Environment and Energy	L _{Aeq(period)}	equivalent continuous noise level
DNG	derived native grassland	LGA	Local Government Area
DP&I	NSW Department of Planning and Infrastructure (now DPE)	m	metres
		M	million
		m/s	metres per second

MCM	Moolarben Coal Mines Pty Ltd	RGS	RGS Environmental Pty Ltd
MCO	Moolarben Coal Operations Pty Ltd	RING	Rail Infrastructure Noise Guideline
mg/L	milligrams per litre	RMS	NSW Roads and Maritime Services
MIA	mine infrastructure area	RO	reverse osmosis
Mining SEPP	<i>State Environmental Planning Policy (Mining Petroleum Production and Extractive Industries) 2007</i>	ROM	run-of-mine
ML	Mining Lease	SEARs	Secretary's Environmental Assessment Requirements
ML/day	megalitres per day	SEPP 44	State Environmental Planning Policy No 44 (Koala Habitat Protection)
MOP	Mining Operations Plan	SEPP 55	State Environmental Planning Policy No 55 (Remediation of Land)
MPR	Marine Pollution Research Pty Ltd	SIGNAL	Stream Invertebrate Grade Number Average Level
Mt	million tonnes	SLR	SLR Consulting
Mtpa	million tonnes per annum	TAS	Todoroski Air Sciences
MWR LEP	Mid-Western Regional Local Environmental Plan 2012	TEOMs	Tapered Element Oscillating Mass Balances
MWRC	Mid-Western Regional Council	TSP	total suspended particulate
NAF	non-acid forming	TSS	Total Suspended Solids
NGERS	National Greenhouse Gas and Energy Reporting Scheme	UCML	Ulan Coal Mines Limited
NPV	Net Present Value	WRM	WRM Water and Environment
NSW	New South Wales	Yancoal	Yancoal Australia Limited
NT Act	<i>Commonwealth Native Title Act, 1993</i>	°	degrees
NTU	Nephelometric Turbidity Units	µm	micrometres
OEH	NSW Office of Environment and Heritage	µS/cm	microSiemens per centimetre
PAF	potentially acid forming		
PAF-LC	potentially acid forming – low capacity		
PCT	Plant Community Type		
PHA	Preliminary Hazard Analysis		
PM _{2.5}	particulate matter ≤ 2.5 µm		
PM ₁₀	particulate matter ≤ 10 µm		
PoEO Act	<i>NSW Protection of the Environment Operations Act, 1997</i>		
PPR	Preferred Project Report		
RAPs	Registered Aboriginal Parties		