MOOLARBEN COAL COMPLEX ANNUAL REVIEW 2017

Document	Version	Issue	Author	Approved
ENV_RPT_ANNUAL REVIEW 2017	2	June 2018	MCO	GC

Name of operation	Moolarben Coal Complex
Name of operator	Moolarben Coal Operations Pty Ltd
Development consent / project approval #	05_0117 and 08_0135
Name of holder of development consent / project approval	Moolarben Coal Mines Pty Limited
Mining lease #	ML 1605, 1606, 1628, 1691, 1715
Name of holder of mining leases	Moolarben Coal Mines Pty Ltd, Sojitz Moolarben Resources Pty Ltd and Kores Australia Moolarben Resources Pty Ltd
Water licence #	Refer Table 6
Name of holder of water licence	Moolarben Coal Operations Pty Ltd
MOP/RMP start date	1 January 2017
MOP/RMP end date	31 December 2017
Annual Review start date	01 January 2017
Annual Review end date	31 December 2017

I, Graham Chase, certify that this audit report is a true and accurate record of the compliance status of Moolarben Coal Complex for the period January 1st 2017 to December 31 2017 and that I am authorised to make this statement on behalf of Moolarben Coal Operations.

Note.

a) The Annual Review is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000.

b) The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or $22,000, or both).

Name of authorised reporting officer	Graham Chase
Title of authorised reporting officer	Environment and Community Manager
Signature of authorised reporting officer	
Date	28 June 2018

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1.0 STATEMENT OF COMPLIANCE

A summary of compliance with relevant approval conditions for the reporting period is provided in **Table 1** and **Table 2**. A compliance table key is provided in **Table 3**.

Table 1: Statement of compliance

Approval	Compliance Status (Including Administrative Non-compliances)
PA 05_0117	No
PA 08_0135	No
ML 1605	No
ML 1606	Yes
ML 1628	Yes
ML 1691	Yes
ML 1715	Yes
WAL36340	Yes
WAL37582	Yes
WAL37583	Yes
WAL39799	Yes
20BL173935	Yes

Table 2: Non-compliances

Approval	Condition Number	Condition description (summary)	Compliance status	Comment	Where addressed
PA 08_0135	Sch. 3 Con. 9	Blasting Criteria	Non-Compliant	Blast overpressure above criteria	6.3 and 11.0
PA 08_0135 PA05-0117	Sch. 2 Con. 2	The Proponent shall carry out the project generally in accordance with the EA	Non-Compliant	Material stockpiled contrary to EA	11.0
PA 08_0135 PA05-0117	Sch. 3 Con. 22	Air Quality Management Plan	Non-Compliant	Non continuous TEOM monitoring due to being out of service	6.4 and 11.0
PA 08_0135 PA05-0117	Sch. 3 Con. 29	Surface Water Management Plan	Non-Compliant	Non continuous stream flow monitoring due to being out of service	7.3.1 and 11.0
ML 1605	Con. 3	Mining operations to be carried out in accordance with the Mining Operations Plan	Non-Compliant	Material stockpiled contrary to MOP	11.0
EPBC (2008/4444)	Con. 4	Secure the lands identified as the Offset Areas	Non-Compliant	Delay securing offset by legal instrument.	6.5, 11.0 and Appendix 4

Table 3: Compliance Table Key

Risk	Colour Code	Description
High	Non-Compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Non-Compliant	Non-compliance with: • potential for serious environmental consequences, but is unlikely to occur, or • potential for moderate environmental consequences, but is likely to occur
Low	Non-Compliant	Non-compliance with: • potential for moderate environmental consequences, but is unlikely to occur, or • potential for low environmental consequences, but is likely to occur
Administrative	Non-Compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions)

2.0 INTRODUCTION

The Moolarben Coal Complex (MCC) is located approximately 40 kilometres north of Mudgee in the Western Coalfield of New South Wales **(Figure 1)** within the Mid-Western Regional Local Government Area. Local relevant land ownership within the immediate vicinity of the MCC is provided in **Appendix 1**.

Moolarben Coal Operations Pty Ltd (MCO) is the operator of the Moolarben Coal Complex (MCC) 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).

Current mining operations undertaken across the MCC have approval until 31 December 2038. All mining operations are conducted in accordance with NSW Project Approval (05_0117) (Moolarben Coal Project Stage 1) as modified, and NSW Project Approval (08_0135) (Moolarben Coal Project Stage 2) as modified.

The current mining operations are undertaken in accordance with Approval Decisions (EPBC 2007/3297), (EPBC 2008/4444) and (EPBC 2013/6926) under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act).

Current mining operations at the MCC are conducted in accordance with the requirements of the conditions of Mining Lease (ML) 1605, ML 1606, ML 1628, ML 1691, and ML1715 granted under the *Mining Act, 1992*.

2.1 SCOPE

This Annual Review has been prepared by MCO (with input from experienced and qualified experts) to satisfy the reporting requirements of NSW Project Approval (05_0117) (as modified), NSW Project Approval (08_0135) (as modified), mining leases ML 1605, ML 1606, ML1628, ML1691 and ML1715, EPBC approvals (2007/3297, 2008/4444 and 2013/6926) and water licences. The report presents a summary of the regulatory compliance, environmental performance, and community engagement activities for MCO.

The following key agencies shall be provided with a copy of this report:

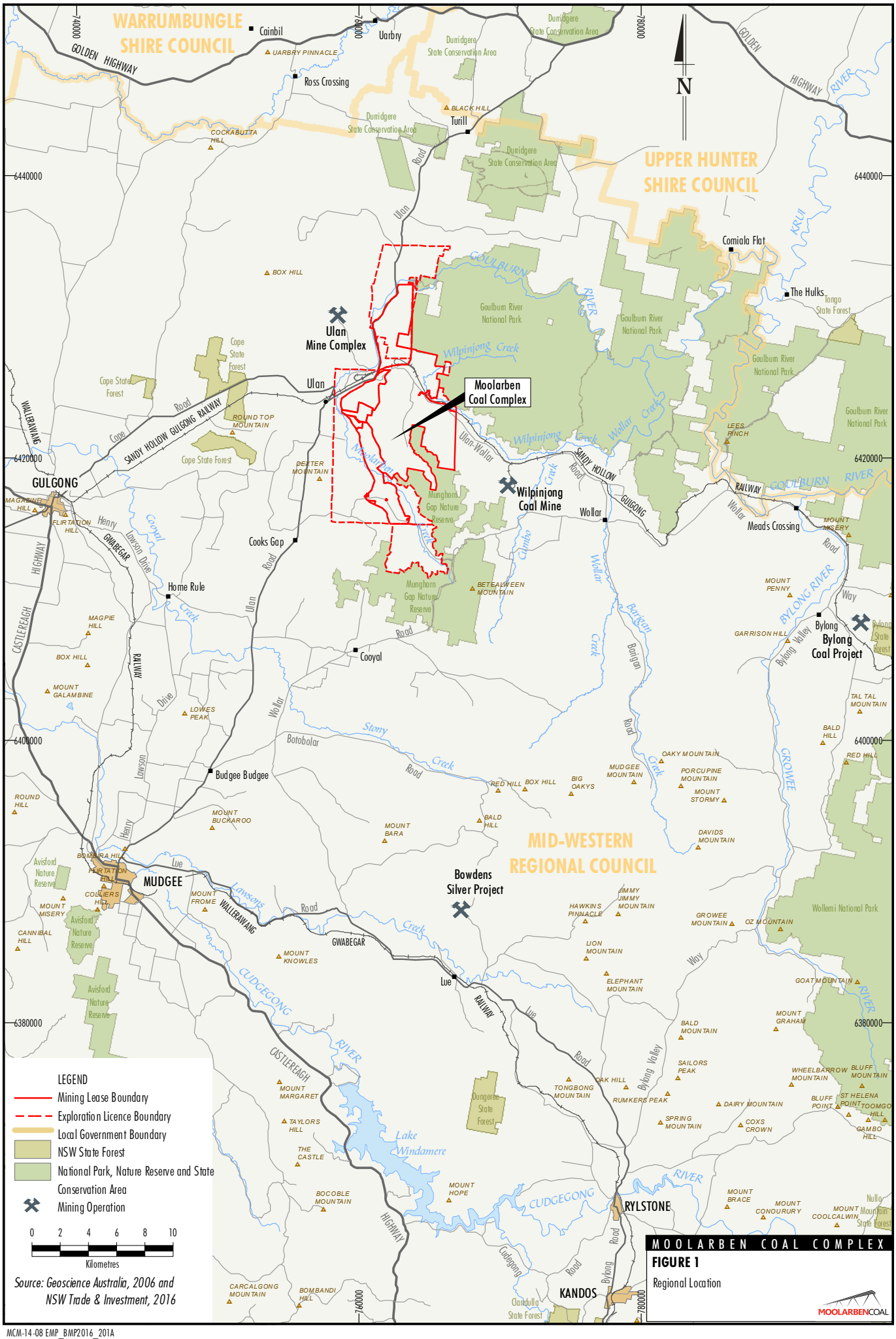
- NSW Department of Planning and Environment (DP&E);
- NSW Department of Planning and Environment – Division of Resources & Geosciences (DRG);
- NSW Department of Primary Industries – Lands and Water (DPI-Water);
- Commonwealth Department of the Environment and Energy (DotEE);
- NSW Office of Environment and Heritage (OEH);
- NSW Environment Protection Authority (EPA);
- Mid-Western Regional Council (MWRC); and
- Members of the MCC Community Consultative Committee (CCC).

In addition, an electronic copy will be made publicly available on the Moolarben Coal website (http://www.moolarbencoal.com.au/) in accordance with Schedule 5, Condition 11 (a) of PA05_117 and Schedule 6, Condition 11 (a) of PA08_0135.

2.2 STRUCTURE OF THIS ANNUAL REVIEW

The remainder of the Annual Review is structured as follows and is based on the *Annual Review Guidelines – Post-approval requirements for State significant mining developments* (NSW Department of Planning and Environment, 2015):

Section 3: Outlines the relevant statutory approvals.
Section 4: Outlines the activities undertaken at Moolarben Coal Complex for the period and those proposed for the next period.
Section 5: Actions required from previous Annual Review.
Section 6: Outlines environmental performance including noise, blasting, air quality, biodiversity and heritage.
Section 7: Outlines the water management performance.
Section 8: Outlines subsidence performance.
Section 9: Outlines the rehabilitation management performance
Section 10: Outlines the community performance.
Section 11: Describes independent audit requirements.
Section 12: Provides a summary of incidents and non-compliances.
Section 13: Outlines activities to be completed in the next reporting period.
Appendices: Supporting information and monitoring data.



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2.3 PROJECT DESCRIPTION

MCC comprises the Moolarben Stage 1 and Stage 2 Projects. An overview of the complex is provided in **Figure 2**. The Stage 1 and Stage 2 operations are summarised in **Table 4** below.

Stage 1 has commenced and at full development will comprise:

- the construction and operation of three open cut mines (OC1, OC2 and OC3);
- construction and operation of one longwall underground mine (UG4);
- construction and operation of a Coal Handling and Preparation Plant (CHPP);
- road and rail works – including rail loop, train load-out and closure and/or diversion of Carrs Gap Road, and Moolarben Road; and,
- Other infrastructure areas – including administration offices and workshops.

Stage 2 has commenced and at full development will comprise:

- the construction and operation of one open cut mining operation (OC4) and two underground mining operations (UG1 and UG2);
- construction and operation of the Stage 2 ROM coal facilities and conveyors and associated facilities between the Stage 2 ROM coal facilities and Stage 1 CHPP;
- extension of the use of the existing approved Stage 1 Coal Handling and Preparation Plant (CHPP) to Year 24 of Stage 2;
- development of an out-of-pit emplacement area;
- construction and operation of administration offices, workshops, supporting power and communications infrastructure and related facilities;
- Construction of a remote service infrastructure area;
- diversion of Murragamba and Eastern Creeks;
- development of water management infrastructure; and,
- other associated minor infrastructure, plant, equipment and activities, including ancillary works, minor modifications and alterations to existing infrastructure as required.

Table 4: Moolarben Coal Complex production overview

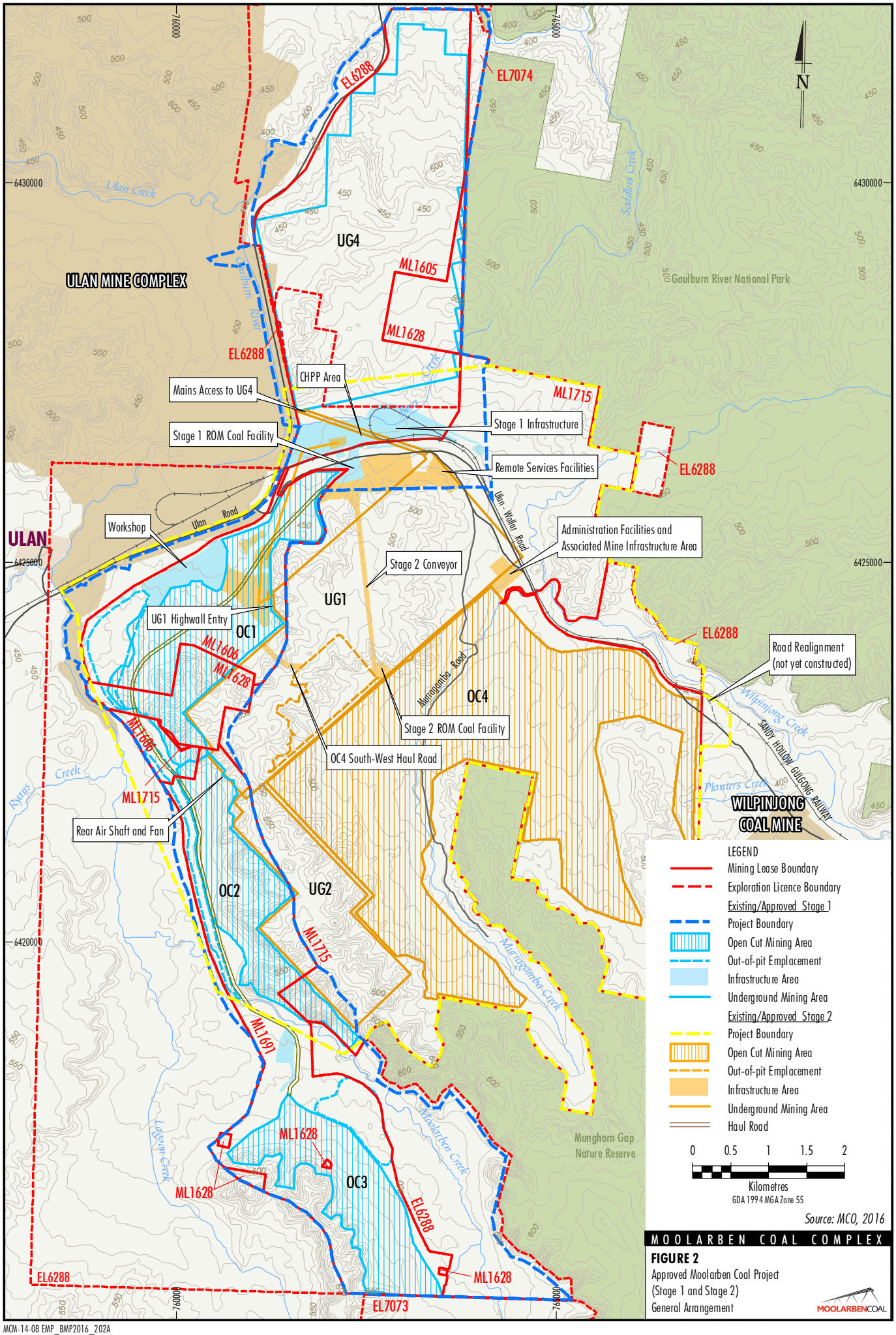
Relevant Approval Component	Moolarben Coal Project	
	Stage 1 **Project Approval (05_0117)**	**Stage 2** **Project Approval (08_0135)**
Operational Mine Life	Mining operations can be carried out until 31 December 2038.	
Hours of Operation	Mining operations can be carried out 24 hours a day, 7 days a week.	
Coal Extraction Limits	Up to 8 Mtpa of ROM coal can be extracted from the open cut mining operations in any calendar year from Stage 1.	Up to 12 Mtpa of ROM coal can be extracted from the open cut mining operations in any calendar year from Stage 2.
	Up to 8 Mtpa (total) of ROM coal can be extracted from the underground mining operations at the Moolarben Coal Complex in any calendar year.	
Coal Processing and Offsite Transport	Up to 13.5 Mtpa (total) of ROM coal from the Moolarben Coal Complex can be processed in the calendar year 2017, and 13 Mtpa in any calendar year thereafter from Stages 1 and 2. Not more than 7 laden trains on average or 9 laden trains maximum to leave the complex per day.	
Coal Processing and Offsite Transport (Cont.)	All coal is to be transported from the Moolarben Coal Complex by rail.	All coal extracted from the site is sent to the Moolarben Stage 1 mine surface infrastructure area for processing and/or transport to market.

2.4 KEY MINE CONTACT PERSONNEL

The following table provides contact details for key personnel responsible for environmental management across the Moolarben Coal Complex.

Table 5 : Mine Contact Personnel

Position/Area of Responsibility	Name	Contact Number(s)	Email Address
General Manager	Steve Archinal	02 6376 1500	steve.archinal@yancoal.com.au
Environment and Community Manager	Graham Chase	02 6376 1407	graham.chase@yancoal.com.au
Senior Environment and Community Coordinator	Trent Cini	02 6376 1436	trent.cini@yancoal.com.au
Environment and Community Complaints Line	1800 556 484		
Postal Address	Locked Bag 2003, Mudgee, NSW, 2850		



MOOLARBEN COAL COMPLEX

FIGURE 2

Approved Moolarben Coal Project (Stage 1 and Stage 2) General Arrangement

MOOLARBENCOAL

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3.0 APPROVALS

3.1 SUMMARY OF APPROVALS

Project Approvals, Mining Leases, and other Licences relevant to MCO are provided in **Table 6**. Current Project Approvals, EPBC Approvals, Exploration Licences, and Mining Leases are available at www.moolarbencoal.com.au.

Table 6: Relevant Approvals, Leases and Licences

Approval	Description	Expiry Date
Project Approval – NSW Department to Planning and Environment		
05_0117	Stage 1 as modified	31 December 2038
08_0135	Stage 2 as modified	31 December 2038
Mining Lease – NSW Department of Industry –Resources & Energy		
ML1605	Underground 4, CHPP and infrastructure areas	20 December 2028
ML1606	OC1, OC2, UG1 and associated infrastructure	20 December 2028
ML1628	OC1, OC2, OC3, UG1 and UG4	24 February 2030
ML1691	OC2, OC3, UG1, UG2 and associated infrastructure	23 September 2034
ML1715	OC2, OC4, UG1, UG2 and associated infrastructure	31 August 2036
Mining Operation Plan – NSW Department of Industry –Resources & Energy		
MOP	Stage 1 and Stage 2 operations	1 January 2019
Exploration Licences – NSW Department of Industry –Resources & Energy		
EL6288	Coal Exploration Licence	22 August 2017 (renewal pending)
EL7073	Coal Exploration Licence	12 February 2020
EL7074	Coal Exploration Licence	12 February 2020
Environmental Protection Licence – NSW Environment Protection Agency		
EPL12932	Licence authorising the carrying out of scheduled activities	N/A
Environment Protection and Biodiversity Conservation – Commonwealth Department of the Environment		
2007/3297	Stage 1 coal mines and associated infrastructure	31 December 2027
2008/4444	Stage 2 coal mines	31 December 2065
2013/6926	Modify and extend the Moolarben Coal Project.	31 December 2064
Water Licences – NSW Department of Primary Industries – Water		
WAL 39799	Sydney Basin - North Coast Groundwater Sources – Aquifer Licence	N/A
20BL173935	Monitoring Bore Licence	Perpetuity
WAL36340	Wollar Creek Water Source -Aquifer	N/A
WAL37582	Upper Goulburn River Water Source – Unregulated River	N/A
WAL37583	Wollar Creek Water Source - Unregulated River	N/A

During the reporting period the following approvals were granted:

- Stage 1 Mod 13 – Temporary increase in washing limit for 2017
- Moolarben Coal Complex Mining Operations Plan 2017-2019 amendment A & B

An application to modify project Approval (05_0117) and project Approval (08_0135) was submitted during the reporting period. The application included:

- an increase in the amount of run-of-mine (ROM) coal production from the Stage 1 and Stage 2 open cuts and associated increase in the annual rate of coal processing and product coal production over the life of the mine.
- Minor extensions and reductions of Open Cut 2 and 3 and relocated/additional surface infrastructure.
- Water treatment facilities and increased licensed water releases to manage on-site water surpluses.

3.2 ANNUAL REPORTING

Table 7 provides a checklist of Annual Reporting requirements and performance conditions along with the relevant sections within this report.

Table 7: Annual Review Requirements

Approval Type & Reference		Annual Review Section
Project Approval 05_0117 Condition 4 Schedule 5	By the end of March each year, or other timing as may be agreed by the Secretary, the Proponent shall review the environmental performance of the project to the satisfaction of the Secretary. This review must: a. describe the development that was carried out in the previous calendar year, and the development that is proposed to be carried out over the next year; b. include a comprehensive review of the monitoring results and complaints records of the project over the previous calendar year, which includes a comparison of these results against the • the relevant statutory requirements, limits or performance measures/criteria; • the monitoring results of previous years; and • the relevant predictions in the EA; c. identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance; d. identify any trends in the monitoring data over the life of the project; e. identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and f. describe what measures will be implemented over the next year to improve the environmental performance of the project.	4.2 & 4.3 6 to 10 6 to 10 & 12 6 to 10 6 to 10 6 to 10 & 13
Project Approval 08_0135 Condition 4 Schedule 6	*By the end of March each year, or other timing as may be agreed by the Secretary, the Proponent shall review the environmental performance of the project to the satisfaction of the Secretary. This review must:* *a. describe the development that was carried out in the previous calendar year, and the development that is proposed to be carried out over the next year;* *b. include a comprehensive review of the monitoring results and complaints records of the project over the previous calendar year, which includes a comparison of these results against the* • *the relevant statutory requirements, limits or performance measures/criteria;* • *the monitoring results of previous years; and* • *the relevant predictions in the EA;* *c. identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;* *d. identify any trends in the monitoring data over the life of the project;* *e. identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and* *f. describe what measures will be implemented over the next year to improve the environmental performance of the project.*	4.2 & 4.3 6 to 10 6 to 10 & 12 6 to 10 6 to 10 6 to 10 & 13
Mining Lease 1605, 1606 & 1628 Condition 4 & 5	*The lease holder must lodge Environmental Management Reports (EMR) with The Director-General annually or at dates otherwise directed by the Director-General.* *The EMR must:* *- report against compliance with the MOP;* *- report on progress in respect of rehabilitation completion criteria;* *- report on the extent of compliance with regulatory requirements; and*	This Report & Section 9

Approval Type & Reference		Annual Review Section
	- have regard to any relevant guidelines adopted by the Director-General;	
Mining Lease 1691 Condition 4	*(a) The lease holder must lodge Environmental Management Reports (EMR) with the Director-General annually or at dates otherwise directed by the Director-General.* *(b) The EMR must:* *I. Report against compliance with the MOP;* *II. Report on progress in respect of rehabilitation completion criteria;* *III. Report on the extent of compliance with regulatory requirements; and* *IV. Have regard to any relevant guidelines adopted by the Director-General.*	This Report & Section 9
Mining Lease 1715 Condition 3	*f) The lease holder must prepare a Rehabilitaiton Report ot he satisfaction of the Minister. The report must:* *(i) provide a detailed review of the progress of rehabilitation against the performance measures and criteria established in the approved MOP;* *(ii) be submitted annually on the grant anniversary (or at such other times as agreed by the Minister; and* *(iii) be prepared in accordance with any relevant annual reporting guidelines published on the Department's website at www.resources.nsw.gov.au/environment.*	This Report & Section 9
EPBC 2007/3297 Condition 4	*The person taking the action must publish a report on their website addressing compliance with each of the conditions of this approval, by 31 March for the preceeding calendar year. Annual reports must published until the Minister is satisfied that the person taking the action has complied with all conditions for the approval. Documentary evidence providing proof od the date of publication must be provided to the Department at the same time as the compliance report is published.*	This Report Section 6 and Appendix 4
EPBC 2008/4444 Condition 10	*The approval holder must publish a report on their website addressing compliance with each of the conditions of this approval, including implementation of the BOMP and VCPLMP as specified in the conditions, by 31 March for the preceeding calendar year. Documentary evidence providing proof of the date of publication must be provided to the Department at the same time as the compliance report is published.*	This Report Section 6 and Appendix 4
EPBC 2013/6926 Condition 10	*The approval holder must publish a report on their website addressing compliance with each of the conditions of this approval, including implementation of the BOMP and VCPLMP as specified in the conditions, by 31 March for the preceeding calendar year. Documentary evidence providing proof of the date of publication must be provided to the Department at the same time as the compliance report is published.*	This Report Section 6 and Appendix 4

4.0 OPERATIONS SUMMARY

4.1 MINING OPERATIONS

Details of production and associated waste generated by the site for the current and next reporting period are provided in **Table 8**.

Table 8 : Production Summary

Material	Approved Limit (PA 05_0117 & 08_0135)	Reporting Period		
		Previous Period (actual)	Current Period (actual)	Next Period (forecast)
Waste Rock/ Overburden (BCM)	N/A	42,920,769	48,507,017	43,160,732
Open Cut ROM Coal (t) (OC1, 2 & 3)	8,000,000[1]	8,842,743	4,975,112	4,614,596
Open Cut ROM Coal (t) (OC4)	12,000,000	2,972,741	8,022,824	7,599,392
Open Cut ROM Coal (t)	13,000,000	11,815,484	12,997,936	12,213,988
Underground ROM Coal (t)	8,000,000	422,086	1,717,257	4,804,024
Coal Washing (t)	13,500,000[2]	12,155,570	13,499,408	12,172,989
Rejects (Co Disposal)	N/A	2,806,783	2,125,682	2,002,354
Product Coal (t)	N/A	9,348,787	12,380,408	14,974,657

[1] 2016 Open Cut Extraction Limit was 9 million tonnes.
[2] Wash limit increased from 13 million tonnes to 13.5 million tonnes for 2017 only.

4.2 REPORTING PERIOD ACTIVITIES

This section provides further detail on the activities completed in the current reporting period. Works were carried out in accordance with the relevant Mining Operations Plan (MOP). **Figure 4.** presents the areas of activity.

4.2.1 EXPLORATION

Exploration activities were undertaken in EL6288, ML1715, ML1605, ML1628 and ML1691, including a total of 15 exploration holes within EL6288 and a further 73 exploration holes primarily focusing on UG4 in ML1605 and ML1628, UG1 and OC4 within ML1715 and OC3 within ML1691.

All drilling programs use existing tracks to access sites where possible. New tracks were created using a slasher if possible. Drill sites were up to 50m x50m to allow suitable room to safely undertake drilling activities.

4.2.2 LAND DISTURBANCE

During the reporting period 61ha were disturbed for open-cut mining across OC2 and OC4 with the majority of the land disturbance associated with the progression of mining. The areas disturbed this reporting period are shown in **Figure 3**.

All land disturbance is undertaken in accordance with the Ground Disturbance Permit (GDP) process. This includes pre-clearance surveys, heritage clearance, erosion and sediment control plans, confirmation of land ownership and disturbance extents reviewed to ensure compliance with relevant management plans (Surface Water, Heritage, Biodiversity and Rehabilitation Management Plans).

Topsoil, mulch and select salvageable hollows were reclaimed for use in rehabilitation areas, or stockpiled for future use.

4.2.3 CONSTRUCTION

Construction works during the reporting period included the mine progression infrastructure and continuation of the Underground 1 project. Mine infrastructure works included water management infrastructure, northern bore fields and ancillary works. Underground 1 Project construction activities undertaken in the period included:

- Construction and commissioning the overland conveyor, sizing station and product stockpile;
- Completion of the CHPP civil earthworks and rehabilitation;
- Construction and commissioning new 66/11kv sub station at the RSIA;
- Construction and commissioning of two ventilation shafts and associated fans at the RSIA;
- Installation of service bore holes;
- Installation and commissioning of Longwall mining system;
- Construction of drainage and dewatering infrastructure; and,
- Construct MIA workshop, store and other infrastructure.

4.2.4 MINING OPERATIONS

Mining activities were undertaken in accordance with relevant project approvals and the approved MOP. During the current reporting period general mining activities included:

- Overburden removal from OC1, OC2 and OC4 using excavator and truck fleets;
- Overburden removal from OC4 using cast and dozer push;
- Coal extraction from OC1, OC2, and OC4;
- Drilling and blasting select overburden and coal;
- Spoil emplacement in-pit in OC1, OC2, OC4 and within the OC4 Out of pit emplacement;
- Bulk spoil reshaping and rehabilitation;
- Construction and operation of water management works;
- Continued underground development; and
- Commencement of longwall operations in LW101.

4.2.5 COAL PROCESSING AND TRANSPORT

Open Cut ROM coal was transported from the open cut ROMs via conveyor to the CHPP for processing. ROM coal from the UG1 ROM was transported to the underground product stockpile via conveyor. Washed product coal was transported to the product coal stockpile prior to railing. Coarse rejects were co-mingled with dewatered fine rejects and transported by conveyor to the Rejects Bin and then trucked back to the open pit for selective placement with mine spoil.

All product coal was loaded onto trains via the Train Load-out in the Moolarben rail loop and transported via rail to port. MCO monitored the amount of coal transported from site each year and the date/time of each movement. During the period, the maximum number of train movements per day was 7 with an average of 3.9 per day.

4.2.6 REHABILITATION

Rehabilitation works during the reporting period were undertaken within Open Cut 1, Open Cut 2, Open Cut 4, and progressive rehabilitation of construction areas. More detail of rehabilitation activities during the reporting period is provided in **Section 9.0**.

4.3 NEXT REPORTING PERIOD

The proposed mining sequence for 2018 is detailed in the currently approved MOP dated December 2017. The status of proposed activities at the end of 2018 are provided in **Figure 5**.

MCO will continue to operate 24 hours per day, 7 days per week with blasting limited to the hours and frequency detailed in PA 05_0117 Schedule 3, Condition 9 & 10 and PA 08_0135 Schedule 3, Condition 10 & 11.

4.3.1 EXPLORATION

Proposed exploration activities during 2018 will primarily focus on EL7073, the southern and eastern areas of EL6288, and ML1715 including the eastern extents of OC4 and UG2. All exploration carried out on MCO Exploration Licence areas will be approved through the Division of Resources and Geosciences application to Conduct Exploration Activities, including all required environmental assessments.

4.3.2 LAND DISTURBANCE

During the next reporting period approximately 202.5ha will be disturbed for open-cut mining across OC1, OC2 and OC4 with the majority of land associated with the progression of OC2 and OC4 including the development of water management infrastructure. The areas to be disturbed are shown in **Figure 3**.

4.3.3 CONSTRUCTION

Proposed construction works during the next reporting period includes mine progression infrastructure and completion of the Underground 1 project. Mine infrastructure works include water management infrastructure, clean water diversions, northern bore fields and ancillary works. Underground 1 Project construction activities include:

- Construction of a ventilation shaft in UG1;
- Construction and commissioning of main ventilation fans;
- Construction and equipping of service bore holes; and,
- Construction of drainage and dewatering infrastructure.

4.3.4 MINING OPERATIONS

Mining operations for the next period are shown in **Figure 5** and include:

- Drilling and blasting select overburden and coal;
- Overburden removal from OC1, OC2 and OC4 using dozer, excavator and truck fleets;
- Overburden removal from OC4 using cast and dozer push;
- Spoil emplacement in-pit in OC1, OC2, and OC4 including out of pit dumps in OC4;
- Coal extraction from OC1, OC2 and OC4;
- Bulk spoil reshaping and rehabilitation;
- Construction and operation of water management works;
- Continued underground development; and
- Continued longwall operations in LW101 and LW102.

4.3.5 COAL PROCESSING AND TRANSPORT

Open Cut ROM coal will be transported from the OC1 and OC4 ROMs via conveyor to the CHPP for processing. Underground coal will be transferred with the dedicated UG1 coal handling system. Product coal will be stored on the product coal stockpiles prior to transport. Coarse rejects will be co-mingled with dewatered fine rejects and transported by conveyor to the Rejects Bin from where it will be trucked back to the open pit for selective placement within mine spoil.

All product coal will be loaded onto trains in the Moolarben rail loop and transported via rail. All train movements will be conducted in accordance with the conditions of approval.

4.3.6 REHABILITATION

Rehabilitation works proposed for the next reporting period will be undertaken in OC1, OC2, OC4, OC4 out of pit emplacement and construction areas. Rehabilitation activities will include landform establishment, growth medium development, ecosystem and landuse establishment and rehabilitation maintenance.

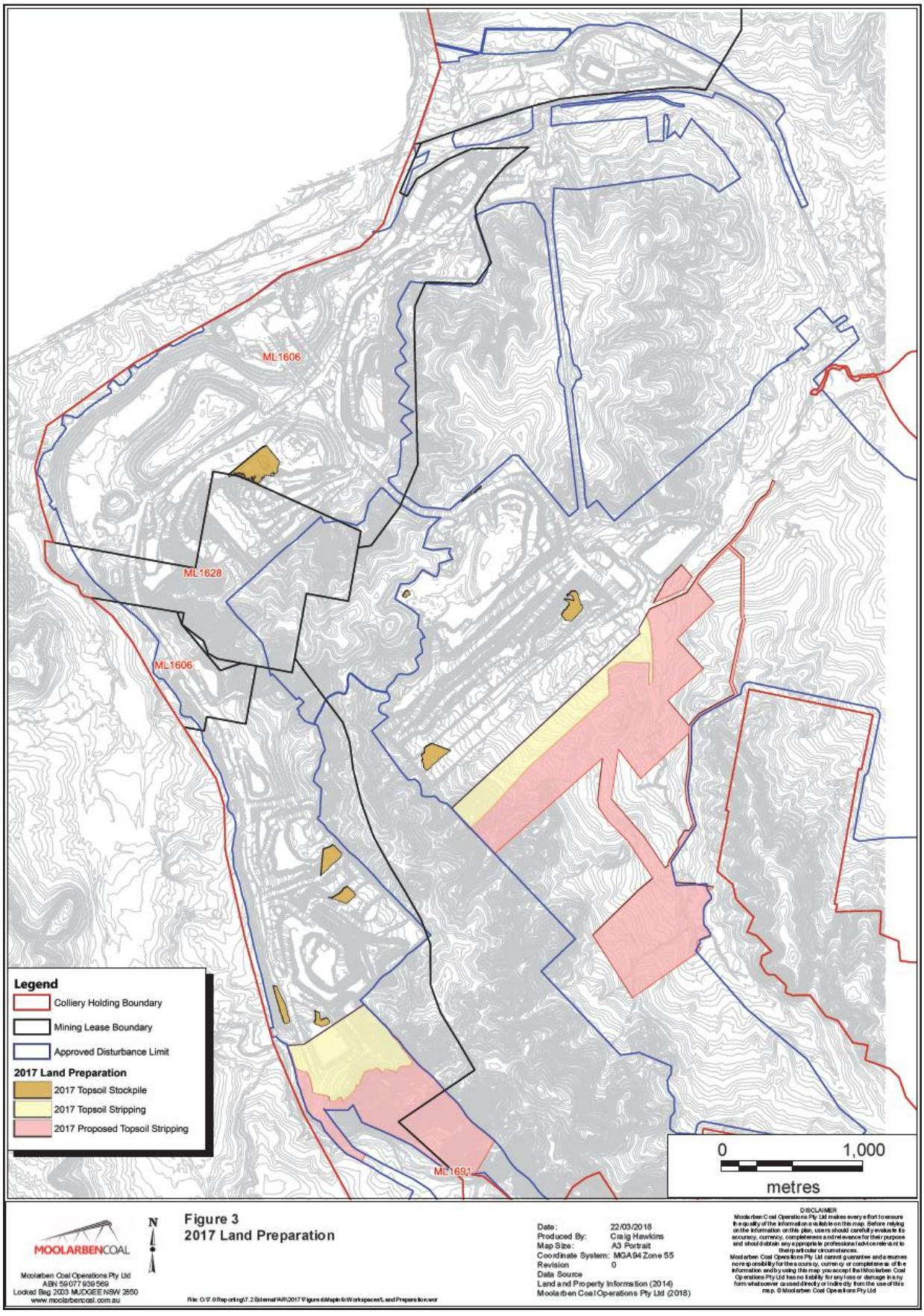

Figure 3: Land preparation areas

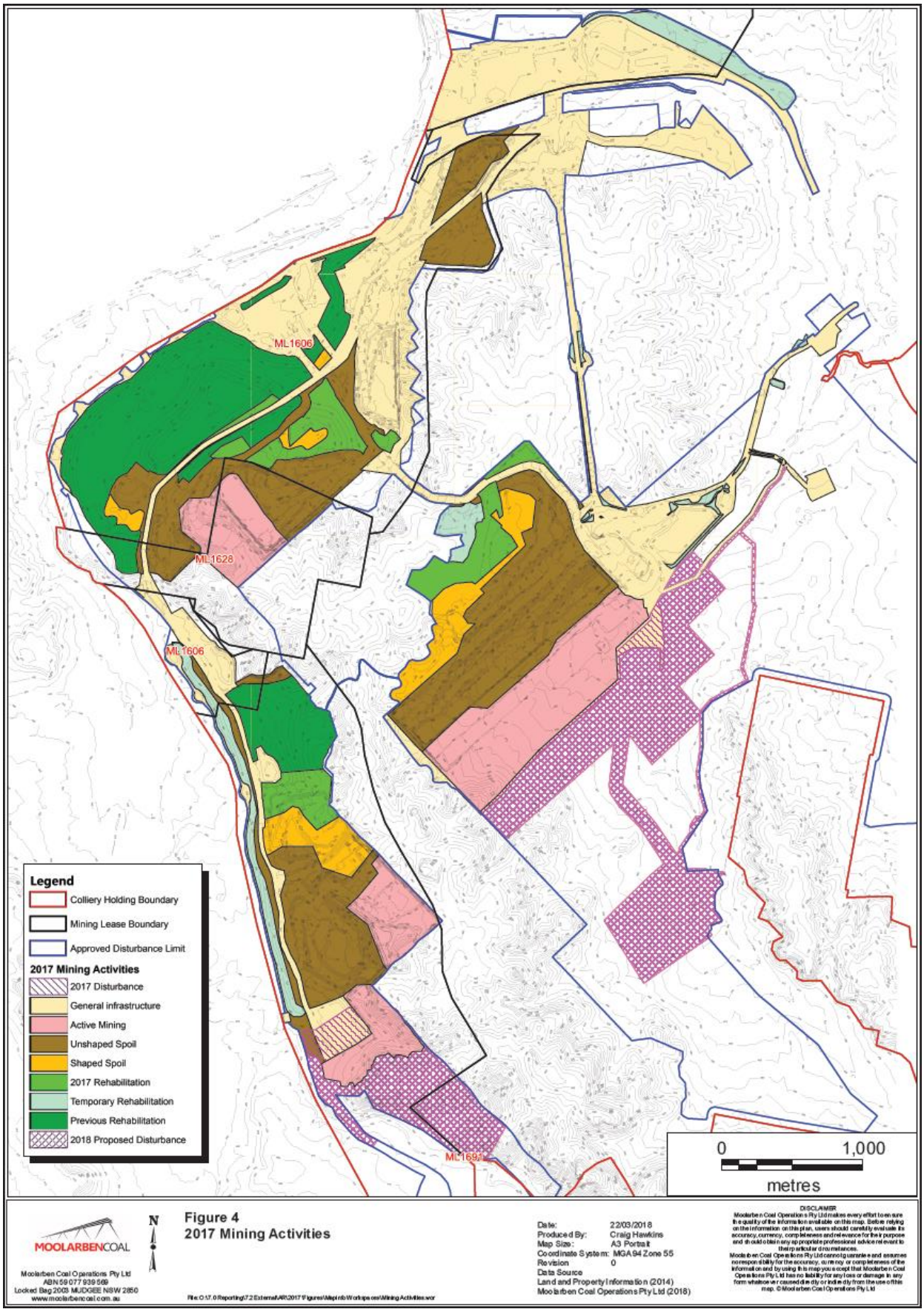

Figure 4: Mining activity areas during the reporting period

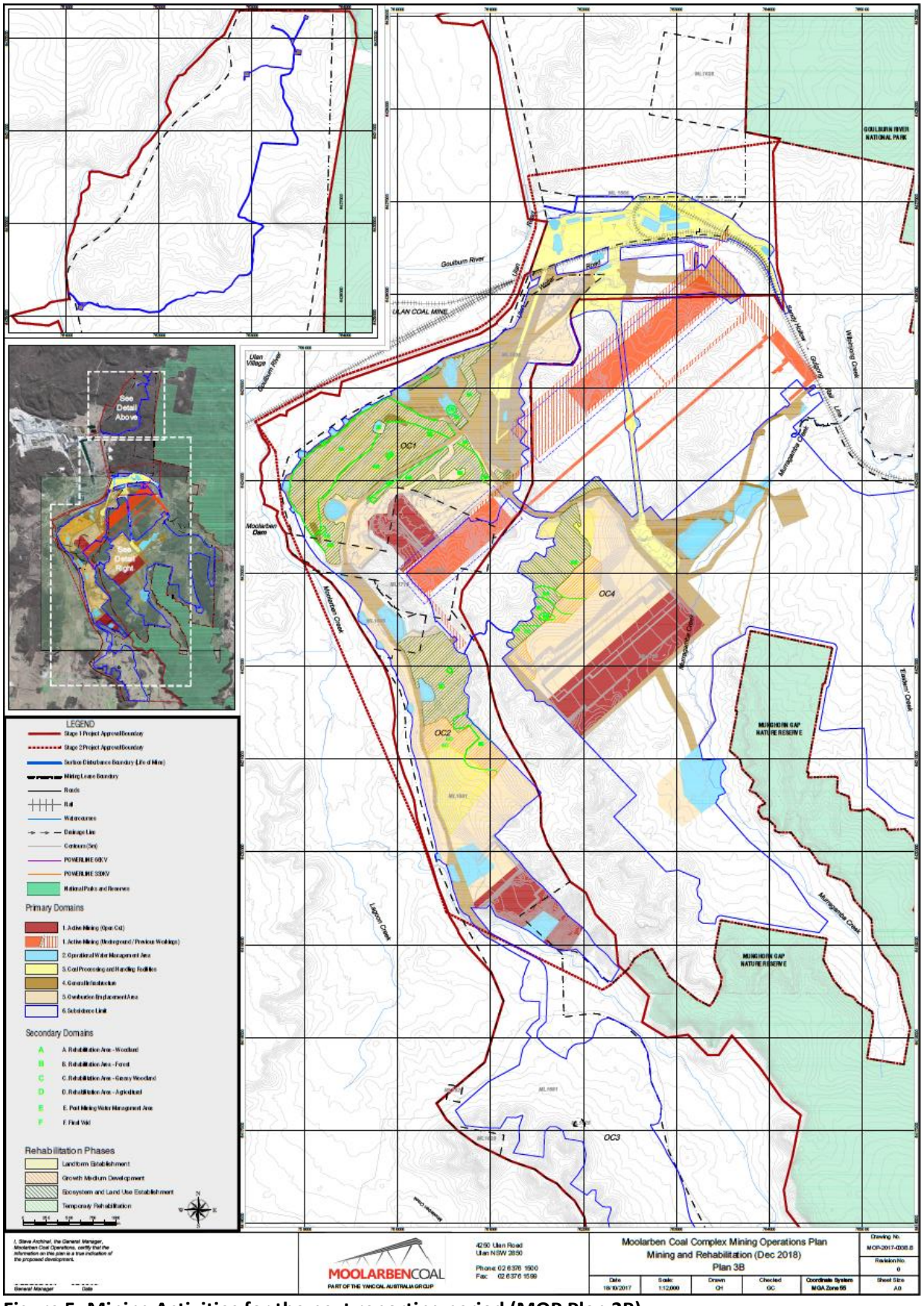

Figure 5: Mining Activities for the next reporting period (MOP Plan 3B)

5.0 ACTIONS REQUIRED FROM PREVIOUS REPORTING PERIOD

Actions in response to the 2016 Annual Review are provided in **Table 9**.

Table 9 : Actions from Previous Annual Review

Action Required from previous Annual Review	Requested by	Action Taken by MCO	Section of AR addressing this action
Review and revise as necessary all environmental management plans	MCO	Action Complete. Management plans reviewed and updated as required.	6, 7, 8 and 9
Review noise triggers during the period and revise where required	MCO	Triggers reviewed. Noise MP being updated.	6.2
Review the blast monitoring network by June 2017	MCO	Action Complete	6.3
Continued monitoring, fencing, and weed and feral animal control works	MCO	Action Complete	6.5
Feral animal monitoring to be expanded to include Area 2 and 3 during the 2017 reporting period	MCO	Action Complete	6.5
Revised heritage assessments to be completed on the historical heritage site 19 (Glen Moor Homestead) by December 2017.	MCO	Action Complete	6.6
Finalise relocation of TEOM05	MCO	Action Complete	6.4
Review and update as required, the current stream flow monitoring system.	MCO	System reviewed and being upgraded.	7.3
Obstructed piezometers to be rectified where practicable	MCO	Action Complete	7.4
Complete spring and seep census survey of the upper reaches of Eastern Creek and Goulburn River around the northern and north-western boundary of UG4 by December 2017	MCO	Action Complete	7.4
Continue baseline monitoring of PZ201, 202 and 203 to develop triggers.	MCO	Action complete. Included in monitoring program.	7.4
WAMP to be reviewed and revised as necessary	MCO	Action complete. Pending approval.	7
Continued progressive rehabilitation and, monitoring of rehabilitation areas with poor cover or density with consideration of follow-up seeding and/or wood debris placement.	MCO	Action Complete.	9

Action Required from previous Annual Review	Requested by	Action Taken by MCO	Section of AR addressing this action
Ensure that trends over the life of the operation and comparison of results for all data is provided in accordance with Condition 4 of Schedule 5 of PA 05_0117 and Condition 4 of Schedule 6 of PA 08_0135.	DP&E	Action Complete.	6 to 10
Include actions as identified from the review on the Annual Review by regulatory agencies in Table 7	DP&E	Action Complete.	5
State weather any compensatory water supply has been provided	DP&E	Action Complete	7
Include trigger levels on Figure 3e	DP&E	Action Complete	Appendix 2
Include a review of compliance against Condition 14 of Schedule 3 of PA 05_0117 and Condition 15 of Schedule 3 of PA 08_0135 in Table 13 of the Annual Review	DP&E	Action Complete	6.3
Include a section on waste minimisation and management in accordance with Condition 64 of Schedule 3 of PA 05_0117 and Condition 52 of Schedule 3 of PA 08_0135.	DP&E	Action Complete	6.8

6.0 ENVIRONMENTAL PERFORMANCE

In accordance with the MCC Project Approvals, MCO have developed a series of environmental Management Plans in consultation with the relevant government agencies. Current approved plans are available for review via the MCO website - http://www.moolarbencoal.com.au

In order to measure compliance with the project approvals, various licences, and site management plans, MCO undertakes a comprehensive environmental monitoring program. The locations of environmental monitoring undertaken during the 2017 reporting period are identified in **Appendix 2**.

This section provides summary details on:

- **Section 6.1** - Meteorological overview
- **Section 6.2** - Noise;
- **Section 6.3** – Blasting;
- **Section 6.4** – Air quality;
- **Section 6.5** – Biodiversity; and,
- **Section 6.6** – Heritage.

Water, subsidence, rehabilitation and community aspects are reported in **Sections 7.0, 8.0, 9.0** and **10.0** respectively.

6.1 METEOROLOGICAL OVERVIEW

MCO utilises one permanent meteorological monitoring station - WS03 (Ulan Road), and one mobile unit, WS04. The localities of the permanent and mobile stations are illustrated in **Appendix 2**. WS03 is linked to the real-time monitoring system and is the principal weather station for reporting purpose, with WS04 used to supplement weather data as required.

Meteorological parameters recorded by WS03 include:

- wind speed at 10 m;
- wind direction at 10 m;
- sigma theta;
- temperature at 2 m and 10 m;
- relative humidity at 2 m;
- solar radiation at 2 m; and,
- Rainfall

WS03 rainfall and temperature records for 2017 are summarised in **Table 10**. A total of 536.6mm of rainfall was recorded in 2017, with March the wettest month (118.0 mm) and July the driest (4.4mm). Total rainfall at MCO was 114.9mm lower than the annual average rainfall recorded at the Gulgong Post Office, of 652mm. 2017 rainfall was below average and drier than 2016 which recorded 850.2mm. Temperature recorded at WS03 ranged from – 6.2°C in July 2017 to 42.7°C in February 2017. In comparison to 2016, the 2017 year at MCO was colder (in 2016, MCO reached a low of -3.6°C), and hotter (in 2016, MCO reached a top of 36.9°C). From January to March and October to December north east and easterly winds were predominant with south westerly and southerly winds predominant from April to September. Monthly wind roses are in **Appendix 3A**.

Meteorological data is presented in **Appendix 3A**.

Table 10: Meteorological Summary – MCO WS03

Month	Rainfall (mm)	Cumulative Rainfall (mm)	Long-term average Rainfall (mm)	Max Temp (°C)	Min Temp (°C)
Jan-17	39.2	39.2	70.5	40.0	14.4
Feb-17	53.2	92.4	61.1	42.7	7.0
Mar-17	118.0	210.4	55.2	32.3	8.4
Apr-17	23.4	233.8	43.9	24.2	2.3
May-17	27.4	261.2	45.1	22.2	-2.5
Jun-17	9.4	270.6	50.9	18.6	-2.7
Jul-17	4.4	275.0	49.1	21.7	-6.2
Aug-17	21.6	296.6	45.8	23.1	-3.4
Sep-17	6.2	302.8	47.1	32.1	-1.3
Oct-17	50.8	353.6	55.5	30.6	1.7
Nov-17	102.6	456.2	60.0	30.7	5.2
Dec-17	80.4	536.6	67.3	36.7	9.9
Total	**536.6**	**536.6**	**651.5**		

6.2 NOISE

MCO manages noise in accordance with the MCO Noise Management Plan (NMP). The NMP was revised in 2016.The NMP is currently being revised and will be resubmitted for approval. The plan was developed by MCO with advice from experienced and qualified experts (SLR Consulting Australia Pty Ltd) to satisfy Condition 7, Schedule 3 of PA 05_0117 (as modified) and Condition 8, Schedule 3 of PA 08-0135.

During the reporting period, major noise producing activities included:

- The operation of OC1, OC2 and OC4, UG1, the CHPP and rail load-out facilities;
- Construction activities in OC4, Underground 1, CHPP, and Open Cut Admin/Workshop mine infrastructure areas.

Operational processes for MCO to reduce noise emissions included:

- Use of sound attenuated major equipment;
- Separate day and night dumping areas when deemed necessary;
- Use of shielded areas in adverse weather conditions;
- Use of real-time noise monitoring data and Mine Production Environmental Assistants to assist operational personnel in proactive and reactive management of noise impacts;
- Use of interactive predictive noise models to assess predicted noise risks associated with meteorological influences;
- Sound power testing equipment; and
- Routine maintenance of equipment, including sound attenuation components.

6.2.1 REAL- TIME NOISE MONITORING

The NMP identifies response triggers for the real-time noise via four monitoring stations (refer **Appendix 2** for localities). When a trigger has been reached, an SMS alarm is sent to operational personnel and

members of the Environment and Community Department. The real-time monitoring network operated throughout the period. As part of the revision of the NMP the real-time noise protocols were updated.

6.2.2 ATTENDED NOISE MONITORING

During the 2017 reporting period, attended environmental noise monitoring was conducted monthly with additional sites monitored quarterly. The purpose of attended noise monitoring is to quantify and describe the acoustic environment around MCO's operations and compare noise contribution from the MCC to the project Noise Criteria.

Noise Criteria are specified for day, evening, and night period for the amenity of neighbouring residences. Noise Criteria are expressed as $LAeq_{(15min)}$ and $LA1_{(1min)}$. **Table 11** provides a summary of project noise criteria and noise performance based on attended noise monitoring for 2017, together with management implications and proposed actions.

MCO complied with the project specific noise criteria at all monitoring sites during attended noise monitoring in the reporting period. A summary of results from attended noise monitoring undertaken during the period in accordance with the NMP is provided in **Appendix 3B**.

6.2.3 ATTENDED VALIDATION NOISE MONITORING

In accordance with the NMP, attended monitoring was undertaken during the reporting period at three locations (i.e. NA2, NA3 & NA12) to verify the results of real-time noise monitoring. A fourth location (NA10) was establish during the reporting period with validation commencing in July.

A review of validation monitoring concluded that the current real-time monitors consistently overestimated the MCO LAeq during the validation periods. The real-time data appeared to be routinely influenced by extraneous low frequency noise sources such as road traffic, aircraft, dogs, and wind. Due to the inability to distinguish between contributing noise sources, the real-time data is not suitable for compliance purposes and cannot be relied upon to provide an accurate estimate of mine generated noise.

6.2.4 COMPARISON AGAINST PREVIOUS YEARS

Attended noise monitoring results were reviewed against previous years to 2012. This review found a high level of variability in results. Of the results where a noise reading was determined (i.e. not inaudible and criteria applicable), there is some correlation between monitoring results and the distance to the receiver from the operations.

Attended noise monitoring undertaken at NA1 Ulan school during the day time period shows that MCO was inaudible during 68% of the samples, with no exceedances of criteria. NA6 Lower Ridge Road night monitoring shows that MCO was inaudible during 12% of the samples, with no exceedances. Attended noise monitoring completed at NA12 Winchester Crescent during the night period shows that MCO was inaudible during 37% of the samples, with no sustained exceedances of criteria.

Attended noise monitoring at the Goulburn River National Park and the Munghorn Gap Nature Reserve commenced during 2015 on a quarterly basis. Monitoring results indicate that MCO was inaudible during 30% and 80% of the samples respectively, with no exceedances recorded during monitoring.

Table 11 : Attended Noise Monitoring Summary

Aspect	Approved Criteria					Performance During the Reporting Period	Key Management implications	Implemented/ proposed management Actions
Attended Noise Monitoring	**Land No.**	**Day** [1] L_{A1eq} **(15min).**	**Evening**[2] L_{A1eq} **(15min).**	**Night**[3] L_{A1eq} **(15min).**	**Night**[3] L_{A1eq} **(1min).**	Monthly attended monitoring was undertaken at three locations (NA1, NA12 & NA6) throughout 2017 as required by the NMP Quarterly monitoring was undertaken at three locations (NA11, GRNP & MGNR) throughout 2017 as required by the NMP. No exceedance or non-compliances with relevant noise criteria were recorded during monthly attended noise monitoring in 2017. Two noise exceedances were recorded by EPA. MCO continued to coordinate noise management with neighbouring mines. ***Note*** *approved monitoring locations were selected as representative of residences* and are shown in **Appendix 2**.	Noise management controls effective.	Continue the implementation of the NMP. Real-time triggers reviewed and revised. NMP to be revised and consider the Noise Policy for Industry as necessary.
	30,63	39	39	39	45			
	70	37	37	37	45			
	75	36	36	36	45			
	31	36	35	35	45			
	All other privately owned land residences	35	35	35	45			
	Ulan School	35 (internal) when in use			-			
	Ulan Anglican Church Ulan Catholic Church	35 (internal) when in use			-			
	Goulburn River National Park Munghorn Gap Nature Reserve	50			-			

1 Day is defined as the period between 7am-6pm Monday to Saturday, and 8am-6pm on Sundays and Public Holidays
2 Evening is defined as the period 6pm-10pm
3 Night is defined as the period from 10pm-7am Monday to Saturday, and 10pm-8am on Sundays and Public Holidays.

6.2.5 COMPARISON TO PREDICTED LEVELS

Predicted noise levels from Year 2016 of the OC4 South West Haul Road Modification (Stage 1 MOD 11 and Stage 2 Modification 1) were compared against actual noise levels during 2017. Results indicated that MCO was generally well under the predicted levels where meteorological conditions were relevant. Two readings were above predictions for $LA1_{(1min)}$ readings, during inversion with drainage conditions. There are no systemic issues identified and noise management controls were effective during the period.

Measured operational levels are compared to predicted levels in **Table 12**. In this table, a 'positive' difference is where the measured level is greater than the predicted level. A 'negative' difference is where the measured levels are less than the predicted levels. Notation used in the tables to denote differences is irrespective of the integer value sign. For example, the notation >-17 means the values are more than 17 dB less than the predicted level. Where the meteorological conditions (primarily wind direction and temperature gradient) during the attended monitoring do not correspond with those that are modelled, no further analysis is undertaken. A summary report for attended noise monitoring and comparison against predicted results is included in **Appendix 3B.**

Table 12: EA Predictions– Attended Noise Monitoring, Various Weather Conditions

	$dB(A)_{Leq\ (15min)}$			$dB(A)_{LA1(1min)}$		
	NA1 Ulan School	**NA6 Lower Ridge Rd**	**NA12 Winchester Cres**	**NA1 Ulan School**	**NA6 Lower Ridge Rd**	**NA12 Winchester Cres**
	Day[1,2]	**Night[2]**	**Night[2,]**	**Day[1,2]**	**Night[2]**	**Night[2,]**
January	NR	-13[2]	-11[2]	NR	-15[2]	-8[2]
February	NR	>-7[2]	>-4[2]	NR	>-8[2]	>-5[2]
March	NR	NR	NR	NR	NR	NR
April	NR	-2[2]	-1[2]	NR	+1[2]	+3[2]
May	NR	>-12[2]	>-9[2]	NR	>-10[2]	>-12[2]
June	NR	NR	-6[3]	NR	NR	-6[3]
July	NR	NR	NR	NR	NR	NR
August	NR	>-17[3]	IA[2]	NR	>-20[3]	IA[2]
September	IA	>-17[3]	>-14[2]	IA	>-20[3]	>-17[2]
October	NR	NR	NR	NR	NR	NR
November	NR	-6[2]	NR	NR	0[2]	-11[2]
December	NR	>-17[3]	-8[2]	NR	>-20[3]	-10[2]

[1.] NR denotes met conditions not relevant, NA denotes not applicable, IA denotes conditions relevant but MCO inaudible during monitoring, NM denotes conditions relevant but MCO not directly measurable during monitoring;
[2.] Wind conditions assumes winds at speeds between 0.1 and 3 m/s during monitoring and assumes the following possible predicted wind directions: ENE from 56.25 to 78.75 degrees, E from 78.75 to 101.25 degrees, SSW from 191.25 to 213.75 degrees, SW from 213.75 to 236.25 degrees and WSW from 236.25 to 258.75 degrees; and
[3.] Strong Inversion of 5.2 degrees Celsius per 100 m or greater.

6.3 BLASTING

MCO manages blasting in accordance with the Blast Management Plan (BMP). The plan was developed by MCO with advice from experienced and qualified experts (SLR Consulting Australia Pty Ltd) to satisfy Condition 15, Schedule 3 of PA 05_0117 (as modified) and Condition 16, Schedule 3 of PA 08-0135 (as modified). The BMP is currently being revised in consultation with the EPA and the DPE.

Blasting criteria, blasting hours, blasting frequency, property inspection requirements and operating conditions are provided in Conditions 8 to 14, Schedule 3 and Conditions 9 to 15, Schedule 3 of the NSW Project Approvals (05_0117) and (08_0135) respectively.

The blast monitoring locations are identified in **Appendix 2**. During the reporting period blast monitoring included airblast overpressure and ground vibration at locations representative of privately owned residence, churches and schools, and aboriginal rock shelters where required. During the reporting period the blast monitoring network was upgraded.

A summary of the blast monitoring parameters is provided in **Table 13**.

Table 13: Blast Monitoring Parameters

Parameter	Units of Measure	Frequency	Sampling Method
Overpressure	dB (Lin Peak)	Every blast	Type 1 noise blast logger
Ground Vibration	mm/s	Every blast	Geophone logger or similar
Fume	AEISG Code of Practice Fume Rating System	Every blast	Observation and video recording

Note - Full meteorological complement of monitoring is undertaken via WS03 (Ulan Road) and WS04 (Mobile Unit), as described in Section 6.1 of this report.

6.3.1 SUMMARY OF BLAST MONITORING RESULTS

Blast monitoring compliance for the reporting period is presented in **Table 14**, and a summary of blast monitoring results for the period is provided in **Table 15**. Individual blast results are provided in full at **Appendix 3C**. One exceedance of the blast overpressure criteria occurred in the period and is discussed in **Section 12.0**.

Table 14 : Blast Monitoring Summary (BM1 & BM5)

Blast Summary	Number	Compliance (% Of Blasts)
Total Blasts	137	N/A
Days with >2 blasts	0	Compliant
Annual average blasts per week	2.6	Compliant
Blasts outside blasting hours	0	Compliant
Airblast Overpressure >115 dB(Lin Peak)[1]	2[2]	Compliant (1.4%)
Airblast Overpressure >120 dB(Lin Peak)	1[3]	Non-Compliant
Ground Vibration >5 mm/s[1]	0	Compliant (0%)
Ground Vibration >10 mm/s	0	Compliant
Reportable Fume Events	0	Nil

[1] Allowable exceedances of 5% of total blasts over a period of 12 months.
[2] One blast recorded in exceedance of 115dBL for the reporting period – at BM1 (28/08/17)
[3] One Blast recorded in exceedance of 120dBL for the reporting period – at BM5 (17/02/17)

No blasting was undertaken within 500m of any public road, railway line, 330kV powerline or land outside the site not owned by MCO.

Table 15 : Blast Monitoring Summary

Aspect	Approved Criteria				Performance During the Reporting Period	Trend/ Key Management Implications	Implemented/ proposed actions
Blast	Receiver	Air Blast Overpressure Level dB (Linear Peak) dBL[1]	Peak Particle Velocity – Ground Vibration mm/s[2]	Allowable Exceedance	Compliance monitoring was undertaken at the following representative locations for the 2017 reporting period • **BM1 – Ulan School** ○ Max. Overpressure =115.2 dBL ○ Max Ground Vibration =1.1 mm/s ○ Average Ground Vibration = 0.28 mm/s. • **BM5 – Ridge Road** ○ Max. Overpressure =126.6 dBL ○ Max Ground Vibration =1.15 mm/s ○ Average Ground Vibration = 0.36 mm/s ○ No data was recorded at BM5 for a single blast on July the 18th 2017 due to technical issues. One blast overpressure exceedance was recorded in the period at BM5 due to wavefront reinforcement. A full blast summary is contained at **Appendix 3C**.	In accordance with condition 13 (c), Schedule 3 of project approval 05_0117 and condition 14 (d), schedule 3 of project approval 08_0135 MCO co-ordinates the timing of blasting onsite with the timing of blasting at Ulan and Wilpinjong mines to minimise cumulative impacts. Air blast over pressure and peak particle velocity continue to trend lower over the life of the operation at BM1 Ulan School. Air blast over pressure and peak particle velocity continue to remain stable over the life of the operation at BM5 Ridge Road.	MCO will review and if necessary revise, the strategies, plans and programs within three months of submission of this Annual Review. MCO proposes to revise the BMP. During the reporting period MCO reviewed and upgraded blast monitoring equipment within the blast monitoring network.
	Residence Privately Owned	120	10	0%			
		115	5	5% of the total number of blasts over a 12-month period			
	All Public Infrastruct	-	50	0%			

Notes - [1]- dB (Linear Peak) dBL = decibel linear peak [2]- mm/s = millimetres per second [3] - These criteria do not apply if the Proponent has a written agreement with the relevant owner, and has advised the Department in writing of the terms of this agreement. MCO has written agreements with TransGrid and Australian Rail Track Corporation (ARTC) to undertake blasting within 500 metres (m) of the Wollar-Wellington 330 kV transmission line and within 500 m of ARTC infrastructure, respectively.

6.3.2 COMPARISON TO PREVIOUS BLAST MONITORING AND PREDICTED LEVELS

A comparison of the 2017 blast results to 2016 results and predications in the EA are outlined in **Table 16** below.

Table 16 : Comparison to Blasting Results - BM1 & BM5, 2016 and EA

Site	Vibration Predictions in EA (mm/s)	2016 vibration range (mm/s)	2017 vibration range (mm/s)	Comment on results
BM1 Ulan School	2.3	0.08-1.58	0.06-1.10	Generally consistent with previous results, slightly lower than predicted.
BM5 Ridge Rd	Site not originally modelled	0.01 – 1.24	0.01 – 1.15	Generally consistent with previous results.
Site	**Overpressure in EA (dBL)**	**2016 Overpressure Range (dBL)**	**2017 Overpressure Range (dBL)[1]**	**Comment on results**
BM1 Ulan School	114.0	81.9-116.1	81.9-115.6	Generally consistent with previous results, slightly higher than predicted.
BM5 Ridge Rd	Site not originally modelled	89-110.9	71.2-126.6	Generally consistent with previous results with one exception.

[1] *Excludes environmental influenced results.*

Blast Monitoring trends since 2012 are depicted below in **Figure 6** and **Figure 7**. The monitoring data indicates a correlation between monitoring results and distance of the receiver from the blast locations. Within the graphs the five percent and maximum limit has been included for the blast overpressure graph and the five percent limit has been included within the ground vibration graph. Results have generally been below these criteria.

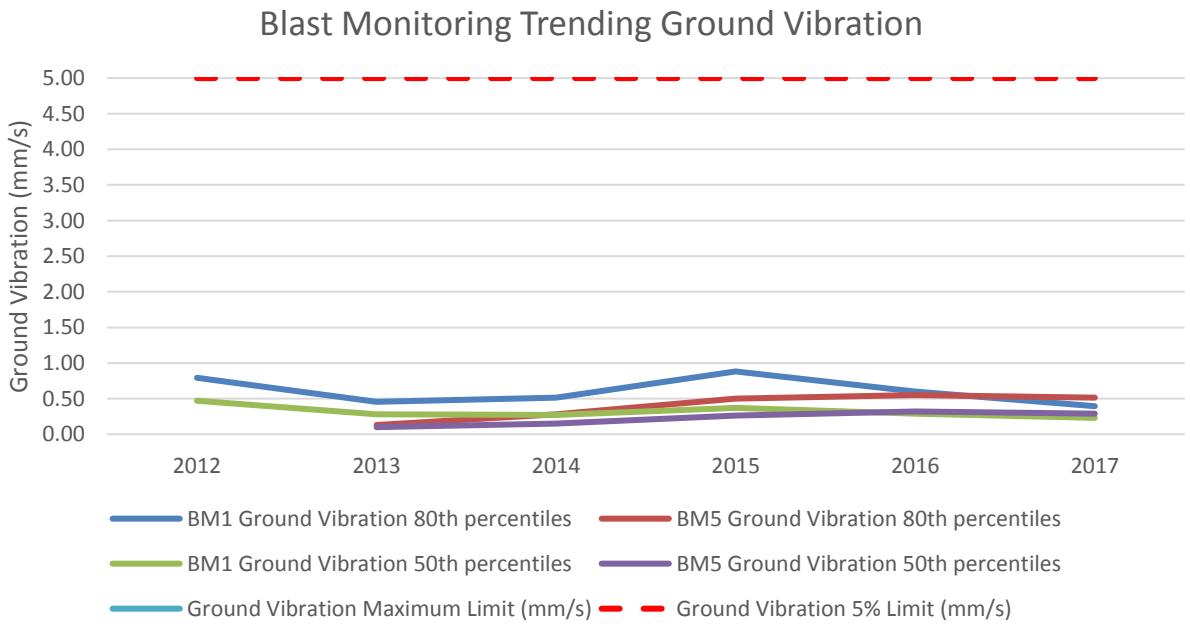

Figure 6 Blast Monitoring Trending Ground Vibration

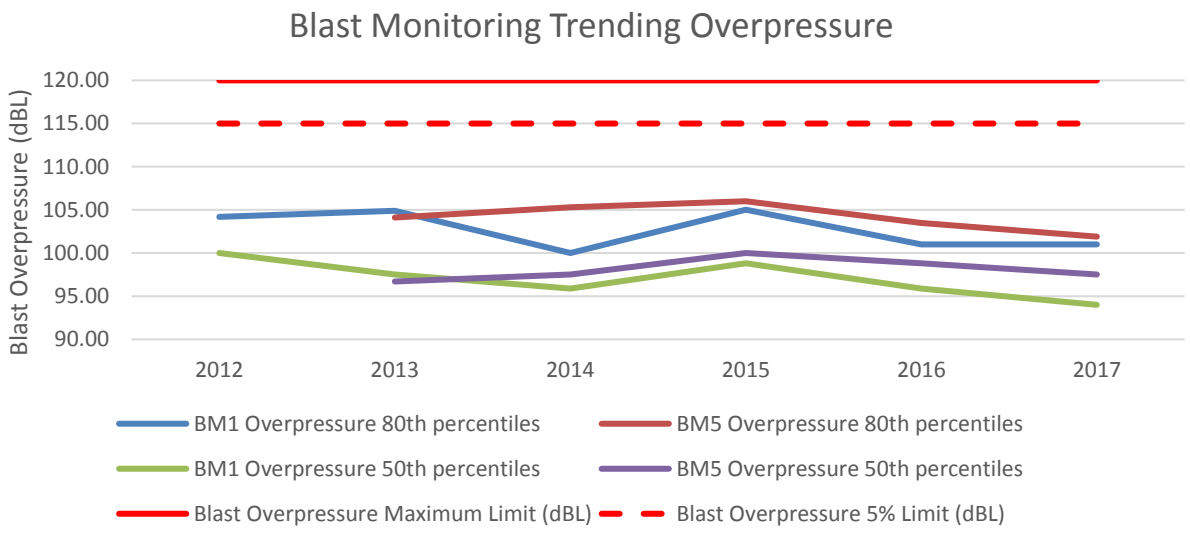

Figure 7 Blast Monitoring Trending Overpressure

6.4 AIR QUALITY

MCO manages air quality in accordance with Air Quality Management Plan (AQMP). The AQMP was revised during the reporting period and approved in November 2017. The plan was developed by MCO with advice from experienced and qualified experts (Todoroski Air Sciences) to satisfy Condition 19, Schedule 3 of PA 05_0117 and Condition 22, Schedule 3 of PA 08-0135.

During the reporting period, MCO undertook air quality monitoring in accordance with the approved AQMP. This included:

- Deposited particulate matter monitoring with Dust Depositional (DD) gauges at eleven locations around the Moolarben Coal Complex;
- PM_{10} – High Volume Sampling (HVAS) monitoring at two sites – Ulan Village (PM01) and south-west of Open Cut 1 and west of Open Cut 2 (PM02);
- PM_{10} – Real Time Monitoring via Tampered Element Oscillating Mass Balance's (TEOMs) at three permanent locations around the Moolarben Coal Complex;
- Total Suspended Particulate (TSP) matter calculated from TEOM PM_{10} monitoring results;
- TEOM05 relocated to the TEOM07 location. An E-Sampler was utilised whilst the relocation was undertaken.
- TEOM07 was established on Ulan-Road in the vicinity of Southern Winchester Crescent;
- Meteorological monitoring is undertaken via Automatic Weather Stations (AWSs), with WS03 (located on Ulan Road) the principal station for reporting purposes.

The AQMP monitoring locations are identified in **Appendix 2**. The air quality monitoring program is outlined in **Appendix 3D**. A summary of air quality monitoring results for the reporting period is provided in **Table 17, Table 18,** and **Appendix 3D**.

Table 17: Air Quality Monitoring Summary

Aspect		Approved Criteria	Performance during the Monitoring Period	Trend/ Key Management Implications	Implemented/proposed Management Action
	Monitoring Form				
Air Quality	Dust Deposition	4/g/m^2/month (max total) 2g/m^2/month above background average (Incremental increase)	Annual averages for each dust depositional gauge are reported in **Table 19**. All dust depositional results for the 2017 reporting period were below the 4/g/m^2/month criterion. The 2g/m^2/month criterion was not triggered.	Annual Average Dust depositional results for the operation have had a very slight increasing trend even though they remain well below the criteria.	Continue the implementation of the AQMP. Review AQMP following Annual Review and revise as necessary.
	PM $_{10}$	50µg/m^3 (24hr average)	All PM$_{10}$ results, excluding extraordinary events were within criteria. Results are outlined below. • TEOM 01 – 39.5µg/m^3 • TEOM 04 – 41.3µg/m^3 • TEOM 06 – 49.4µg/m^3 • TEOM 07[a] – 172.8µg/m^3 (40.6µg/m^3 excluding extraordinary events - Bushfire) • PM01 - 34µg/m^3 • PM02 - 38µg/m^3	There were two exceedances of the 24hr PM$_{10}$ 24 hour average criteria at TEOM 7 during February due to extraordinary events (Moolarben Road bushfires). TEOM05 was replaced by TEOM 07. Monitoring at this location was not continuous during the relocation.	
	PM$_{10}$	30µg/m^3 (Annual average)	The average PM^{10} results for the reporting period are presented in **Table 20**. All sites were below the Annual average criteria.	Annual average PM$_{10}$ results for the 2017 reporting period indicate a slight increase and/or stable trend at most locations when compared to 2016.	
	Total Suspended Particulate (TSP)	90µg/m^3(Annual average)	TSP results are presented in **Table 21.** TSP is calculated using the approved AQMP methodology based on PM$_{10}$ constituting 40% of the total TSP. During the reporting period, all sites where calculated as being below the 90µg/m^3 criterion.	Annual average TSP results for the 2017 reporting period indicate a slight increase and/or stable trend at most locations when compared to 2016.	

[a]*Maximum results due to extraordinary event -Bushfire. TEOM 05 replaced by TEOM07 during the period*

An explanation of exceedances of the TEOM 50μg/m^3 (Daily limit) criterion is outlined below:

- 7 February 2017 – TEOM07 recorded 172.84μg/m^3. An investigation concluded the exceedance was the result of a bushfire on Moolarben Road adjacent to the monitor.
- 14 February 2017 – TEOM07 recorded 55.4μg/m^3. An investigation concluded the exceedance was the results of a bushfire on Moolarben Road adjacent to the monitor.

As the exceedance on the 7th and 14th of February 2017 was influenced by bush fire, the air quality impact assessment criteria are not applicable in accordance with Condition 17 and Condition 19, Schedule 3 of PA 05_0117 and Condition 18 and Condition 20, Schedule 3 of PA 08_0135.

6.4.1 DATA CAPTURE RATE

The following table (**Table 18**) provides details on the data capture rates for the reporting period.

Table 18 Data Capture Rate for PM_{10} Annual Averages

Location	2017 Data Capture Rate
TEOM 01 (Ulan School)	100%
TEOM04 (Ulan Road)	100%
TEOM06 (Ulan-Wollar Road)	100%
TEOM07 (Ulan Road)	100%[a]
PM01 (Ulan Village	100%
PM02 (Ridge Road)	100%

[a] Site established in 2017. Calculated on 5 months of data

6.4.2 COMPARISON TO PREVIOUS AIR QUALITY MONITORING AND BACKGROUND LEVELS

Dust Deposition

Year 6 of the Stage 1 Optimisation Modification (Mod 9) has been selected for EIS comparison, as it is the most reflective of the current mining operations at MCO. All deposition results are within criteria and generally consistent with predicted results considering the difference in mine progression (**Table 19**). Data trends are presented in **Appendix 3D.**

Table 19: Comparison of Depositional Dust results

Dust Gauge	Annual Average (g/m2/month) (Criteria = 4 g/m^2/month)							
	Back-ground	2012	2013	2014	2015	2016	2017	Yr 6 (MOD 9) Predictions
DG01	1.2	0.3	0.5	0.8	0.6	0.5	0.6	0.6
DG04	2.0	1.3	1.3	1.6	1.0	1.2	1.0	1.0
DG05	1.8	0.8	1.0	2.0	0.8	1.3	1.5	1.2
DG06	1.2	0.4	0.7	1.0	0.6	0.6	0.7	0.6
DG07	1.7	0.8	1.0	0.9	0.9	0.9	0.7	0.7
DG08	1.4	0.7	0.7	0.8	0.6	0.7	0.9	0.7
DG09		0.4	0.7	2.0	0.6	0.6	0.9	0.7
DG11		-	0.6	0.8	0.6	0.7	1.1	0.8
DG12		-	-	-	1.5	1.0	1.2	1.2
DG13		-	-	-	0.7	0.7	0.7	0.7
DG14		-	-	-	1.1	0.7	1.2	*

PM_{10}

Year 6 of the Stage 1 Optimisation Modification (Mod 9) has been selected for EIS comparison, as it is the most reflective of the current mining operations at MCO. Results are within criteria and generally consistent with predicted results (**Table 20**) indicating that current air quality management practices are effective. Data trends are presented in **Appendix 3D.**

Table 20: Comparison of annual average PM10 Results

Unit	Annual Average (µg/m³)[4] (Criteria = 30 µg/m³)							
	Back-ground	2012	2013	2014	2015	2016	2017	Yr 6 (MOD 9) Predictions
Ulan School (TEOM01)	15.1	10.2	12.4	11.4	13.2	13.0	12.28	21.9
Ulan Road (TEOM04)	-[1]	8.9	10.8	12.7	9.0	11.6	15.15	12.6
Ulan-Wollar Road (TEOM06)	-[1]	-[2]	-[2]	-[2]	9.0	11.5	12.54	27.7
Ulan Road (TEOM07)	-[1]	-[2]	-[2]	-[2]	-[2]	-[2]	11.16[3]	6.9
Ulan Village HVAS (PM01)	17.9	11.9	12.2	13.8	13.2	11.5	13.0	22.0
Ridge Road HVAS (PM02)	-[1]	9.7	10.0	11.7	10.8	9.9	13.5	11.1

[1] No background values as site established after 2009. [2] No previous data as site not established. [3] Calculated on 5 months of data. [4] Annual Averages include extraordinary events such as bushfires and prescribed burns.

Total Suspended Particulates

TSP results (**Table 21**) are within criteria and generally consistent with predicted results.

Table 21: Comparison of annual average TSP results

Unit	Annual Average Calculated TSP (µg/m³) (Criteria = 30 µg/m³)							
	Background	2012	2013	2014	2015	2016	2017	Yr 6 (MOD 9) Predictions
TEOM01(Ulan School)	37.75	25.5	31	28.5	33	32.6	30.7	39.3
TEOM04 (Ulan Road)	0	22.25	27	31.75	22.5	29.0	37.9	24.9
TEOM06 (Ulan-Wollar Rd)	*	**	**	**	22.5	28.8	31.4	49.3
TEOM07 (Ulan Road)	*	**	**	**	**	**	27.9[a]	15.7
PM01(Ulan Village HVAS)	44.75	29.75	30.5	34.5	33	28.8	32.4	39.6
PM02 (Ridge Road HVAS)	*	24.25	26.25	29.25	27	24.8	33.7	22.5

* No background values as site established after 2009. ** No previous data as site not established. [a] Calculated on 5 months of data

6.4.3 SPONTANEOUS COMBUSTION

No spontaneous combustion events occurred during the period.

6.4.4 GREENHOUSE GAS REPORTING

Yancoal's Australian operations reported under the National Greenhouse and Energy Reporting Scheme for the 2016-17 financial year. Scope 1 and Scope 2 emissions calculated for the 2016-17 financial year was 250,245t CO_2-e. Scope 1 and Scope 2 emissions calculated for the 2015-16 financial year was 168,647t CO_2-e. The increase in emissions was due to the expansion of the mine and increased operational activity.

Year 6 of the Stage 1 Optimisation Modification (Mod 9), estimated emissions for Scope 1 and Scope 2 at 170,807t CO_2-e, approximately 79,438t CO_2-e less than calculated emissions for the 2016-17 financial year. The variance is primarily related to increased diesel consumption above Mod 9 estimations.

The Energy Savings Action Plan was revised in 2016 and is pending approval.

6.5 BIODIVERSITY

MCO manages biodiversity in accordance with the Biodiversity Management Plan (BioMP). The BioMP was revised in August 2016 and submitted for approval. The plan was developed by MCO with advice from experienced and qualified experts (EcoLogical Australia) to satisfy Condition 36, Schedule 3 of PA 05_0117 (as modified) and Condition 39, Schedule 3 of PA 08-0135 (as modified). In accordance with Condition 13(a), Schedule 2 of the Project Approvals (05_0117 and 08_0135), the BioMP is being staged and revisions of the plan will be submitted on a progressive basis. Offset management is also undertaken in accordance with relevant components of the Landscape Management Plan and Biodiversity Offset Management Plan (2013/6926).

The objectives of the management plans are to provide procedures and strategies to be implemented during the life of the Project to minimise biodiversity impacts on site (albeit in consideration of the approved impacts) and enhance biodiversity values on the offset areas. In addition to monitoring, the management plans describe procedures for:

- Vegetation Clearance Protocol – including Ground Disturbance Permits (GDPs), Pre-clearance surveys, habitat features, identification of suitable release locations;
- Collection and use of locally sourced native seed and supplementary tubestock;
- Strategies to manage vegetation onsite and improve vegetation connectivity;
- Additional biodiversity measures – rehabilitation of the environmental bund, weeds and pests, surface water management and erosion control, management of grazing and agriculture, access restrictions, and bushfire management.

The objective of biodiversity monitoring is to evaluate the vegetation and fauna habitat condition at the Moolarben Coal Complex (including recovery and or enhancement of native vegetation) and to identify appropriate management actions to be applied, where required. Biodiversity monitoring relating to the vegetation management zone also includes noxious weed and vertebrate pest monitoring. Monitoring will be used to measure success against the short, medium and long-term targets described in the management plans and identify the need for corrective actions

Monitoring of mine rehabilitation areas is described in the Rehabilitation Management Plan.

6.5.1 LAND PREPARATION

Pre-Clearance Survey

During the reporting period, MCO continued to prepare land for the advancement of Open Cut mining in accordance with approved management plans and GDPs. Pre-clearing surveys were undertaken across approximately 61ha of land during the reporting period.

No threatened flora species listed as vulnerable or endangered under the NSW Threatened Species Conservation Act 1995 (TSC Act) or the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act) were observed during the pre-clearing surveys.

Two threatened fauna species listed as vulnerable under the TSC Act were identified during the pre-clearing surveys. These were:

- *Climacteris picumnus victoriae* (Brown Treecreeper) – vulnerable (TSC Act)
- *Daphoenositta chrysoptera* (Varied Sittellas) – vulnerable (TSC Act)

Clearing Supervision

During all land disturbance activities for the period, fauna species searches were completed with fauna identified either observed evacuating during clearing or relocated by appropriately qualified ecologists prior to disturbance.

During the clearing supervision, felling of all identified habitat trees was undertaken under the supervision of a suitably qualified ecologist. The majority of fauna observed during clearing supervision evacuated hollow-bearing trees on their own accord or were relocated.

6.5.2 BIODIVERSITY OFFSET WORKS UNDERTAKEN

Weed and feral animal baseline monitoring and control works were undertaken throughout the reporting period. Wild dog and feral pig baiting was undertaken in conjunction with the NSW Local Land Service (LLS) and neighbouring landholders within biodiversity offset properties. Weed control works were undertaken throughout the offset areas focusing on Serrated Tussock, Blackberries, Blue Heliotrope, Tree of Heaven, St Johns Wort, Spiny Rush and Prickly Pear. Native seed collection was continued within offset areas.

Fencing replacement and maintenance activities were completed on Bobadeen, Area 2, Elward's, Dun Dun, Libertus and Ulan 18. Track maintenance was conducted on Dun Dun. On ground and desktop mapping activities were completed on the majority of offsets including weeds and feral animals, access tracks, fire breaks, fencing, waste, and erosion. Revegetation works were undertaken on the Bobadeen offset which included the planting of tube stock and seed.

During the reporting period Avisford 1 offset area was gifted to the National Parks Estate. MCO continued to work with the Department of Planning to progress the security mechanisms for the offset areas associated with the project.

6.5.3 BIODIVERSITY OFFSET MONITORING

Flora and fauna monitoring during the reporting period included the Stage 1 and EPBC (2007/3297) Biodiversity Offset Areas (BOAs) Area 1, Area 2, Area 3, Stage 1 Mod 9 and EPBC (2013/6929) offset areas, and the collection of baseline flora and fauna monitoring of the Stage 2 and EPBC (2008/4444) BOAs. Flora monitoring included monitoring of analogue sites located in National Parks or State Conservation Areas. Monitoring locations are provided in **Appendix 2**.

Offset monitoring included:

- Full floristic surveys
- Rapid assessment
- Fauna surveys targeting diurnal and nocturnal birds, reptiles, amphibians, mammals, microbats and habitat assessment

Stage 2 and EPBC (2008/4444) BOA baseline monitoring included vegetation validation, full floristic survey, fauna surveys and natural regeneration monitoring.

Monitoring is undertaken across two management zones that have been mapped within the BOAs. Each of these zones have defined strategic ecological management objectives, with an overall aim to achieve a sustainable landscape with improved overall ecological quality in the long term. The management zones are:

- Management Zone 1 (MZ1) – Enhancement of remnant vegetation; and
- Management Zone 2 (MZ2) – Regeneration/revegetation of grassland to forest/woodland.

6.5.3.1 Offset Monitoring Results

Floristic Monitoring– Offset Areas 1, 2 and 3

Species Richness Monitoring

A total of 407 flora species were recorded across the Stage 1 BOAs during 2017 monitoring (spring and autumn). Of these, 328 were native, 54 were exotic and 25 were unable to be identified as native or exotic. This is an overall decline from 2016 monitoring, when a total of 459 species were recorded (349 native, 80 exotic and 30 could not be identified as native or exotic). This decline is likely attributed to the unseasonably wet weather in 2016 promoting plant diversity and growth.

Within individual sites, species richness ranged between 12 and 45 species during autumn 2017 monitoring and seven to 47 species during spring 2017 monitoring. Weed presence was low during 2017, with only three sites in autumn and one site in spring recording over ten per cent weed cover.

Management Zone 1 Areas

Consistent with previous years' results, native tree and mid-storey covers were the performance measures that were most frequently below benchmark values across MZ1 sites. Native mid-storey cover increased at most sites between spring 2015 and spring 2016, then decreased in 2017, indicating natural variability is acting on this element of the vegetative structure, possibly due to rainfall creating denser foliage in the mid-storey.

The low rankings for individual sites (in particular for tree cover) tend to reflect localised assemblages of the vegetation community and may be attributed to historical disturbances such as selective logging.

Management Zone 2 Areas

Nearly all MZ2 (regeneration/revegetation) sites recorded their lowest or equal lowest native species diversity since the beginning of the monitoring program (**Appendix 3e Figure 5**). Native species richness fluctuates considerably between 2010 and 2017. These results show that spring 2017 was a below average year across the sites.

There were notable improvements in regeneration of canopy species, however there was a much lower rate of regeneration of canopy species within MZ2 than during spring 2016. This could be caused by low survival of small seedlings. At many sites, regeneration of other non-target species,

such as *Angophora floribunda* was observed, this is not included in the regeneration score for the completion criteria, however they still contribute to the overall site condition.

Natural Regeneration/Revegetation Monitoring

Natural regeneration monitoring results are consistent with 2016 results. As observed in 2016, there is a tendency for regeneration to be in higher densities near remnant vegetation and paddock trees, with Blakely's Red Gum being the most commonly recorded regenerating species.

Fauna Monitoring – Offset Areas 1, 2, 3

A total of 95 fauna species were identified during the 2017 spring monitoring, consisting of 79 bird species, 11 reptile species, 4 mammal species and one amphibian species. This is a decline from 2016 results, when 126 species were recorded, consisting of 89 bird species, 16 reptile species, 33 mammal species and 12 amphibian species. The wet conditions experienced in 2016 is considered to have increased resource availability, in turn affecting species richness and abundance.

A total of seven threatened bird species and one threatened mammal listed under either the NSW Biodiversity Conservation Act 2016 (BC Act) and/or the Commonwealth *Environment Protection and Biodiversity Conservation* Act 1999 (EPBC Act) were identified within the BOAs during the 2017 spring survey period. This is a decrease of threatened bird species compared to 2015 and 2016 results. This is in part due to the unseasonably wet weather in 2016 creating favourable conditions for bird species and partially due to migratory species such as *Merops ornatus* (Rainbow Bee-eater) no longer being included as threatened fauna.

Bird and microbat data continues to demonstrate effectiveness as a surrogate for biodiversity through the analysis of DNG and woodland/forest indicator species across respective monitoring sites. Overall, indicator bird analysis results were consistent with 2016 results, with declines at some sites.

Floristic Monitoring – Stage 1 Mod 9 and EPBC (2013/6929) offset areas.

Species Richness Monitoring

A total of 381 flora species were recorded across the MOD 9 BOAs during 2017 monitoring (spring and autumn). Of these, 259 were native, 87 were exotic, and 35 were unable to be identified as native or exotic. This is the highest species richness recorded since monitoring began in 2015. Flora species richness has increased annually, from a total of 312 species in 2015 to 334 species in 2016.

Exotic species cover was less than 5% in all MZ1 sites, which is consistent with 2015 results, suggesting a return to normal levels after a peak in 2016 in response to unseasonally high rainfall. Exotic species cover in Management Zone 2 (MZ2) sites ranged from zero to 80%, with higher coverage recorded in autumn than spring. Consistent with 2015 and 2016 results, *Hypochaeris radicata* (Catsear) was the most common exotic species, whilst *Trifolium* spp. (Clovers) contributed the most exotic cover.

Management Zone 1 Areas

Species richness increased at only one out of the 14 previously established MZ1 sites. The decline in richness at the MOD 9 MZ1 sites can be attributed to the low rainfall during and leading up to the monitoring period compared to 2016.

Native species richness, canopy cover and mid-storey cover were all below benchmark across most of the sites, while native groundcover was most often above benchmark. Site Mod9_Fl12 was the only site to get an overall rating of high, however native species richness and native groundcover were still lower than in spring 2016.

Management Zone 2 Areas

There has been previously a high degree of variability in native species richness both within and between MZ2 sites, and this trend has continued in 2017. Native species richness, canopy cover and mid-storey cover were all below benchmark across most of the sites, while native groundcover was most often above benchmark. Native groundcover has previously seen a reduction between 2015 and 2016 at most sites, 2017 recorded an increase in cover since 2016 at 11 of the 14 sites.

Native groundcover has varied considerably both within and between MZ2 sites since 2015. While there was a reduction in native groundcover between 2015 and 2016 at most sites, 2017 recorded an increase in cover at 11 of the 14 previously established sites.

Natural Regeneration/Revegetation Monitoring

Natural regeneration of *Allocasuarina sp*., *Angophora floribunda* (Rough-barked Apple), *Eucalyptus blakelyi* (Blakely's Red Gum), *E. crebra* (Narrow-leaved Ironbark), *E. moluccana* (Grey Box) and *E. sideroxylon* (Mugga Ironbark) were recorded within the Bobadeen BOA. Consistent with previous results, the majority of natural regeneration occurred along the edges of remnant riparian vegetation and paddock trees in the south-eastern corner of the BOA.

Regenerating species composition has altered slightly within the Clarkes BOA compared to 2016 results, which is likely attributed to increased plant material available for identification as individuals grow. Regeneration is reasonably spread along the transects, although there are clusters associated with paddock trees and boundaries of remnant vegetation

Whilst regenerating species richness within the Elward BOA has expanded since 2016, with *Eucalyptus moluccana* detected, the extent of natural regeneration has receded slightly since previous monitoring.

Natural regeneration within the Property 5 BOA is very limited, consistent with previous years. A. floribunda is the most common regenerating species. Regeneration is almost entirely along the boundary between DNG and remnant woodland.

Fauna Monitoring – Stage 1 Mod 9 and EPBC (2013/6929) offset areas.

Spring Fauna Monitoring

A total of 107 fauna species were identified during the 2017 spring monitoring. This consisted of 82 birds, six mammals, 17 reptiles and two amphibians. This is a decline compared to 2016 results, when 120 species were recorded, consisting of 85 bird species, 8 mammal species, 19 reptile species and 8 amphibian species. This is likely attributed to the favourable wet conditions in 2016 promoting species richness and abundance.

A total of nine threatened fauna species listed under either the NSW Biodiversity Conservation Act 2016 (BC Act) and/or the Commonwealth *Environment Protection and Biodiversity Conservation* Act 1999 (EPBC Act) were identified within the BOAs during the 2017 spring survey period. Birds made up seven of these species, all of which are listed as vulnerable under the BC Act. The threatened species *Hoplocephalus bungaroides* (Broad-headed Snake) was recorded for the first time within the MCO BOAs.

Winter Bird Monitoring

Winter bird monitoring is undertaken within the Stage 1 Mod 9 EPBC (2013/6929) BOAs, the main objective of the survey is to identify if the EPBC listed species, Swift Parrot (*Lathamus discolor*) and Regent Honeyeater (*Anthochaera phrygia*), are present within the Stage 1 Mod 9 EPBC (2013/6929) BOAs.

The two-target species (Swift Parrot and Regent Honeyeater) were not found to be present at any of the sites. Five other threatened species listed as vulnerable under the NSW BC Act were identified, including Brown Treecreeper (*Climacteris picumnus* subsp. *victoriae*), Grey-crowned Babbler (*Pomatostomus temporalis* subsp. *temporalis*), Little Lorikeet (*Glossopsitta concinna*), Speckled Warbler (*Pyrrholaemus sagittatus*) and Varied Sittella (*Daphoenositta chrysoptera*). This is an increase in threatened species diversity from 2016.

Floristic Monitoring – Stage 2 and EPBC (2008/4444) offset areas.
During 2017 monitoring a total of 499 flora species were recorded across the Stage 2 and EPBC (2008/4444) BOAs. Of these, 329 were native, 117 were exotic and 53 could not be identified as native or exotic. This is the first-year floristic monitoring has been undertaken within the Stage 2 and EPBC (2008/4444) BOAs and all data collected forms baseline data.

Natural Regeneration/Revegetation Monitoring
MZ1 sites contain consistently more habitat features (HBTs, LWD and native tree cover) and higher native species diversity compared to MZ2 sites.

The majority of natural regeneration was near boundaries with remnant woodland at the base of paddock trees, with *Eucalyptus melliodora* (Yellow Box) as the most abundant regenerating species. Natural regeneration varied greatly between BOAs and transects. The Dun Dun BOA had the highest density of natural regeneration of all the Stage 2 BOAs. This can be attributed to the large percentage of remnant vegetation across the BOA and the patchy nature of the cleared areas.

Fauna Monitoring – Stage 2 and EPBC (2008/4444) offset areas.
Baseline fauna surveys within the BOAs recorded a total of 162 fauna species, which consisted of 109 birds, 23 mammals, 27 reptiles and 3 amphibians. Species richness across the BOAs ranged from 51 species to 104 species.

A total of 13 threatened fauna species listed under either the NSW Biodiversity Conservation Act 2016 (BC Act) and/or the Commonwealth *Environment Protection and Biodiversity Conservation* Act 1999 (EPBC Act) were identified within the BOAs during the 2017 spring survey period. Birds made up nine of these species, all of which are listed as vulnerable under the BC Act.

Four threatened microbat species were positively identified during monitoring, with each of these species listed as vulnerable under the BC Act. *Chalinolobus dwyeri* (Large-eared Pied Bat) was recorded at multiple locations and is also listed as vulnerable under EPBC Act.

6.5.4 ACTIONS FOR NEXT REPORTING PERIOD

During the next period activities to be undertaken include review of management plans and revision where necessary, continued monitoring, revegetation planning, fencing, track and fire trail works, weed and feral animal control works and property security.

6.6 HERITAGE

MCO manages Heritage in accordance with the Heritage Management Plan (HMP). The revised HMP was approved in November 2017.

During the reporting period MCO continued the salvage and management of Aboriginal heritage sites associated with the project. The results of all survey and salvage activities during the period have been included in the MCO heritage database.

Annual inspections of heritage conservation areas were completed during 2017, the condition of the areas is unchanged since the last monitoring period.

Prior to December 2017 historical heritage site 19 (Glen Moor Homestead) was subject to a revised heritage assessment in accordance with the HMP.

6.6.1 ACTIONS FOR NEXT REPORTING PERIOD

Further salvage and management of Aboriginal and European heritage sites associated with the project will be completed during the next reporting period. Registered Aboriginal Party (RAP) groups will continue to be involved in due diligence and salvage works in accordance with the Heritage Management Plan.

6.7 BUSHFIRE

There were no major outbreaks of fire at MCC during the reporting period. In conjunction with NSW National Parks and Wildlife Service (NPWs) commenced preparation for a Hazard Reduction Burn (Prescribed burn) on MCO and adjacent NPWS lands in 2017. MCO responded to bushfires in the vicinity. In the next reporting period fire trail maintenance works will continue.

6.8 WASTE MANAGEMENT

During the reporting period MCO continued to maintain a Total Integrated Waste Management Service to manage all waste streams generated on site and to maximise recycling. This includes general waste, cardboard and paper recycling, co-mingled recycling, batteries, waste oil, and steel. The volumes of total waste and recycled material removed from site are shown in **Table 22**. Waste volumes have been variable since 2012, with volumes increasing in association with the expansion of the operations. During the reporting period 69% of all waste removed from site was recycled, this is a decline from previous years. The minor downward trend in recycling volumes would likely be associated with the increase of non-recyclable waste streams linked to construction activities and the establishment of a new underground operation.

Table 22: Waste Removal Volumes removed during the reporting period

	2012	2013	2014	2015	2016	2017
Total Waste (t)	990.6	1379.6	1490.5	1276.7	2615.1	2612.9
Recycled Waste (t)	778.2	1173.1	1346.5	1058.3	1730.2	1806.0
Percentage Recycled	79%	85%	90%	83%	66%	69%

7.0 WATER MANAGEMENT

MCO manages water in accordance with the Water Management Plan (WAMP). The Surface Water Management Plan was revised and approved in January 2016. The plan was developed by MCO with input from DP&E endorsed experienced and qualified experts (WRM Water & Environment and Dundon Consulting) in accordance with Condition 33, Schedule 3 of PA 05_0117 (as modified) and Condition 29, Schedule 3 of PA 08-0135. The WAMP was reviewed and revised in the period, incorporating an updated Site Water Balance, Surface Water Management Plan and Groundwater Management Plan. The revised plan was submitted in December 2018.

During the reporting period, MCO undertook water monitoring and data review in accordance with the WAMP. Surface water and groundwater monitoring sites are provided in **Appendix 2.** Surface water monitoring includes:

- Surface water quality and flow (monthly/6 monthly/event based);
- Stream health (annual);
- Channel stability (annually);
- Licensed discharge points; and,
- Water take from Ulan Coal Mine.

Groundwater related monitoring includes:

- Groundwater levels/pressure (monthly);
- Groundwater quality (6 monthly);
- Groundwater take; and,
- Potential seepage from mine water storages.

The groundwater monitoring includes the following lithological units:

- Quaternary alluvium;
- Tertiary aged unconsolidated sediments;
- Triassic sandstones;
- Permian coal measures;
- Ulan seam coal;
- Marrangaroo formation; and
- Basement units (consisting mostly of granites and metavolcanics).

During the period MCO constructed water storages (mine water and sediment), extended the dewatering and transfer network and installed operational and construction related erosion and sediment controls.

Details of water licensing and associated take are provided in **Section 7.1**. A summary of the site water balance is provided in **Section 7.2**. A summary of surface water monitoring groundwater monitoring results for the reporting period are provided in **Section 7.3** and **Section 7.4** respectively. Detailed surface water and groundwater monitoring results for the reporting period provided at **Appendix 3F** and **Appendix 3G** respectively.

7.1 WATER LICENCES

The NSW Department of Primary Industries – Water (DPI Water) requirements are for water take to be reported as part of the annual review with a break-down in six monthly periods to coincide with the water year (i.e. 1 July 2017 to 30 June 2017). Consequently, water take has been reported in a manner consistent with this requirement. MCO measures water take in accordance with the approved

Water Management Plan. Water take is either groundwater inflow removed from operation, or water extracted from licenced bores or reduction in stream baseflow.

Water licenses and associated take in the period is summarised in **Table 23**.

Table 23: Water Licences and Take

Licence	Description	Entitlement	2017			2018 (Est)		
			Jan - Jun (ML)	Jul - Dec (ML)	Total (ML)	Jan - Jun (ML)	Jul - Dec (ML)	Total (ML)
Licences under the Water Management Act, 2000								
WAL36340	Wollar Creek Water Source -Aquifer	218 Units[1]	2	2	4	2	2	4
WAL37582	Upper Goulburn River Water Source – Unregulated River	9 Units	0	0	0	0	0	0
WAL 39799[2]	Sydney Basin - North Coast Groundwater Sources – Aquifer Licence	2950 Units	720	881	1601	905	905	1810
Licences under the Water Act, 1912								
20BL173935	Monitoring and Test Bores	N/A	N/A	N/A	N/A	N/A	N/A	N/A

[1] One unit equivalent to 1.0 ML as per the *Available Water Determination Order for Various NSW Unregulated and Alluvial Water Sources (No. 1) 2017.*

[2] Water licences 20BL172002 and 20BL173923 converted to WAL 39799

7.2 WATER BALANCE

MCO monitors the water balance for the operation to assists forecasting and managing site water management. The site water balance (**Table 24**) for the reporting period was prepared with input from suitably qualified and experienced consultants WRM and Peter Dundon. Site water storage increased by 54ML during the reporting period. The main demands were coal processing and dust suppression. The Balance includes a variance of 159ML (6.1%).

Table 24: Site Water Balance

Water Sources (Inflows)	Volume (ML)
UCML Water	7
Groundwater Extraction (bores)	50
Rainfall / runoff	1,002
Groundwater inflows	1,552
Total	2,611
Water Loss (Outflows)	
Evaporation	365
Seepage	0
Construction & dust suppression	1,205
Licensed Discharge	0
Unlicensed Discharge	0
CHPP Demand	1,006
Underground demand	140
Total	2,716
Water Balance	
Inflows minus outflows	-105
Change in inventory	54
Balance	-159 (6.1%)

7.3 SURFACE WATER

7.3.1 SURFACE WATER QUALITY AND FLOWS

7.3.1.1 Surface Water Flows

The Moolarben Coal Complex is within the Upper Goulburn River and Wollar Creek catchments. Moolarben Creek and Sportsmans Hollow creek are the primary tributaries of the upper Goulburn River catchment with Bora creek a minor tributary. Wilpinjong Creek and its tributaries (Eastern and Murragamba creeks) drain to the Wollar creek. Most the watercourses are ephemeral in nature.

In accordance with the SWMP, stream flow gauges have been installed in the ephemeral Wilpinjong, Murragamba, Eastern and Bora Creeks. Creek flow is heavily influenced by rain events. During the period stream gauge records were poor with significant data loss due to power, communications and equipment failure with Bora Creek, Wilpinjong Creek and Murragamba creek failed to record validated flow data during events. Data has been supplemented with data from Ulan Coal Mines and Wilpinjong Coal Mine. The recorded stream gauging is provided in **Appendix 3F**. During the period MCO undertook works to review and commenced upgrading stream flow gauges including replacing units, and will continue to improve data capture rates during the 2018 reporting period.

7.3.1.2 Surface Water Quality

Surface water monitoring was undertaken in the Goulburn River, Bora Creek, Moolarben Creek and Murragamba Creek in accordance with the SWMP. Results varied both spatially and temporarily consistent with fluctuations associate with rainfall events in ephemeral watercourses. Several locations were dry during monitoring rounds reflecting the ephemeral nature of the creeks and below average rainfall. Monitoring identified readings outside the 20^{th}/80^{th} percentile range at both upstream and downstream locations. The findings are described in **Section 7.3.1.2** below. Water quality data for the period is presented in **Figure 8, Figure 9** and **Figure 10.** Monitoring data is provided in **Appendix 3F**.

7.3.1.3 Rainfall Event Sampling

As per MCO's approved SWMP rainfall sampling is undertaken where rainfall exceeds 30mm in 24 hours. During the reporting period there were three occasions where rainfall events triggered the requirement to collect additional water samples. All samples were collected within the prescribe timeframes.

7.3.2 Water Discharges

MCO is licensed to discharge water in accordance with its Environmental Protection Licence (EPL 12932) subject to various water quality and rainfall criteria.

No water discharges occurred from MCO during the reporting period.

7.3.2.1 Comparison to baseline and trends

Location	Trigger Values		Performance during the Monitoring Period	Trend/ Key Management Implications	Implemented / proposed Management Action
Surface Water Quality					
Goulburn River Sites; SW01 SW02 SW12	PH	*6.2 - 7.0*	Surface water pH in the Goulburn River was neutral to slightly alkaline ranging from 7.4 to 8.2. Readings were generally within the historical range, though above the 80%ile levels. All results were outside of the current trigger levels during the period, in accordance with the SWMP the surface water response and contingency plan was followed and the exceedances were determined not to be attributable to MCO.	pH readings range between 7.5 and 8.3 (20th and 80th percentiles) for SW01 and SW02 and between 7.0 and 7.7 (20th and 80th percentiles) for SW12. There is no discernible trend in pH at these locations over the last five years. Investigation triggers require revision to reflect water quality.	The SWMP, including triggers, was revised and submitted for approval. The revised SWMP will be implemented following approval.
	EC	*990*	The EC readings were generally consistent with the samples over the last five years. EC ranged from 287 to 779 during the reporting period. All results were below the current trigger levels.	EC readings range between 596 and 835 µS/cm (20th and 80th percentiles) for SW01 and SW02 and between 398 and 622 µS/cm (20th and 80th percentiles) for SW12. The recorded EC values for Goulburn River are generally below the trigger level (990 µS/cm) over the last five years. There appears to be an overall slight decrease in EC at SW01 and SW02. EC triggers are to be reviewed.	
	Turbidity	*25*	All the turbidity samples in the Goulburn River were consistent with historical data, with the majority of the results below the current trigger level.	Turbidity readings range between 1 and 9 NTU (20th and 80th percentile) for SW01 and SW02 and between 6 and 60 NTU (20th and 80th percentile) for SW12. The turbidity readings for all three monitoring locations are generally below the trigger level (25 NTU). There is no discernible trend in turbidity at these locations over the last five years.	
Bora Creek	PH	*6.5 - 8.0*	Bora Creek is an ephemeral creek with flow not recorded during sampling events at SW10 during the 2017 reporting period and only three events at	pH ranged from 6.0 to 7.5 (20th and 80th percentiles) for SW10 and from 6.8 to 7.5 (20th and 80th percentiles) for SW11. The majority of the pH	

Location	Trigger Values		Performance during the Monitoring Period	Trend/ Key Management Implications	Implemented / proposed Management Action
Sites; SW10 SW11			SW11. Surface water pH was slightly acid to neutral ranging from 6.8 to 7.2.	samples are within the trigger levels. There is no discernible trend in pH at these locations over the last five years.	
	EC	*350*	Bora creek experienced limited flow events. Two sampling events exceeded the current trigger levels, on both occasions there was no flow and the samples were taken from a depression in the creek bed. Subsequent results were below the trigger.	EC readings range between 82 and 139 µS/cm (20th and 80th percentiles) for SW10 and between 146 and 321 µS/cm (20th and 80th percentiles) for SW11. The majority of the EC readings are below the trigger level. There is no discernible trend in EC at these locations over the last five years.	
	Turbidity	*214*	During the reporting period turbidity levels were consistent with historical data, there were no exceedances of the trigger level.	Turbidity readings at SW10 range between 3 and 18 NTU (20th and 80th percentiles) and between 35 and 131 NTU (20th and 80th percentiles) for SW11. There is no discernible trend in turbidity at these locations over the last five years.	
Moolarben and Lagoons Creek Sites; SW05 SW07 SW08 SW09	PH	*6.1 – 7.0*	pH in Moolarben and Lagoon creeks was consistent with the historical data. Eastern creek was dry during all monthly monitoring rounds. Triger levels were exceeded on a number of occasions within Moolarben and Lagoons Creek. SW07, SW08, and SW09 are located upstream of the operation, in accordance with the SWMP the surface water response and contingency plan was followed and the exceedances were determined not to be attributable to MCO.	pH was neutral to slightly alkaline ranging from 6.6 to 8.1. The majority of the samples are above the trigger levels for Moolarben Creek. The pH at SW08 and SW09, upstream of Lagoon Creek, is generally lower than at SW05 and SW07. There appears to be trends associated with climate variability. Triggers require revision.	
	EC	*1,130*	All EC readings at SW05 were within the trigger level while upstream (non-mine impacted) EC readings continued to be elevated, consistent with	EC readings at SW05 range between 496 and 908 µS/cm (20th and 80th percentiles) and are generally lower than the trigger level. Upstream (non-mine	

Location	Trigger Values		Performance during the Monitoring Period	Trend/ Key Management Implications	Implemented / proposed Management Action
			historical records. SW09 which is located furthest upstream in Moolarben Creek generally has the highest EC.	impacted) Lagoon Creek (SW07) and Moolarben Creek (SW08 and SW09), the EC readings are elevated ranging between 1,789 and 4,638 µS/cm (20th and 80th percentiles). There appears the be a small reduction in EC at all locations since mid-2016, likely due to 2016 be a wetter year than average.	
	Turbidity	*35*	Turbidity readings were all consistent with the historical data and generally below the trigger level.	The 20th percentile turbidity readings for all four monitoring locations ranges between 2 and 6 NTU, while the 80th percentile ranges between 17 and 29 NTU. The majority of the turbidity readings are less than the trigger level for Moolarben Creek. There is no discernible trend in at these locations over the last five years.	
Murragamba, Eastern and Wilpinjong Creek Sites; SW04 SW15 SW16 SW17 SW19	PH	*6.0 – 6.8*	pH was generally consistent with historical data. The majority of samples were outside of the current trigger levels during the period, in accordance with the SWMP the surface water response and contingency plan was followed and the exceedances were determined not to be attributable to MCO.	pH readings range between 6.2 and 6.8 (20th and 80th percentiles) for upstream Murragamba Creek (SW19) and between 7.0 and 8.2 (20th and 80th percentiles) for downstream Murragamba Creek (SW04). The 20th and 80th percentiles for SW04 are above the trigger levels for Murragamba Creek. Wilpinjong Creek has a pH ranging between 6.1 and 7.3 (20th and 80th percentiles) for SW15, SW16 and SW17, while the 20th percentile for SW18 is 4.7. There is no discernible trend in pH at these locations over the last five years.	
	EC	*1,166*	The EC readings at all sites were generally lower than the historical data. SW04 recorded one EC value greater than the trigger level at the time of sampling there was no flow and the sample was	The EC in Murragamba Creek ranges between 39 and 738 µS/cm (20th and 80th percentiles) for SW19 and 276 and 1,317 µS/cm (20th and 80th percentiles) for SW04. SW04 recorded high EC readings between January 2013 and April 2014 and	

Location	Trigger Values		Performance during the Monitoring Period	Trend/ Key Management Implications	Implemented / proposed Management Action
			taken from were taken from a depression in the creek bed.	also between July 2015 and July 2016. These high EC recording are associated with extended dry periods. Wilpinjong Creek has EC ranging between 96 and 805 µS/cm (20th and 80th percentiles). There is no discernible trend in EC at these locations over the last five years.	
	Turbidity	*206*	SW04 and SW16 recorded turbidity readings consistent with historical records, while SW15 and SW17 recorded 20th and 80th percentiles which were higher than the historical 20th and 80th percentiles. All turbidity readings at SW04 were significantly below the trigger level for Murragamba Creek.	Murragamba Creek has turbidity readings between 10 and 126 NTU (20th and 80th percentiles) with the majority of the samples recording a turbidity value below the trigger level. Wilpinjong Creek has a turbidity ranging between 20 and 156 NTU (20th and 80th percentiles). SW04 showed a slight increase in turbidity levels during 2016, however they remains below the trigger level. This increase is likely associated with the generally active channel and banks within the lower reaches of Murragamba creek, as identified in channel stability monitoring, and the higher rainfall received during 2016. There is no other discernible trend in turbidity at these locations over the last five years.	

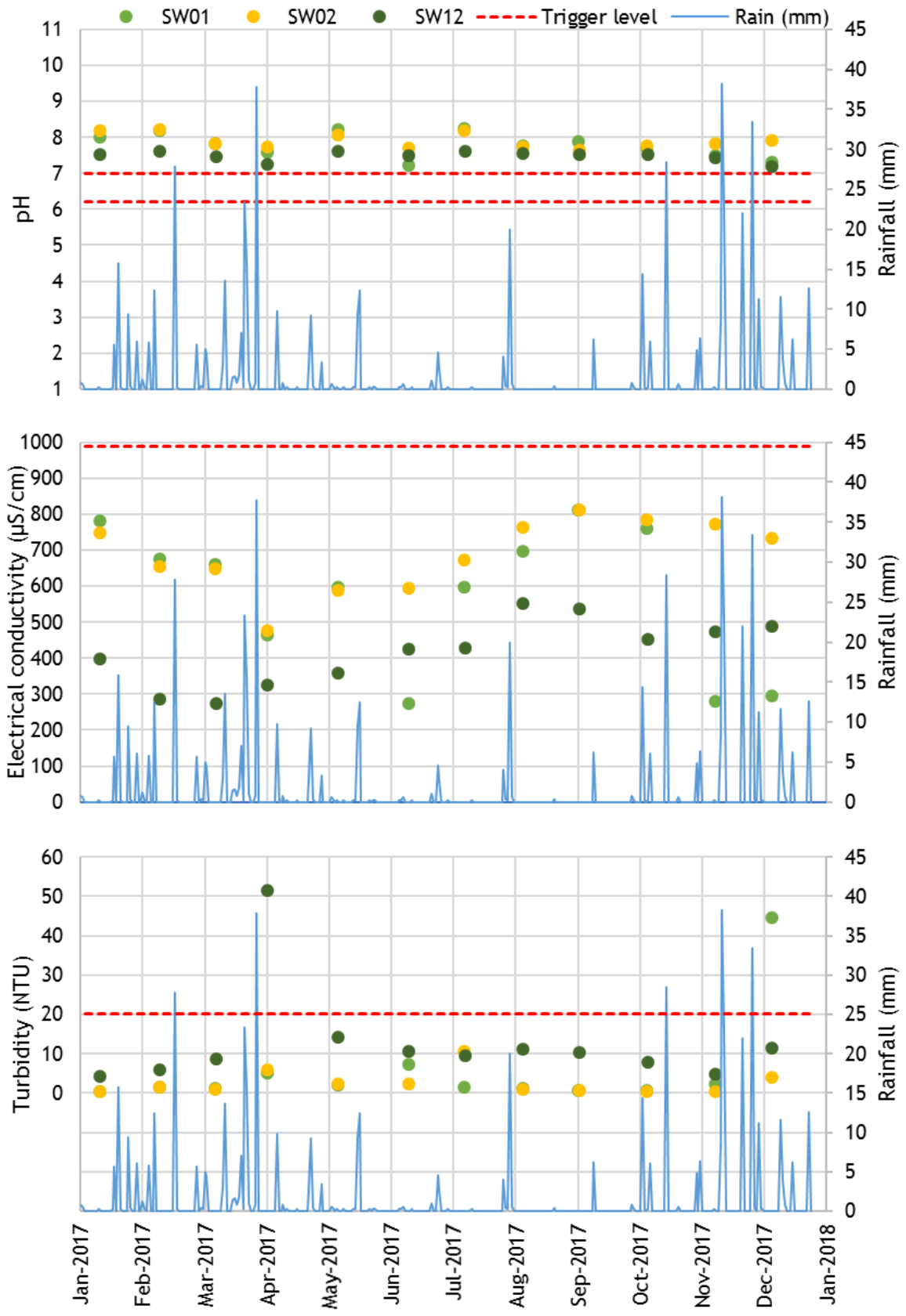

Figure 8: Goulburn River Water Quality

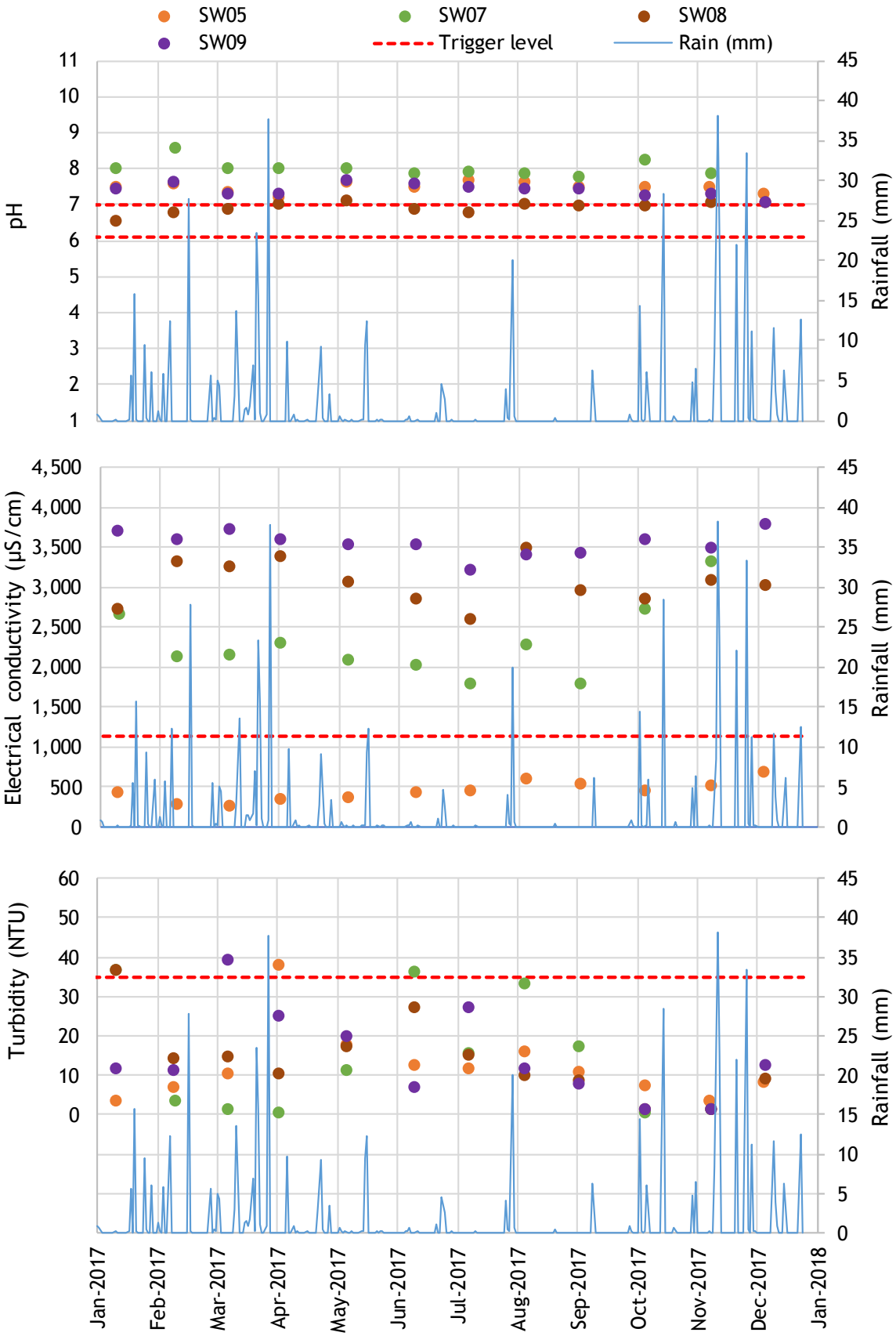

Figure 9: Moolarben and Lagoon Creek Water Quality

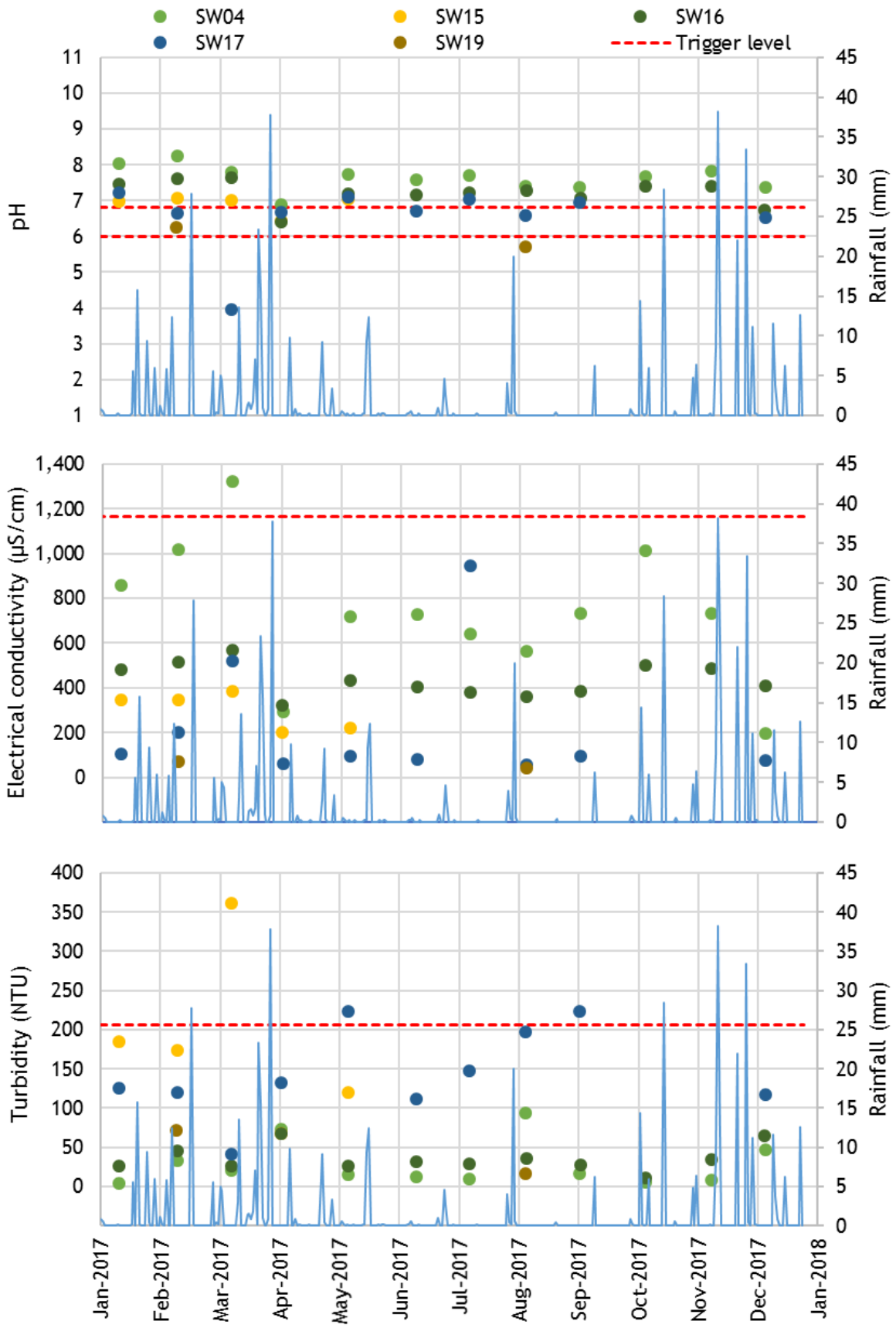

Figure 10: Murragamba, Eastern and Wilpinjong Creek Water Quality

7.3.3 STREAM HEALTH MONITORING

Stream Health monitoring was undertaken in Autumn and Spring 2017 including Aquatic Habitat Condition (RCE Index), Aquatic Macroinvertebrate Diversity and Pollution Tolerance SIGNAL2 Scores. Trigger investigation values have been incorporated into the SWMP, with scores below the trigger level triggering investigation.

7.3.3.1 Autumn 2017

Autumn stream health monitoring was undertaken between 30th May and 2nd June 2017. Sites SH03, SH04, SH08 and SH15 were dry and were not sampled. Site SH01 was split into two sub-sites, SH01B in the original Bobadeen Creek location and SH01G in the Goulburn River location established in Spring 2012. The Autumn 2017 stream health sampling was during a low flow event following a generally dry period with flows decreasing from the previous Spring sampling event.

There were no indications of MCO mine-related impact on stream health or aquatic habitat condition in Autumn 2017, with differences between sites in Autumn 2017 generally relating to differences in site natural environmental habitat and climatic factors.

- Aquatic Habitat Condition (RCE Index) - RCE scores remained stable at all sites. All site results were above established trigger values. High RCE scores were recorded at three sites and were all characterised by complete riparian zones and banks stabilised by trees and shrubs, good riffle/pool sequences and good stream detritus characteristics.
- Aquatic Macroinvertebrate Diversity - Autumn 2017 Diversity scores were all above trigger values. Most Moolarben Creek and Goulburn River site Diversity results were elevated compared to results for the last two years, with results more in line with pre-mining averages.
- Pollution Tolerance SIGNAL2 Scores - SIGNAL2 scores were above established trigger values for all sites. Mainstream Moolarben Creek site SIGNAL-2 values were similar to pre-mining average values and within the range of previous seasonal results. Goulburn River results were above pre-mining averages and exhibited less variability than in previous years. Wilpinjong Creek site SIGNAL-2 scores were in line with previous seasonal results.

7.3.3.2 Spring 2017

Spring stream health monitoring was undertaken between 20th and 23rd November 2017. Sites SH03, SH04, SH15 and SH19 were dry and were not sampled in spring 2017. The spring 2017 stream health sampling was after a moderate storm flow event following a generally dry period. The monitoring locations are illustrated in **Appendix 2**.

- Aquatic Habitat Condition (RCE Index) - All RCE scores were above established trigger values. All Goulburn River site scores (except site SH13) were the same as autumn 2017. Six sites in Moolarben Creek and Wilpinjong Creek recorded slight improvements (1 to 2%) all relating to improved creek bed habitat characteristics. Two sites (SH13 and SH18) recorded slight deterioration (1 and 3% respectively). Site SH08 also recorded a 3% deterioration from the last time the site was wet (in spring 16). The results were all well within the individual seasonal ranges for each site.
- Aquatic Macroinvertebrate Diversity - All site Taxa Diversity results were above established trigger values with site diversity values generally higher than those recorded in the previous autumn 2017 survey. Goulburn River and Moolarben Creek site results were more in line with pre-mining averages. The Wilpinjong Creek spring 2017 site diversity scores were the same or slightly better than previous surveys.

- Pollution Tolerance SIGNAL2 Scores - SIGNAL2 scores were above established trigger values for all sites. Moolarben Creek site SIGNAL-2 values were similar to autumn 2017 results and within the range of previous seasonal results. Goulburn River results were slightly lower than autumn 2017 results but above pre-mining averages and exhibited less variability than in previous years. Wilpinjong Creek site SIGNAL-2 scores were in line with previous seasonal results.

7.3.3.3 Trends

Review of the aquatic habitat condition (RCE Index) trends indicate that overall there has been little change in site aquatic habitat conditions with variations generally related to stream bed conditions and stream vegetation ratios. Variability is more pronounced for sites located in smaller sub-catchments due mainly to variations in creek bed characteristics responding to wet and dry conditions.

Given that overall aquatic habitat conditions of MCO Stream Health sites have remained stable, climatic factors and flow regimes are the dominant influence on aquatic ecological community and macroinvertebrate assemblage change over time. Flow regimes are related to the physical locations of monitoring sites within their respective catchments in regard to local rainfall runoff or in regard to licensed discharges. Accordingly, sites located in the smaller upper catchments above mining discharge, including Wilpinjong and Moolarben Creeks, can be expected to be influenced more readily by low flow and drought influences plus by high scouring storm flows conditions (boom and bust). Sites in the upper Goulburn River would experience an overall lower frequency of drought and low flow events than the upper creeks with flow regimes for sites below the Ulan Creek discharge mediated by licensed discharge flows from the Ulan Mine Complex (UMC) and some additional contribution from Bobadeen Creek.

Review of Stream Health indices over the mining operational period (Spring 2012 to present) shows several trends (Data trends are presented in **Appendix 3F**):

- Moolarben Creek and Goulburn River site Diversity scores (and Wilpinjong Creek scores to a lesser degree) generally decreased from spring 12/autumn 13 through to autumn 16 with 'recovery' in spring 16 sustained by the two 2017 surveys.
- Whilst there was less trending variation for Stream Health SIGNAL-2 site scores over time there was more volatility in changes from season to season and higher differences between adjacent sites over the period spring 12 to spring 16 - compared to pre-mining averages and to the two 2017 season results.

7.3.4 CHANNEL STABILITY MONITORING

The channel stability monitoring program occurred from the 29th to 31st of August 2017 at locations in **Appendix 2**. Monitoring involved visual and written observational surveys of erosive and depositional features, cross sections at strategic locations and photographic records of each stream reach which included:

- Monitoring the reach of Bora Creek and a tributary from the western culvert of the MCO rail loop and its confluence with Goulburn River;
- Monitoring the reach of Moolarben Creek upstream of Moolarben Dam;
- Monitoring the reach of Murragamba Creek upstream and downstream of approved operations;
- Monitoring the reach of Eastern Creek downstream of approved operations; and,
- Monitoring the reach of Wilpinjong Creek.

7.3.4.1 Monitoring results

Bora Creek channel stability monitoring results indicate a similar declining trend moving downstream, as assessed previously. The upper reaches of Bora Creek including sites BC-pt01 to BC-pt04 were ranked 'Very Stable' to 'Potentially Stabilising'. The lower reaches of Bora Creek were ranked 'Active' to 'Very Active'. The 2017 scores are considered comparable to the results recorded in 2016. There was a slight improvement to the overall channel stability trend in 2017.

Moolarben Creek channel stability monitoring identified continuation of morphological processes identified in previous monitoring, however the overall trend for 2017 indicates a slight declining trend. The main reasons were the slightly lower scores attributed to less vegetation noted on either the floor of the channel and/or the bank walls at a portion of sites where stock was noted. The average classification for Moolarben Creek in 2017 was 'Potentially Stabilising'.

Murragamba Creek channel stability monitoring results indicate slightly improving scores when compared to 2016 results. Improved scores at MuC-pt19 and MuC-pt23 were attributed to more vegetation noted in the channel and/or along the banks of the channel during the 2017 survey. However, a decreasing score at MuC-pt01 was noted due to no vegetation on the creek floor, existing scouring observed within the creek bed and another scour further upstream.

Wilpinjong Creek channel stability monitoring results indicate no significant variances in stability when compared to the 2016 results. The 2017 channel stability monitoring also noted similar morphological processes, as assessed and identified previously and continues to remain spatially variable.
The average CSIRO classification for Wilpinjong Creek in 2017 was 'Potentially Stabilising'.

7.3.4.2 Trends

Channel stability within each creek was variable during the period. Locations vulnerable to erosion were characterised by steep banks, little vegetative cover and exposed dispersive subsoil. More stable locations were characterised by vegetated banks with low gradient slopes. Where active erosion was recorded at sites along each creek, this was predominantly the result of natural influences exacerbated by past land use and agricultural practices that exposed dispersive subsoils. The impact of creek stability within these creeks due to mining operations is considered negligible over the past 12 months.

7.3.5 EFFLUENT

During the period MCO continued to operate four sewerage treatment plants. Discharge quantity was within design limits during the period. Discharge quality is presented in **Appendix 3F**.

7.4 GROUNDWATER

7.4.1 GROUNDWATER LEVELS

MCO monitors a network of piezometers in accordance with the Groundwater Management Plan (GWMP). The monitoring program includes trigger values established to determine the need for investigation and possible response actions for potential impacts to groundwater levels in the alluvial and Triassic aquifers. The Permian strata does not include triggers as it is already extensively affected by past mining, and is predicted to undergo further impact from ongoing mining and contains groundwater of generally poor quality.

Response triggers for groundwater levels within Quaternary alluvium and Triassic Sandstone aquifers are based on the minimal impact considerations in the Aquifer Interference Policy (DPI, 2012). Monitoring frequency and response triggers have been implemented to identify trends that could

potentially lead to a private bore being impacted above the Aquifer Interference Policy considerations (i.e. greater than 2 m drawdown).

No groundwater level investigations were triggered during the period. Investigation triggers, along with monitored groundwater levels are presented in **Table 25**. Standing water level/pressures for all piezometers for the period (including vibrating wire piezometers) are presented in **Appendix 3G**.

During the period PZ58 was replaced and PZ101C obstruction was rectified. PZ156 was located within the UG1 works and was grouted up to mitigate safety risks and as water levels had fallen to the level of the coal seam. PZ201, PZ202 and PZ203 continued to be monitored to establish a baseline and three additional monitoring bores located to the north east of UG1 (PZ211, 213 and 214) were included in the program and commenced baseline data collection.

Groundwater level trends in the period were influenced by the Rainfall Cumulative Deviation (RCD), UG1 mining, open cut operations and regional depressurisation due to neighbouring operations. Rainfall in the reporting period was significantly below average with a resultant reduction in the RCD (**Figure 11**). The RCD reduction contributed to a reduction in water levels throughout the monitoring program.

Figure 11: Rainfall Residual Mass - Wollar

Drawdown in the Ulan coal seam and the Permian measures is influenced by open cut mining and neighbouring operations with a more distinct reduction in water levels associated with UG1. The influence of UG1, especially after first workings progressed east towards the southeast mains, were observed firstly at the adjacent bores (PZ156 and PZ157), then further afield with time (PZ194 and PZ195.)

Groundwater levels in Triassic bores PZ101C and PZ105C locate 5 km north of the current MCO mining operations, show potential additional influences with PZ105C recording a reduced level of about 1.5m below its baseline range. These bores are not considered to be a result of mining as Triassic bores closer to the current operations do not show an impact due to UG1. During the period, some VWPs

were influenced by exploration drilling in their vicinity. Water pressures recovered following grouting without apparent residual drawdown.

PZ211, 213 and 214 were installed north east of UG1 to assess impacts of UG1 on the Wilpinjong Creek palaeochannel. No discernible influence from mining was observed in the period.

Over the longer-term many monitoring network bores exhibit a long-term rise in water levels from 2006 to December 2012 followed by a prolonged period of water level decline to December 2017. In some cases, the natural discharge becomes masked by the impacts of UG1 in late 2016 to early 2017.

The Groundwater Model was revised in the reporting period using contemporary data and modelling software. The groundwater level observations were generally consistent with model predictions to support the Open-cut Optimisation modification including drawdown associated with mining at UG1. Variance in drawdown is likely to reflect slight variances in mining sequences and the below average rainfall and associated reduction in the rainfall cumulative deviation in the period where the model assumes average rainfall.

7.4.2 GROUNDWATER QUALITY

Site specific trigger levels for pH and electrical conductivity have been developed for the Moolarben Coal Complex. A review of the groundwater quality performance is provided in **Table 26**. Water quality results from all piezometers are provided in **Appendix 3G**.

Water quality for the period is generally consistent with baseline data and previous monitoring results. Two water quality investigation triggers were exceeded in the period for PZ184 and PZ55. PZ184 water quality recorded pH levels below the trigger range. The results were consistent with the historical results and the levels are not considered to be impacted by mining. PZ55 electrical conductivity exceedances are similar to those observed in 2016 and there has been no further change of water quality at that bore.

The triggers for PZ184 are to be reviewed and revised in the next reporting period.

7.4.3 PRIVATE GROUNDWATER USERS

MCO had negligible impact on private groundwater users during the reporting period. No compensatory water supply was required or supplied during the period.

7.4.4 SPRING AND SEEP CENSUS

During the reporting period a spring and seep census of the upper reaches of Eastern Creek and Goulburn River around the northern and north-western boundary of UG4 was completed. A number of small ephermeral features were identified adjacent to the Goulburn river, perennial flow in the lower reaches of Bobadeen creek and a spring fed pool in the upper reaches of Eastern Creek.

7.4.5 ACTIONS FOR NEXT REPORTING PERIOD

During the next reporting period the following actions are proposed:

- Continued baseline monitoring of PZ201, 202, 203, 211, 213 and 214 to develop SWL, pH and electrical conductivity triggers.
- WAMP to be reviewed and revised as necessary, including rationalisation of program and updates to trigger levels.
- Review of Groundwater Model calibration after June 2018.

Table 25: Water Levels – Triassic, Alluvium and Palaeochannel Bore Performance

Location	Investigation Trigger Level (mAHD)	Minimum Groundwater Level/Pressure (mAHD)		Trend/ Key Management Implications	Implemented/proposed Management Action
		Baseline	2017		
Alluvium and Palaeochannel Bores					
PZ55	419.8	421.8	423.2	No investigation triggers exceeded. Below average rainfall with reduction in rainfall cumulative deviation. Bores generally exhibited a declining trend during 2017 consistent with the RCD.	PZ211, PZ213 and PZ214 were installed during the period. Continue monitoring program. Continue monitoring to develop triggers for bores without triggers. Revise Groundwater Management Plan including triggers.
PZ58a	465.8 (dry)	467.5	467.5		
PZ184	410.4 (dry)	412.0	411.1		
PZ187	413.7	415.7	415.8		
PZ188	413.2	415.2	415.2		
PZ201*	TBC	408.4	408.4		
PZ202*	TBC	407.4	407.4		
PZ203*	TBC	403.1	403.1		
PZ211	TBC	433.5	432.5		
PZ213	TBC	408.56	414.0		
PZ214	TBC	414.9	414.9		
Triassic Bores					
PZ101C	378.7	380.7	381.5	Declining water level/pressures generally consistent with the RCD and rainfall recharge and natural discharge. PZ101C and PZ105C locate 5 km north of the current MCO mining operations, show potential additional influences with PZ105C recording a reduced level of about 1.5m below its baseline range. Impacts not considered to be MCO mining related as no impact in Triassic bores closer to the current operations.	Continue monitoring program.
PZ105C	374.9	376.9	375.4		
PZ129 (VWP-35m)	387.0 (dry)	388.4	390.6		

* *baseline to be developed.*

Table 26: Water Quality Performance

Location	Investigation Trigger Criteria	Trend/ Key Management Implications	Implemented/proposed Management Action
Water Quality			
All	pH and Electrical Conductivity	Groundwater quality triggered investigation at two locations, PZ184 for low pH and PZ55 for elevated EC. PZ184 pH values were slightly below the low end of the trigger range. Results are consistent with results since 2010. PZ184 investigation triggers for pH require revision PZ55 exceedances are similar to those observed in 2016 leading to the response action and there has been no further deterioration of water quality at that bore. Additional monitoring is being undertaken	Continue monitoring program. Revise Groundwater Management Plan including triggers.

8.0 MINE SUBSIDENCE

MCO undertakes secondary extraction in accordance with the UG1 Longwalls 101 to 103 Extraction Plan (2017) (the Extraction Plan). The Extraction Plan and associated sub-plans were prepared with input from experienced and qualified experts to satisfy Condition 5, Schedule 4 of PA 08_0135 and was approved in September 2017.

During the reporting period secondary extraction was undertake in Longwall 101, from commencement on 9 October 2017 until 31 December 2017 (i.e. the assessment period). As of the 31 December 2017 Longwall LW101 had retreated 709m.

During the reporting period MCO undertook baseline monitoring of subsidence lines, flora and fauna habitats, cliffs, landscape features, and built features. Routine monitoring of subsidence lines, surface water, groundwater, UG1 inflows and outflows. Routine built feature monitoring and post mining flora and fauna surveys were not triggered in the period.

Subsidence monitoring included the 2D ground monitoring A and B lines. Line A is transverse monitoring line that crosses LW101 near the commencing end of this longwall and Line B is a longitudinal monitoring line above the centreline of LW101 at the commencing end. Subsidence impacts are during the period were consistent with the prediction as shown in **Table 27.**

Table 27 Comparison of maximum observed and predicted vertical subsidence, tilt and strain for the A and B Line.

Survey Line	Type	Maximum vertical subsidence (mm)	Maximum tilt (mm/m)	Maximum tensile strain (mm/m)	Maximum compressive strain (mm/m)
A	Measured	169	2.9	0.7	0.7
	Predicted (as of 5th Dec 17)	200	3.5	2.5[1]	2.5[1]
	Predicted (end of LW101)	2250	45	15[1]	15*
B	Measured	1749	50	63	19
	Predicted (end of LW101)	2250	100	> 30[1]	> 30[1]

[1] denotes that the values represent the conventional strains based on the predicted curvatures multiplied by a factor of 10.

A summary of performance against the relevant subsidence performance indicators and subsidence performance measures (i.e. the subsidence performance assessment), detailed in the Extraction Plan and Condition 1 and Condition 3, Schedule 4 of Project Approval (08_0135) is provided in **Table 28** and **Table 29**.

Table 28: Assessment Of Subsidence Performance Indicators Measures for UG1 – Natural and Heritage Features

Subsidence Impact Performance Measure		Subsidence Impact Performance Indicator	Indicators Exceeded?	Assessment of Subsidence Impact Performance Measures	Performance Measures Exceeded?
Water Resources:					
Drainage Lines (DL1 – DL7)	*No greater subsidence impacts or environmental consequences than predicted in the EA*	• Change in visible erosion. • Development of, or change in, headcut erosion along DL7. • Change in character, such as increased erosion or change in vegetation along drainage line. • Extensive duration of water ponding. • Downstream water quality (consistent with approved complex-wide SWMP). • Appearance of unsealed surface cracking across the bed of DL7.	**No**	DL1 – DL7 were located outside the mined extent of LW101. It is unlikely that these drainage lines experienced any measurable ground movements due to mining. No impacts greater than predicted recorded. Pre-mining inspections and of monitoring point establishment along D7 completed.	**No**
Land:					
Cliffs C7, C9 and C10	*Negligible environmental consequences (that is occasional rockfalls, displacement or dislodgement of boulders or slabs or fracturing, that in total do not impact more than 0.5% of the total face of such cliffs within any longwall mining domain)*	• No applicable (NA) subsidence impact performance indicators have been developed as cliffs C7, C9 and C10 are located outside the Study Area of Longwalls LW101 to LW103.	**No**	Cliffs C7, C9 and C10 were located outside the mined extent of LW101, as of the 31st December 2017, at distances ranging between 3 km and 5 km. It is unlikely that these cliffs experienced any measurable ground movements due to mining. No impacts greater than predicted recorded.	**No**
Other cliffs	*No greater subsidence impacts or environmental consequences than predicted in the EA*	• The total length of cliffs within the Longwalls 101-103 Study Area that experiences cliff instabilities (i.e. the exposure of a fresh face of rock and debris scattered around the base of the cliff) is to be less than 6 m.	**No**	Cliffs C5 and C6 are located 0.8 and 1km from the mined extent of LW101. All other relevant cliffs are outside LW101 to 103 area. Pre-mining inspections and establishment of monitoring points at cliff line C5 and C6 above Longwall LW103 were completed. It is unlikely that these cliffs experienced any measurable ground movements due to mining. No adverse impacts have been reported for Cliffs during 2017.	**No**

Subsidence Impact Performance Measure		Subsidence Impact Performance Indicator	Indicators Exceeded?	Assessment of Subsidence Impact Performance Measures	Performance Measures Exceeded?
Minor cliffs Rock face features Steep slopes	*Minor environmental consequences (that is, occasional rockfalls, displacement of or dislodgement of boulders or slabs, or fracturing, that in total do not impact more than 5% of the total face area of each such type of features within any longwall mining domain)*	• In each instance of an identified impact (occasional rockfalls, displacement of boulders or slabs, or fracturing) the affected percentage of the total face area of the feature affected will be determined. It is expected that occasional rockfalls or fracturing would not impact more than 5% of the total face area of rock ledges and overhangs in the Longwall mining domain.	**No**	Pre-mining surveys completed and monitoring sites established above Longwall LW101. Ground movements measured during 2017 were similar to or less than those predicted Some minor rockfalls and cracking observed. Post-mining surveys to be undertaken at the completion of Longwall Mining.	**No**
Biodiversity:					
Threatened species, threatened populations, or endangered ecological communities	*Negligible subsidence impacts or environmental consequences*	Subsidence related impacts to threatened flora, fauna or EECs, including: • Areas of cracking or ponding that exceed predictions in the subsidence predictions and assessments of the impacts relating to the predicted subsidence above Longwalls 101-103; • Declining trend in canopy health or vegetation structure inconsistent with seasonal trends at analogue sites; • Deterioration in tree health outside natural variations (analogue sites to be used as a guide); • Areas of weed incursion and/or infestation; or • Mortality of more than a small number of threatened flora or fauna species attributed to subsidence impacts. • Evidence of impacts (attributable to subsidence) to more than 5% of features that provide potential bat roosting sites in the Longwalls 101 to 103 Study Area (i.e. cliffs and minor cliffs).	**No**	Pre-mining baseline floristic monitoring along transects above Longwall LW101 and LW102 completed. Six baseline floristic sites were established above LW101 and LW102 in five Plant Community Types (PCTs). Two of these, PCT 266 and PCT 1606, are listed as an Endangered Ecological Community (EEC). Pre-mining targeted cliff line monitoring for potential microbat roosting sites completed. Low levels of activity of three target predominantly cave-roosting microbat species across all sites sampled, indicating that significant roosts of these species was unlikely to be present within the study area. Post-mining surveys to be undertaken at the completion of Longwall Mining.	**No**
Heritage Sites:					
Aboriginal heritage sites S2MC 236 (AHIMS No.s 36 3 0016 and 36 3 0134)	*Negligible subsidence impacts or environmental consequences*	• No applicable (NA) subsidence impact performance indicators have been developed as S2MC236 [AHIMS No.s 36-3-0016 and 36-3-0134] are located outside the Study Area of Longwalls LW101 to LW103.	**No**	S2MC236 [AHIMS No.s 36-3-0016 and 36-3-0134] are located outside the Study Area of Longwalls LW101 to LW103.	**No**
Historic Heritage Sites	*No greater subsidence impacts or environmental consequences than predicted in the EA*	• No applicable (NA) subsidence impact performance indicators have been developed as all historic heritage sites are located outside the Study Area of Longwalls LW101 to LW103.	**No**	All Historic heritage sites are located outside Longwall 101 to 103.	**No**
Mine Workings:					

Subsidence Impact Performance Measure		Subsidence Impact Performance Indicator	Indicators Exceeded?	Assessment of Subsidence Impact Performance Measures	Performance Measures Exceeded?
First workings	*First working under an approved Extraction Plan beneath any feature where performance measures require negligible subsidence impacts or negligible environmental consequences to remain long-term stable and non-subsiding*	• First workings remain long-term stable and non-subsiding	**No**	First workings have been designed to meet the requirements of Condition 7, Schedule 4 of Project Approval (08_0135). First workings approval was granted on the 24 March 2016 and 4 May 2016 by the Deputy Sectary of the NSW Department of Industry - Resources and Energy in accordance with the requirements under Condition 7, Schedule 4 of PA08_0135.	**No**
Second workings	*To be carried out only in accordance with an approved Extraction Plan*	• No applicable (NA) subsidence impact performance indicators have been developed for this performance measure.	**NA**	Second workings have been carried out in LW101 in accordance with the approved *Longwalls 101-103 Extraction Plan* during the assessment period.	**No**

Table 29: Assessment Of Subsidence Performance Indicators Measures for UG1 – Built Features

Subsidence Impact Performance Measure		Subsidence Impact Performance Indicator Indicators Exceeded?	Indicators Exceeded?	Assessment of Subsidence Impact Performance Measures	Performance Measures Exceeded?
Key Public Infrastructure:					
Gulgong-Sandy Hollow Railway Line	*Always safe and serviceable.* *Damage that does not affect safety or serviceability must be fully repairable, and must be fully repaired*	• No defects or deformation of the rail track and associated infrastructure due to mining. • No visual displacement at joints or cracks in culverts.	**No**	The Sandy Hollow Gulgong Railway Line is located outside the Longwalls 101-103 Study Area, but may be subject to far-field horizontal movements and non-conventional ground movements Pre-mining monitoring lines established and surveys completed (including FF' line). Specific monitoring not triggered (excluding base-line) in period due to distance to mining greater than trigger to commence monitoring. No triggers of FF'Line indicating no defects, deformation of displacement of joints in culverts due to mining	**No**

Subsidence Impact Performance Measure		Subsidence Impact Performance Indicator Indicators Exceeded?	Indicators Exceeded?	Assessment of Subsidence Impact Performance Measures	Performance Measures Exceeded?
Ulan-Wollar Road		• No additional visible pavement cracking or other defects of the road pavement (when compared against baseline conditions and sections of road outside the Study Area) resulting in deterioration of road quality. • No ponding of water on the road surface as a result of changes in grade from subsidence associated with Longwalls 101-103. • No joint displacement or cracking or other defects of the drainage structure (e.g. pipes/culverts) in excess of 5 mm. • Serviceability of guard rails, marker posts and signage is maintained.	**No**	The Ulan-Wollar Road is located outside the Longwalls 101-103 Study Area, but may be subject to far-field horizontal movements and non-conventional ground movements. Pre-mining monitoring lines established and surveys completed (including FF' line). Specific monitoring not triggered (excluding base-line) in period due to distance to mining greater than trigger to commence monitoring. No triggers of FF'Line indicating no additional cracking, defects, additional ponding, deformation of displacement of joints in culverts due to mining.	
Other Infrastructure:					
Murragamba Road	*Always safe.* *Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated.* *Damage must be fully repairable, and must be fully repaired or else replaced or fully compensated.*	• No applicable (NA) subsidence impact performance indicators have been developed for this performance measure as Murragamba Road is not publicly accessiblec.	**NA**	Murragamba Road is not publicly accessible. No observed impacts to Murragamba Road occurred during the assessment period as a result of Longwall LW101.	**No**
Low voltage electricity power line		• The structural integrity of the 66 kV/22 kV dual circuit powerline (power poles and transmission lines) is maintained. • The electrical clearance from land, vegetation and roads is maintained. • The serviceability of the access roads/tracks is maintained.	**No**	Pre-mining installation of tilt monitoring points in consultation with Essential Energy and baseline structure survey at each timber pole completed. Specific monitoring not triggered (excluding base-line) in period due to distance to mining greater than trigger to commence monitoring. No loss of service or observed impacts to the 66kV/22kV powerline and three associated power poles occurred during the assessment period, as a result of Longwall LW101.	**No**

Subsidence Impact Performance Measure		Subsidence Impact Performance Indicator Indicators Exceeded?	Indicators Exceeded?	Assessment of Subsidence Impact Performance Measures	Performance Measures Exceeded?
Telecommunication cable *Fibre-optic cable*	*Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated.* *Damage must be fully repairable, and must be fully repaired or else replaced or fully compensated.*	• Negligible transmission loss from mine subsidence impacts. • Negligible impacts on structural integrity of the cable lines from mine subsidence.	**No**	The telecommunication cable and optical fibre cable are located outside the Longwalls 101-103 Study Area, but may be subject to far-field horizontal movements and non-conventional ground movements. Pre-mining monitoring lines established and surveys completed (including FF' line). Pre-mining inspection and identification of potential affected Telstra customers completed. No observed impacts either the telecommunications line and/or the fibre optic cable occurred during the assessment period, as a result of Longwall LW101	**No**
Murragamba Trig Station		• No applicable (NA) subsidence impact performance indicators have been developed for this performance measure as the Murragamba Trig Station is located outside the Longwalls 101-103 study Area.	**NA**	The Murragamba Trig Station is located outside the Longwalls 101-103 Study Area.	**No**
Other built features and improvements, including fences	*Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated.* *Damage must be fully repairable, and must be fully repaired or else replaced or fully compensated.*	• No applicable (NA) subsidence impact performance indicators have been developed for this performance measure as no other non-mine owned built features and improvements are located within the Longwalls 101-103 Study Area.	**NA**	No other non-mine owned built features and improvements are located within the Longwalls 101-103 Study Area.	**No**
Public Safety:					
Public safety	*Negligible additional risk*	• No more than negligible additional risk to public safety.	**No**	No more than negligible additional risk to public safety has occurred during the assessment period, as a result of Longwall LW101, due to the remote location and restricted access of UG1 within MCO's open cut operation. There were no incidents regarding public safety as a result of Longwall LW101 during the assessment period.	**No**

Activities in the 2018 reporting period include

- Routine environmental and subsidence line monitoring.
- Monitoring of built features as LW101 extraction approaches the triggers for routine monitoring to commence.
- Establishment and baseline monitoring of additional monitoring locations associated with LW103.
- Remediation works, (Eg. Tracks) as required.

8.1.1 SUBSIDENCE REMEDIATION

No subsidence management actions were required to be undertaken as a result of LW101 extraction during the reporting period.

9.0 REHABILITATION

MCO manages rehabilitation in accordance with Rehabilitation Management Plan (RMP) and Mining Operations Plan (MOP). The RMP was developed by MCO with advice from experienced and qualified experts to satisfy Condition 68, Schedule 3 of PA 05_0117 and Condition 56, Schedule 3 of PA 08-0135. The MCO Rehabilitation Management Plan (RMP) describes the management of rehabilitation at the Moolarben Coal Complex for Stage 1 and Stage 2. The RMP was updated following the approval of the UG1 Modification and was approved in September 2016.

The MOP was developed to meet the requirements of Mining Lease Conditions. The MCO Mining Operations Plan (MOP) was revised during the reporting period to include works within the Northern Borefields area, and as part of exploration activities with approvals received in August and December respectively. The currently approved MOP describes the proposed Stage 1 and Stage 2 mining and rehabilitation activities for the period 1 December 2016 to 1 January 2019 (the MOP term). A description of the proposed rehabilitation activities during the MOP term is provided in Section 7.2 of the MOP. Mining and rehabilitation progression are shown on MOP Plans 3A and 3B. The MOP and RMP is available on the Moolarben Coal website (www.moolarbencoal.com.au).

This section addressed the annual rehabilitation reporting requirements for Project Approvals PA05_0117 and PA08_0135, the MOP and Moolarben Coal Complex MLs. The rehabilitation performance review for 2017, applies to the proposed rehabilitation activities outlined in the 2016 to 2019 MOP.

9.1 MINING AND REHABILITATION STATUS

At the end of December 2017 MCO had undertaken cumulative rehabilitation activities over approximately 230ha of the completed portions of overburden emplacement areas. In addition, interim/temporary rehabilitation in the form of landscaping and planting has been completed around the main offices, rail loop, environmental bunds and entry to the operational areas. External batters on dam walls and rail loop embankments have also been temporarily rehabilitated.

During the reporting period MCO continued to undertake monitoring and maintenance activities within the existing rehabilitated areas. This included the reseeding of areas with limited cover, further placement of woody debris, and weed and feral animal control activities.

The mining and rehabilitation status is presented in **Table 30**. The land preparation activities undertaken in the period and proposed areas in the next period are discussed in **Section 9.5** and **Section 9.6** and presented in **Figure 3**. The status of mining and rehabilitation is presented in **Figure 4**. The status of mining and rehabilitation, and the agreed post rehabilitation land-use is presented in **Figure 5**.

Table 30: Mining and Rehabilitation Status

Mine Area Type	Previous Reporting Period (2016)	This Reporting Period (2017)	Next Reporting Period (2018)
Total Mine Footprint	1,214	1,351	1,474
Total Active Disturbance	945	1,018	1,057
Temporary Rehabilitation	52	52	52
Land being Prepared for Rehabilitation	10	57	97
Land under active Rehabilitation	177	226	268
Completed Rehabilitation	0	0	0

9.2 VEGETATION CLEARANCE AND TOPSOIL STRIPPING

Vegetation clearance was undertaken in accordance with the Vegetation Clearance Protocol and GDPs within the OC2, OC4 and infrastructure areas (**Figure 3**) as described in **Section 6.5.1**. Stripped topsoil was either placed in temporary stockpiles for later use, or placed directly on areas prepared for rehabilitation. Vegetation salvaged was either mulched or retained for use as habitat features within rehabilitation areas.

9.3 SEED COLLECTION

Native seed collection continued throughout the period with seed harvested from MCO owned lands. All activities were undertaken in accordance with the requirements of the Florabank Guidelines (2000). At December 2017 MCO's seed bank contained 456,817 grams of native seed for use in rehabilitation activities across the MCC.

9.4 REHABILIATION MONITORING

MCO undertakes a monitoring program of rehabilitation areas in accordance with the RMP. The monitoring program includes landscape function analysis, floristic monitoring, vegetation structure and growth, fauna monitoring and visual monitoring. During the reporting period the monitoring program was extended to additional rehabilitation areas within OC1.

9.4.1 ECOSYSTEM FUNCTION ANALYSIS

Landscape Function Analysis

Landscape organisation (LO) is a measure of the proportion of the landscape occupied by resource accumulating patches. Landscape Organisation ranged from 0.5 (site R4) to 1.0 (site R10 & R17), with the average LO across all rehabilitation sites being 0.8 (**Figure 12**). This compares to an LO range of 0.834 to 0.996 for analogue sites (average LO 0.931). Despite the dry conditions the LO average remained consistent with 2016 and above the 2015 average. The three sites with lowest scores in 2016 all improved in 2017. Litter and bare soil were the dominant inter-patch/patch types across the rehabilitation sites.

Trees/shrubs, and microhabitat features such as logs and rocks, continue to contribute to a limited proportion of the rehabilitation landscape organisation. Ground cover percentages decreased across all sites between 2016 and spring 2017. This is most likely due to the lower than average rainfall and slightly hotter than average temperatures recorded during 2017. Monitoring sites are presented in **Appendix 2**.

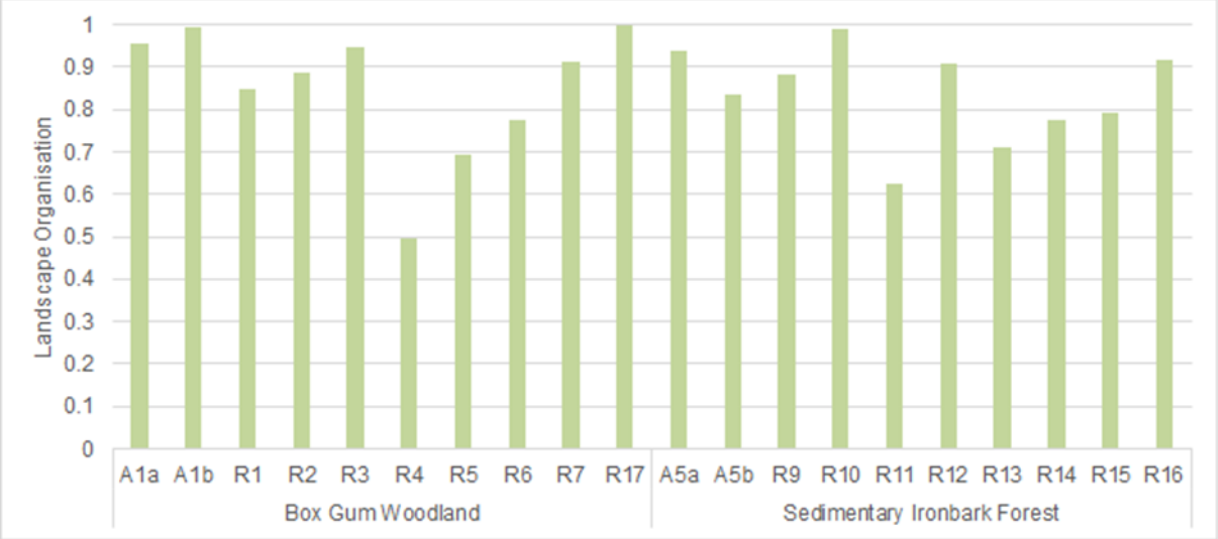

Figure 12: Landscape Organisation for each LFA transect, spring 2017 (analogues: spring 2014)

Floristic Monitoring

During autumn 2017, all Box Gum Woodland rehabilitation floristic plots exhibited a higher number of native species than exotic. Native species richness during ranged from 12 to 31 species, with exotic species richness ranging from three to 13 species. During spring 2017, native species richness ranged from 21 to 25 species, with exotic species richness ranging from three to 13 species (**Figure 13**). Species richness decreased in some monitoring and analogue sites. Species richness has generally increased over the recent years with some variations relating to seasonal conditions.

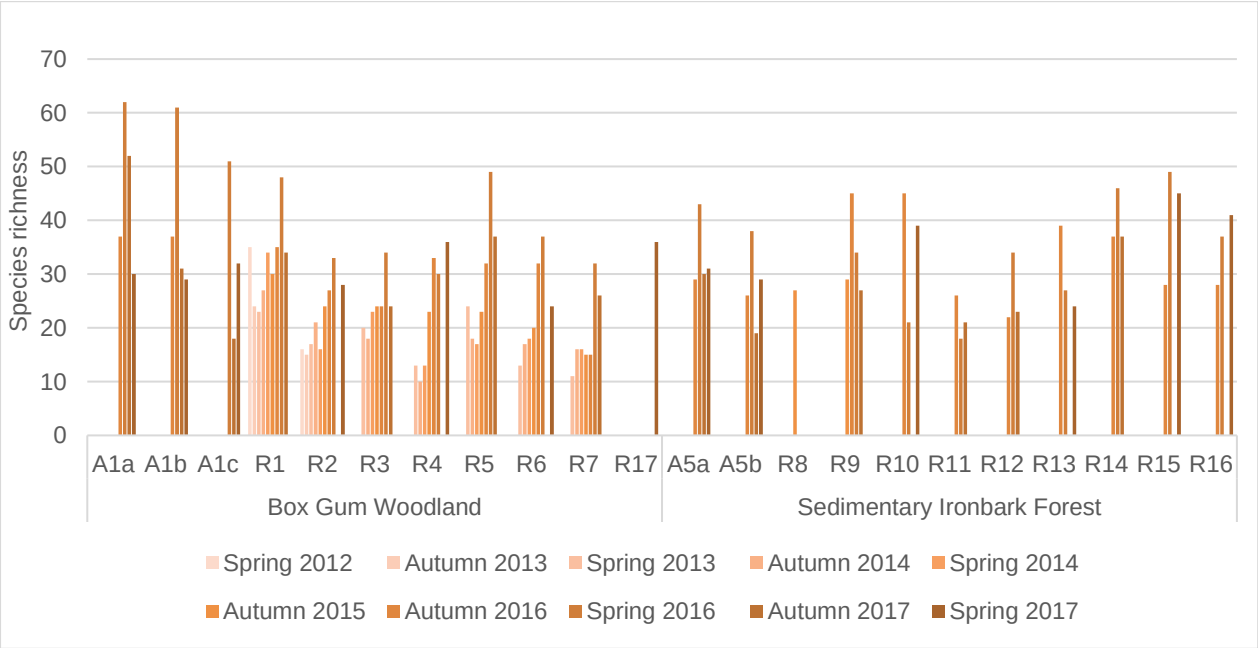

Figure 13: Species Richness (autumn 2013 – spring 2017)

Vegetation Structure and Growth

At both the Box Gum Woodland and Sedimentary Ironbark Forest sites, the lowest height of the upper strata continues to be less than that seen at their respective analogue sites. This trend is consistent with the age of the rehabilitation. The minimum heights of the upper strata has generally shown an increase demonstrating that these species are continuing to establish within the rehabilitation area.

As with spring 2016, spring 2017 monitoring indicated that the upper and mid layers of the rehabilitation was dominated by Acacia species, including Acacia linearifolia (Narrow-leaved Wattle), Acacia spectabilis (Mudgee Wattle), Acacia polybotrya and Acacia verniciflua (Varnish Wattle). Eucalypts (E. punctata and Eucalyptus spp.) were recorded in the upper and mid-storey of seven of the eight Box Gum Shrubby Woodland rehabilitation sites and five of the eight sites within the Sedimentary Ironbark Rehabilitation area. This represents an increase of 4 box Gum Shrubby Woodland sites and 3 Sedimentary Iron Bark sites since 2016.

Fauna Monitoring

A total of 40 native and one exotic fauna species were recorded during spring 2017, including two threatened species (Miniopterus schreibersii oceanensis (Eastern Bentwing Bat) and Nyctophilus sp. (Long-eared Bats). The increasing species richness trend over the last five years of monitoring is shown in **Figure 14**. A record number of microbat species were recorded at Anabat sites, and bird species richness was well above the historical average for the second year in a row.

Forty bird species were observed utilising habitat within the rehabilitation areas during spring 2017. This included 13 species that were not seen within OC1 during 2016 monitoring.

The presence of obligate woodland bird species such as honeyeaters, and a higher species richness, indicates that sections of the rehabilitation are maturing and are more advanced in their transition toward functioning woodland ecosystems. The presence of both grassland and woodland species across multiple sites may be reflective of the highly heterogeneous, mosaic nature of vegetation structure and development throughout the rehabilitation area.

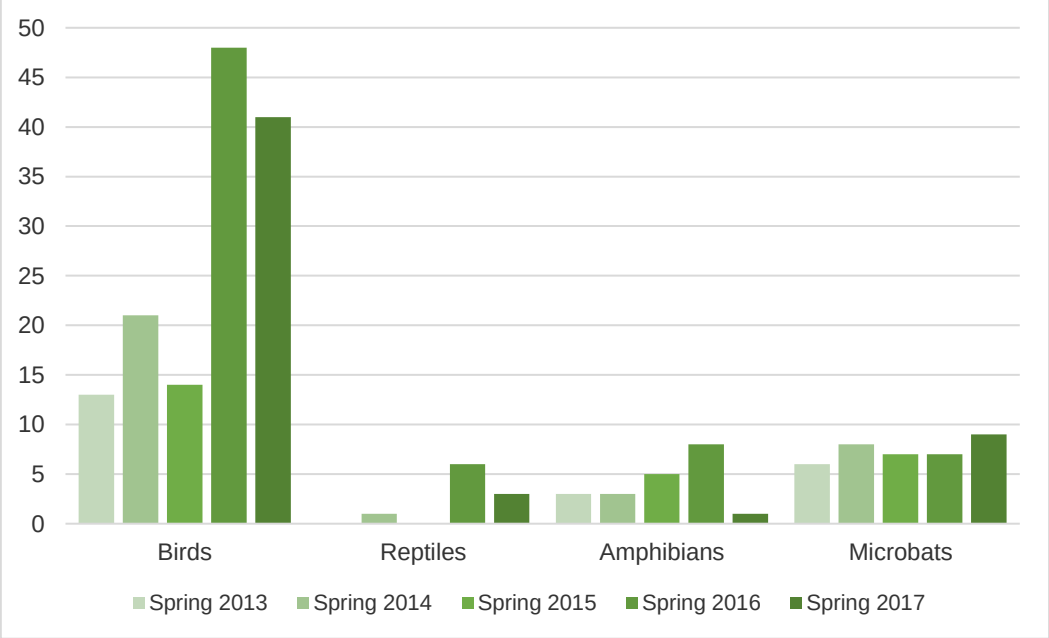

Figure 14: Comparison of target fauna species

Visual Monitoring

Weeds (exotic plants excluding cover crop species) during spring 2017 were generally observed as occurrences of individual plants or small patches rather than strong infestations. The Priority Weed Hypericum perforatum (St John's Wort) was, scattered throughout OC1. Carthamus lanatus (Saffron Thistle) was present in large numbers in open locations where canopy species have yet to become well established.

Visual monitoring undertaken during spring 2017 observed isolated areas of moderate erosion particularly on steeper areas.

Noticeable growth of eucalypts was observed throughout areas of the February 2012 rehabilitation area. The association between higher eucalypt densities and microhabitat features such as LWD, or along sheltered gentle gully areas, was similarly observed in a number of other areas throughout the OC1 rehabilitation.

Rehabilitation performance and changes since 2015 are presented in **Figure 15** below.

Assessment of RMP Performance Indicators

Analysis of the Box Gum Woodland and Sedimentary Ironbark Forest rehabilitation against the RMP Performance Indicators (and vegetation structure indicators) is presented in **Table 31** and **Table 32**.

Table 31: Box Gum Shrubby Woodland rehabilitation assessment

Objective: Establish native vegetation comparable to Box Gum Shrubby Woodland communities including stands of Allocasuarina spp.	**Completion Criteria (by years 5-7)**			
	Species composition targets			**Vegetation structure targets**
Monitoring Sites and Year established	Presence of **one to three overstorey** species from Box Gum Shrubby Woodland	Presence of at least **four native ground cover species** that are present at analogue sites	*Presence of **stands** of Allocasuarina spp.	Indicator species plant densities trending towards plant densities of analogue sites
November 2010 R1	Yes	Yes	Yes	Whilst overstorey species from the Box Gum Woodland communities are present, the current structure lacks a *Eucalyptus* canopy, upper layer is *Acacia* spp. dominated, and native groundcover is in very low densities.
November 2010 R2	Yes	Yes		
February 2012 R3	Yes	Yes		
February 2012 R4	Yes	Yes		
February 2012 R5	Yes	Yes		
February 2012 R6	Yes	No		
February 2012 R7	Yes	No		
December 2014 R17	Yes	Yes		

*Stands of Allocasuarina spp. are only required to be present with in the rehab area not within each monitoring site

Table 32: Sedimentary Ironbark Forest rehabilitation assessment

Objective: Establish native vegetation comparable to Sedimentary Ironbark Forest communities including stands of *Allocasuarina* spp.	**Completion Criteria (by years 5-7)**			
	Species composition targets			**Vegetation structure targets**
Monitoring Sites and Year established	Presence of **two to three overstorey** species from Sedimentary Ironbark Forest	Presence of at least **four native ground cover species** that are present at analogue sites	*Presence of **stands** of Allocasuarina spp.	Indicator species plant densities trending towards plant densities of analogue sites
February 2013 R9	Yes	Yes	Yes	Whilst overstorey species from the Sedimentary ironbark communities are present, the current structure lacks a *Eucalyptus* canopy, upper layer is *Acacia* spp. dominated, and native groundcover is in very low densities.
March 2012 R10	Yes	Yes		
March 2012 R11	No	No		
March 2012 R12	No	No		
November 2012 R13	No	No		
November 2012 R14	Yes	Yes		
March 2012 R15	No	Yes		
November 2012 R16	Yes	Yes		

*Stands of Allocasuarina spp. are only required to be present with in the rehab area not within each monitoring site

Figure 15: Rehabilitation Progress 2015 to 2017.

9.5 REHBILITATION WORKS

Rehabilitation of disturbed lands are undertaken sequentially (or in phases) to achieve the final land use. A description of these phases of rehabilitation relevant to the Moolarben Coal Complex are provided in the MOP. A summary of rehabilitation phases completed during the reporting period included:

Decommissioning
There were no decommissioning activities undertaken at MCO.

Landform Establishment
46ha in OC1, OC2 and OC4 had reshaping completed to final landform. Final landforms were established to the relevant completion criteria including:

- Constructed landforms consist with surrounding topography;
- Slopes were generally less than 10^0 to 18^0;
- Constructed landforms were free draining; and
- No hostile overburden material in the final surface layers.

Growth Medium Development
12ha in OC1, OC2 and OC4 had topsoil applied. Growth medium was managed and applied to the relevant completion criteria including:

- Topsoil depths achieved a minimum of 100mm;
- Appropriate soil ameliorants have been applied in accordance with specification and recommendations from subsoil and topsoil material characterisation testing; and
- Topsoil areas were lightly ripped along the contour.

Ecosystem and Landuse Establishment
226ha of rehabilitation in the ecosystem and landuse establishment phase located in OC1 and OC2 were maintained and further enhanced.

9.6 ACTIONS DURING NEXT PERIOD

Rehabilitation actions to be progressed in the next period include:

- Continued progressive rehabilitation;
- Continued weed and feral animal control; and,
- Continued monitoring of rehabilitation areas with poor cover or density with consideration of supplementary seeding and/or wood debris placement.

10.0 COMMUNITY

10.1 COMMUNITY ENGAGEMENT

During 2017, MCO continued to foster positive relationships with the local community through engagement and ongoing financial support provided to a range of community groups and events – including, but not limited to – Mudgee High School and Ulan Public School, Gulgong Netball Club, Cooyal Tennis Club, Mudgee Running Festival, Mudgee Rotary, Henbury Sport & Rec Club, Turill Community and Sports Club, Rylstone Street Feast, Gulgong Folk Festival and Sculptures in the Garden. MCO also supported the Westpac Rescue Helicopter service, the Benevolent Society, Lifeskills and continued its sponsorship of the Moolarben Celebrity Golf Classic with all proceeds going to the local community. In total, MCO provided **$146,799** in community donations during 2017 to 45 community groups and events through its Community Support Program and other programs (**Appendix 6).**

Community/stakeholder related activities undertaken during the reporting period include:

- Moolarben Spirit Awards Program promoting positive contributions in schools;
- Mine tour/career talks with each of the local High Schools and University students;
- Mudgee District High Schools 'Try-A-Trade';
- Vocational student placement from Wollongong University;
- Careers Expo at Gulgong High School;
- Active participation in Wild Dog Groups and the LLS;
- Careers information evening for 2018 apprentices; and,
- Direct engagement with nearby landholders.

Moolarben continued to provide the community with information on its website (www.moolarbencoal.com.au). Information available included project approvals, CCC meeting minutes, community complaint records, environmental monitoring information, environmental audits, environmental management plans and annual review.

MCO continued to operate a free-call 24-hour Environment and Community Complaints Hotline (1800 556 484) during the reporting period to allow the community to contact the operation directly to ask questions or raise concerns about mining activities.

10.2 COMMUNITY COMPLAINTS

MCO maintains a 24-hour Environment and Community Complaints Hotline (1800 556 484). This Hotline is available in order to receive any complaints from neighbouring residents or interested stakeholders. Details for the Hotline are available on the MCO website and in community newsletters.

MCO has developed a Community Complaints Procedure which details how to receive, respond to, record, and action any community complaint received to site. This procedure also outlines the reporting requirements relating to community complaints, including:

- Monthly reporting of community complaints on the MCO website;
- Discussion of community complaints as part of the operational performance provided during CCC meetings; and,
- A summary of complaints is provided in the Annual Review and Annual Return (as part of EPL reporting).

During 2017, a total of 115 complaints were received in relation to MCO Operations by 17

complainants. All complaints are investigated and included in the complaints register on the Moolarben Coal website (www.moolarbencoal.com.au). 54% of complaints were received by two complainants. Noise remained the primary issue of concern (96% of complaints) (**Figure 16**).

A comparison of complaints to previous years is presented in **Table 33**. There has been a decrease in noise complaints during the period and continues the trend since 2015. A register of complaints is provided in **Appendix 5**.

The ongoing use of Mining and Production Environmental Assistance continues to provide real-time feedback to the mining operation and to inform proactive and reactive responses. Ongoing community and stakeholder liaison and consultation has continued.

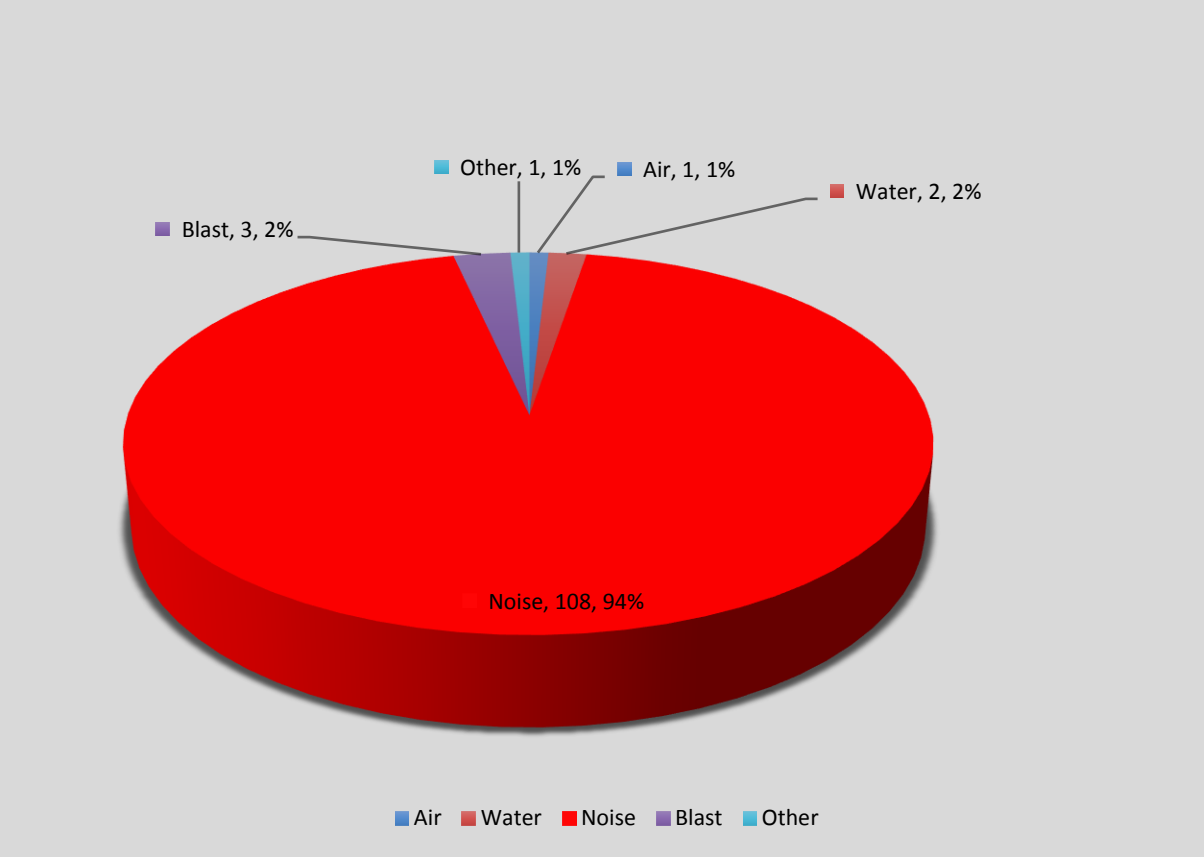

Figure 16 : Community Complaints 2017 – Breakdown by Type

Table 33: Comparison of Community Complaints

Reporting Period	Noise	Blast	Air	Water	Other	Total
2010-2011	110	3	0	0	0	**113**
2011-2012	334	17	2	3	3	**359**
2012-2013	117	0	1	0	2	**120**
2013-2014	239	12	2	0	3	**256**
2015	274	6	2	0	4	**286**
2016	157	7	2	0	1	**167**
2017	108	3	1	2	1	**115**

10.3 COMMUNITY CONSULTATIVE COMMITTEE (CCC)

In accordance with Condition 6, Schedule 5 of project approval (05_0117) and Condition 6, Schedule 6 of project approval (08_0135) the Community Consultative Committee (CCC) continued to meet during the 2017 reporting period. The purpose of a Community Consultative Committee is to provide a forum for open discussion between MCO, the community, the local council and other key stakeholders on issues directly relating to the project, including performance against any conditions, and to keep the community informed on these matters.

Members of the MCO CCC for 2017 are presented in **Table 34**. MCO conducted four CCC meetings during the reporting period with summaries provided in **Table 35.** Meetings were chaired by an independent chairperson with the minutes being available on the MCO website.

Table 34: CCC Members 2017

Name	Representing	Name	Representing
Aleshia Lonsdale	Mudgee Local Aboriginal Land Council	Helen Ungaro	Ulan Public School and Local Landholder. Endorsed by DP&E August 2017
Andrew Palmer	Mudgee Chamber of Commerce	David Stokes	Local resident
Julia Imrie	Local Landholder and Business Owner	John O'Neil	Councillor, Mid-Western Regional Council
Bev Smiles	Mudgee District Environment Group	Ms Lisa Andrews	DP&E endorsed Independent Chair.

Table 35: CCC Meeting Summary

Date	Meeting Summary
14 March	General update on community interaction, operations and exploration, environmental monitoring, community complaints and rehabilitation. UG Project Update. Summary of the Open Cut Optimisation Modification. Employment Update.
13 June	General update on community interaction, operations and exploration, environmental monitoring, community complaints and wild dog baiting program. Summary of Vegetation Clearance Protocol. UG Project Update. Update on the Open Cut Optimisation Modification. Emergency services and employment update. Presentation of 2016 Annual Review.
12 September	General update on community interaction, operations and exploration, environmental monitoring, community complaints and rehabilitation. UG Project Update. Update on the Open Cut Optimisation Modification. Employment Update.
5 December	General update on community interaction, mines rescue, open cut and underground operations, exploration, environmental monitoring, community complaints, rehabilitation and employment update. Update on the Open Cut Optimisation Modification. Christmas dinner was provided by MCO.

10.4 ULAN ROAD STRATEGY

The Mid Western Regional Council continues with the capital and maintenance works on the road. Moolarben continues to make financial contributions to the capital and maintenance costs of the Ulan Road works detailed in the agreement. In addition, Moolarben has assisted the Council sourcing material from the site.

18 properties along Ulan road have also been identified for noise attenuation works. Works required at each of the properties was determined generally in accordance with the RMS guidelines. The current status is:

- 9 properties with works completed;
- 4 properties have agreements in place for works to be completed;
- 1 property with agreement in principle;
- 1 property where owners have declined mitigation works;
- 2 properties on review are outside the mitigation zone; and
- 1 property recently requested mitigation works - property to be assessed.

11.0 INDEPENDENT AUDIT

In December 2015, an Independent Environmental Audit (IEA) was undertaken in accordance with Condition 9, Schedule 5 of PA 05_0117 (as modified) and Condition 9, Schedule 6 of PA 08_0135. All recommendations associated with audit have been undertaken. The staged development of the Biodiversity Management Plan and offset management continues to be progressed.

The IEA was undertaken by Trevor Brown and Associates, a summary of the report and response to the audit action list were provided in the 2015 Annual Review. The 2015 Annual Review is located on the MCO website (www.moolarbencoal.com.au).

The next Independent Audit will be required by December 2018.

12.0 INCIDENTS & NON-COMPLIANCES

There was one reportable incident during the period. On the 17th of February airblast overpressure from an overburden blast event in OC4 Strip 2 exceeded 120dB (Lin Peak) at noise sensitive location; Ridge Road in contravention of Condition 9 Schedule 3 of Project Approval 08_0135. No other monitoring locations were impacted. The Incident was reported to DPE and EPA. The overpressure reading was likely due to localised wave front reinforcement due to blast initiation timing. No complaints were received or adverse impacts occurred. A penalty notice was received from the Department of Planning and Environment. A revision of blasting procedures was completed.

A stockpile of surplus material from construction was created within an approved disturbance area. The stockpile material was assessed to have been stockpiled in a location contrary to the Environmental Assessment and Project Approvals (Condition 2 of schedule 2 of PA 05_0117 and Condition 2 Schedule 2 of PA 08_0135). DPE issued a Penalty Notice and Order to remedy the breach. DRG issued a Caution and Direction to include the stockpile in the Mining Operations Plan and RCE. MCO has assessed the stockpile and are seeking approval for the stockpile which will be used in the rehabilitation of the CHPP area.

Minor administrative non-compliances during the reporting period included

- Non-continuous monitoring of TEOMs due to power supply interruption and routine maintenance.
- Non-continuous monitoring of stream flow recording.
- 5 of 7 EPBC (2008/4444) offsets were not secured in perpetuity within 24 months of the approval. Offsets security terms were being reviewed by the NSW Department of Planning and Environment at the end of the period. MCO continues to progress securing the offsets.

A Formal Warning was received from the EPA on 9 June 2017 on relating to exceedances of the noise criteria on 20 April and 4 May in the vicinity of lower ridge road. Operational adjustments were made at the time.

No prosecution proceedings were undertaken by any regulatory agency during the period.

13.0 ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

The following is a summary of measures to be implemented in the next reporting period.

- Review and revise environmental management plans as necessary.
- WAMP and associated triggers to be reviewed and revised as necessary.
- Noise Management Plan to be revised with consideration of real-time noise triggers and the Noise Policy for Industry.
- Review and revision of Biodiversity Management Plans.
- Progress approvals of stockpile and include in the Mining Operations Plan.
- Continue to progress offset security instruments.
- Complete remaining stream flow monitoring system upgrades.
- Continue baseline monitoring of PZ201, 202, 203, 211, 213 and 214 will continue to develop SWL, pH and electrical conductivity triggers throughout the period.
- Review groundwater model calibration after June 2018.
- Continued progressive rehabilitation.
- Establish baseline monitoring sites for LW103 where not already in place.
- Conduct Independent Environmental Audit.