BHP

Mt Arthur Coal

Annual Review FY18

26 September 2018

amended on 14 December 2018 following DP&E review

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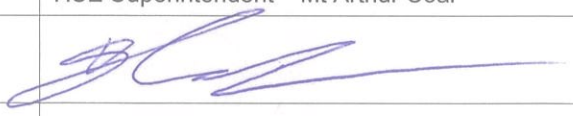
Table 1: Annual Review title block

Document Details	
Name of Operation	Mt Arthur Coal
Name of Operator	Hunter Valley Energy Coal Pty Ltd
Project Approvals	PA 09_0062 (MOD 1) PA 06_0091
Name of holder of project approval	Hunter Valley Energy Coal Pty Ltd
Mining Leases	CCL 744, CL 396, ML 1358, ML 1487, ML 1548, ML1593, ML1655, ML 1739, ML 1757, MPL 263
Name of holder of mining lease	Hunter Valley Energy Coal Pty Ltd; Mt Arthur Coal Pty Limited
Water Licences	WAL917, WAL918, WAL1296
Name of holder of water licence	Hunter Valley Energy Coal Pty Ltd
Mining Operations Plan Commencement Date	1 July 2017 (v1.1 as amended 7 Dec 2017)
Mining Operations Plan Completion Date	30 June 2019
Annual Review Commencement Date	1 July 2017
Annual Review Completion Date	30 June 2018
I, Kris Sheehan, certify that this audit report is a true and accurate record of the compliance status of Mt Arthur Coal for the period 1 July 2017 to 30 June 2018 and that I am authorised to make this statement on behalf of Hunter Valley Energy Coal Pty Ltd. 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	Kris Sheehan
Title of authorised reporting officer	HSE Superintendent – Mt Arthur Coal
Signature of authorised reporting officer	
Date	26/09/2018

1. Statement of Compliance

A statement of Mt Arthur Coal's compliance with its project approval and mining leases is presented in Table 2 with three identified non-compliances during the reporting period being discussed in Table 3.

Table 2: Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	
PA 09_0062	NO
EPL 11457	NO
EPBC 2011/5866	NO
EPBC 2014/7377	YES
ML	YES

Table 3: Non-compliance summary

Relevant approval	Condition	Description Summary	Compliance Status	Comment	Report Reference
PA 09_0062	24	Air Quality Management Plan.	Non-compliant (Low)	DP&E alleged that response to real-time air quality alarms was not sufficient	Incidents and non- compliance section
EPL 11457	O3.1 and O3.2	Dust	Non-compliant (Low)	Excessive wheel generated dust	Incidents and non -compliance section
EPBC 2011/5866	14	Compliance reporting	Non-compliant (Administrative)	Late submission of compliance report	Incidents and non- compliance section

Note: Compliance Status key for Table 3

Risk Level	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-compliance	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. Acronyms

Acronyms	
AEMR	Annual Environmental Management Report
AHMP	Aboriginal Heritage Management Plan
BCM	Bank cubic metres
ARA	Annual rapid assessment
BMP	Biodiversity Management Plan
BRMP	Biodiversity and Rehabilitation Management Plan
CCC	Community Consultative Committee
CCL	Consolidated coal lease
CHBI	Central Hunter Box – Ironbark Woodland
CHISG	Central Hunter Ironbark – Spotted Gum Grey-Gum Box Forest
CHPP	Coal handling preparation plant
CL	Coal lease
DA	Development approval
DoEE	Federal Department of the Environment and Energy
DP&E	NSW Department of Planning and Environment
DRE	NSW Department of Trade and Investment - Division of Resources and Energy
DRG	NSW Department of Planning and Environment – Division of Resources and Geoscience
EA	Environmental assessment
EIS	Environmental impact statement
EL	Exploration licence
EPA	NSW Environment Protection Authority
EP&A	Environmental Planning and Assessment Act 1979
EPBC	Environment Protection and Biodiversity Conservation
EPL	Environment Protection Licence
EMS	Environmental management system

Acronyms	
FY	Financial year
HA	Hectares
HRSTS	Hunter River Salinity Trading Scheme
HSE	Health, Safety and Environment
HVAS	High volume air sampler
HVEC	Hunter Valley Energy Coal (Mt Arthur Coal)
MAC	Mt Arthur Coal
ML	Mining lease
MOP	Mining Operations Plan
MSC	Muswellbrook Shire Council
Mtpa	Million tonnes per annum
NOW	NSW Office of Water
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
PIRMP	Pollution Incident Response Management Procedure
ROM	Run of mine

3. Introduction

The Mt Arthur Coal Complex, located approximately five kilometres south west of Muswellbrook in the Upper Hunter Valley in New South Wales (NSW) includes the Mt Arthur Coal Open Cut, the Mt Arthur Coal Underground Project (no underground operations are currently taking place), Coal Handling and Preparation Plant (CHPP), rail loop and rail load out. The Mt Arthur Coal Complex and surrounding region is shown in Figure 1 and Figure 1a.

This Annual Review details the environmental and community performance for the period from 1 July 2017 to 30 June 2018 for operations at the Mt Arthur Coal Complex.

This document has been prepared in accordance with the Annual Review guidelines issued in by Department of Planning and Environment (DP&E) in October 2015 and fulfils statutory reporting requirements required in mining leases and Schedule 5 Condition 3 of the Mt Arthur Coal Mine Open Cut Consolidation Project Approval Modification 1 (09_0062 MOD 1).

This report was prepared in consultation with the Division of Resources and Geoscience (DRG), DP&E, Muswellbrook Shire Council (MSC), NSW Environment Protection Authority (EPA) and NSW Department of Primary Industries – Office of Water (DPI – Water). The report is distributed to a range of external stakeholders and is available on the BHP website at www.bhp.com.

Contact details for personnel associated with environmental management at Mt Arthur Coal can be found in Table 4.

Table 4: Mt Arthur Coal management contact details

Name and role	Phone contact details
Dawid Boshoff, General Manager, BHP Mt Arthur Coal	(02) 6544 5800
Kris Sheehan, Superintendent Health, Safety and Environment Business Partner, Mt Arthur Coal	(02) 6544 5800
Michael Gale, Principal Environment Analysis and Improvement, BHP Minerals Australia	(02) 6544 5800

BHP

Spatial Data Team
Brisbane

0 1 2
Kilometres

Projection: GDA94 MGA Zone 56

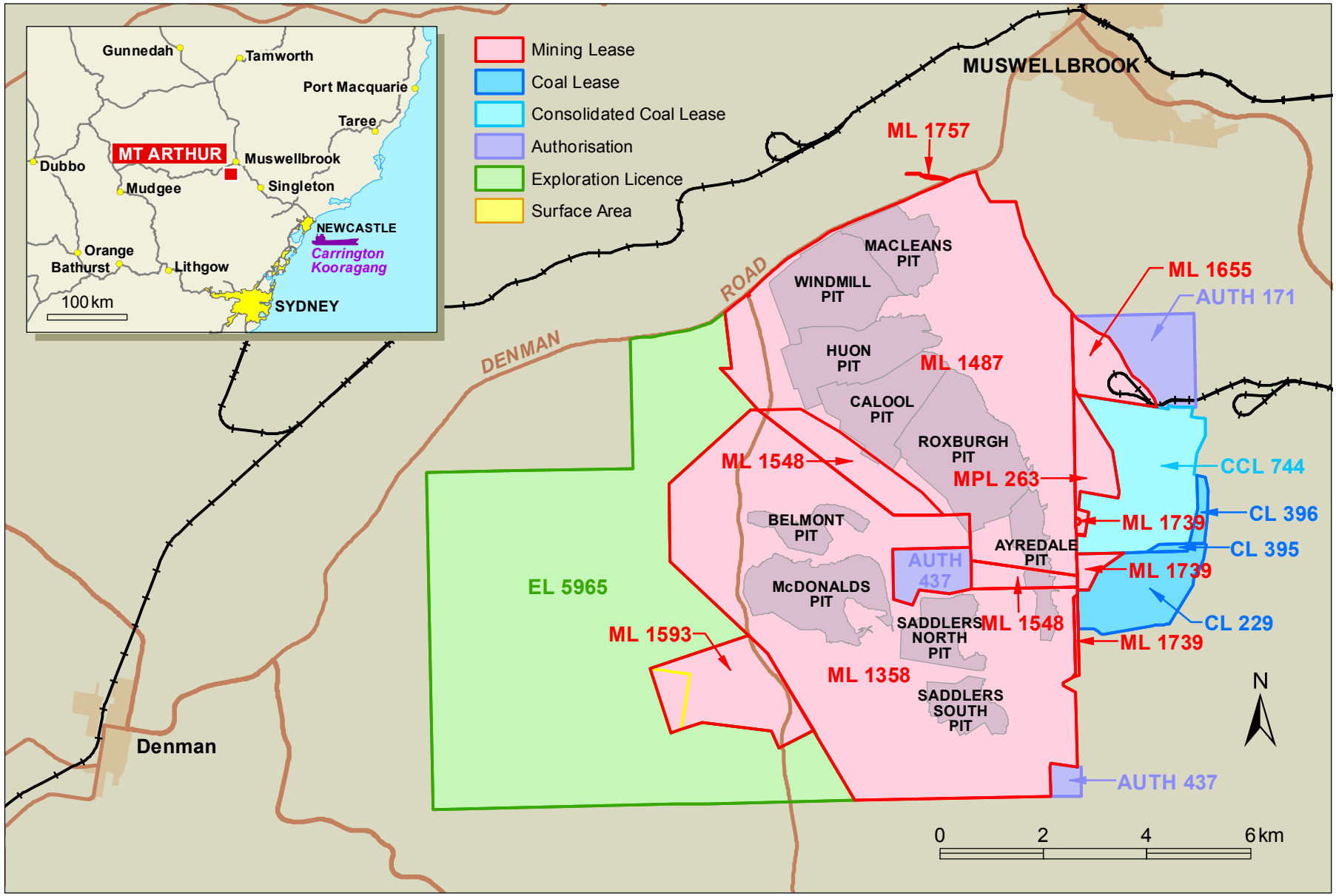
MT ARTHUR COAL

MINING LEASES AND APPROVED DISTURBANCE BOUNDARY

Drawn: P. Watts	Date: 14/08/2018	Revision: 02	Figure:
Checked: M.Gale	Filename: 20160905-1.mxd		

ML1757
THOMAS MITCHELL DRIVE
DENMAN ROAD
EDDERTON ROAD
AUTH171
ML1655
ML1487
ML1548
MPL263
CCL744
CL396
ML1739
CL395
AUTH437
CL229
ML1358
EL5965
ML1593s
ML1593
AUTH 437
6420000
380000
300000

LEGEND
Lease Areas
Approved Disturbance Boundary



Product generated by Mine2Map at 12:11:52 AEST on 11/12/2018

4. Approvals

Mt Arthur Coal has a number of statutory approvals, leases and licences that regulate activities on site. During the reporting period, the following approval modifications occurred:

- Mining lease ML 1757 was granted in satisfaction of a mining lease application (MLA 533) over a 2.45 ha parcel of land north of Denman Road for the use of a water discharge channel associated with Mt Arthur Coal's licensed discharge point to the Hunter River. The addition of ML 1757 to the Mt Arthur Colliery Holding was also approved.
- A new Mining Operations Plan (MOP) was approved by DRG on 29 June 2017 (v1.1 as amended 7 Dec 2017) for FY18-FY19 mining operations.
- EPL 11457 was varied to include:
    - special condition 'Hunter Valley Dust Risk Forecasting Trial – Spring 2017' requiring provision of daily activity and air quality data for the period 1 September 2017 to 30 November 2017 to help refine and calibrate the forecasting system used for the EPA-conducted trial.
    - removal of pollution reduction program 'Coal Mine Wind Erosion of Exposed Land Assessment' following confirmation of works being completed.
    - removal of special condition 'Commencement of Optimised Real-time Particulate Matter Monitoring' following completion of the requirement. The commencement of this monitoring replaced monitoring points 2 and 3 which were removed from the licence. An administrative update to location coordinates of the new monitoring points was also made.

Table 5: Mt Arthur Coal's existing statutory approvals as at 30 June 2018

Description	Issue date	Expiry date
Project approvals issued by the DP&E		
Mt Arthur Coal Mine Open Cut Consolidation Project Modification 1 (09_0062 MOD 1)	26/09/2014	30/06/2026
Mt Arthur Coal Mine Underground Project (06_0091)	02/12/2008	31/12/2030
Mining leases and exploration licences issued by the DRG		
CCL 744	03/07/1989	21/01/2028
CL 396	23/06/1992	03/02/2024
ML 1358	21/09/1994	21/09/2036
ML 1487	13/06/2001	12/06/2022
ML 1548	31/05/2004	30/05/2025
ML 1593	30/04/2007	29/04/2028
ML 1655	03/03/2011	03/03/2032
ML 1739	25/07/2016	25/07/2037
ML1757	07/07/2017	07/07/2038
MPL 263	17/10/1990	17/10/2032

Description	Issue date	Expiry date
A 171	18/10/2004	18/10/2020
A 437	04/03/1991	04/03/2020
EL 5965	14/07/2007	*
Drayton sublease CL 395	13/04/2006 (registered 14/06/2013)	21/01/2029
Drayton sublease CL 229	13/04/2006 (registered 14/06/2013)	02/02/2024
EPL issued by the EPA		
EPL 11457	09/10/2001 (varied on 24/08/2017)	Not specified
EPBC approval issued by the DoE		
EPBC 2011/5866	30/04/2012 (varied on 29/06/2017)	30/06/2022
EPBC 2014/7377	05/12/2016	30/06/2026

* Application for renewal lodged with the DRG and renewal is currently pending.

5. Operations summary

5.1 Mining Operations

Mining and processing operations at Mt Arthur Coal continued 24 hours a day, seven days a week during the reporting period. Mining continued within the Ayredale, Calool, Huon, Macleans, Roxburgh and Windmill open cut pits. Overburden and interburden material was removed by excavator / shovel and transported via rear dump truck to overburden emplacements, including visual dump 1 (VD1), contingency dumps 1 to 5 (CD1 to CD5) and the conveyor corridor dump. Raw coal was extracted by excavator and transported to the CHPP by rear dump truck.

Raw coal was processed at the CHPP, with 16.18 Mt product coal being railed to the port of Newcastle for export and 1.38 Mt of product coal being transported to the Bayswater power station via overland conveyor. Coarse coal waste (rejects) was co-disposed within overburden emplacements and fine coal waste (tailings) was pumped to the tailings storage emplacement in East Pit. Production figures for raw, product and waste materials produced during the reporting period are summarised in Table 6.

Table 6: Production summary

Material	Unit	Approved limit	Previous reporting period (actual)	This reporting period (actual)	Next reporting period (estimate)
Overburden	bcm	N/A	99,408,000	113,514,000	127,080,000
Run-of-mine coal	tonnes	32Mtpa	23,511,000	23,679,000	27,516,000
Coarse reject	tonnes	N/A	3,069,000	2,603,000	4,169,000
Fine reject / tailings	tonnes	N/A	1,984,000	2,650,000	2,864,000
Product (saleable) coal	tonnes	27Mtpa (by rail)	18,177,000	18,541,000	19,000,000

5.2 Other Operations

Other operations at Mt Arthur Coal during the Reporting period included:

- *Exploration*: 53 boreholes (totalling 17,727 metres) were drilled in ML1358, ML1487 and ML 1548 to further define coal seam geology and geotechnical parameters of the resource. Rehabilitation and sealing of 42 boreholes was completed. A 4km^2 3D seismic survey was completed in EL5965, ML1358 and ML1487 utilising IVI 'envirovibe' vibrators as the energy source. A 1 kilometre 2D seismic line was also completed during this campaign. No land clearance was associated with the seismic lines. During the reporting period there were no variations from the MOP related to exploration activities.
- *Land Preparation*: *Land Preparation*: During the reporting period approximately 194,400 cubic metres of topsoil was recovered from 135 ha of clearing ahead of mining using excavators, dozers and trucks and stockpiled or placed directly onto reshaped areas to be rehabilitated where able to with the remaining topsoil stockpiled. Between 100 to 300 millimetres of topsoil was recovered during stripping. A further 472,000 cubic metres was relocated from existing stockpiles on the Ayredale, Huon and Windmill Pit highwall areas and hauled to rehabilitation or prepared stockpile pads.
- *Infrastructure Construction and Management*: The following major projects were commenced, progressed or completed during the reporting period:
    - The detailed design phase for the Tailings Dam Stage 2 raise project was completed and a high risk activity notification was submitted to the DRG.
    - Decommissioning of the disused Bayswater No. 2 infrastructure area is continuing. Asbestos removal from structures has been undertaken following completion of an asbestos audit.

- Construction of the Conveyor Corridor overburden emplacement area was commenced and will progress into the next reporting period.

During the reporting period there were no variations from the current MOP related to construction works on site.

5.3 Employment Details

As at 30 June 2018, Mt Arthur Coal employed 985 permanent and fixed-term contract employees and approximately 518 contractors on a full-time equivalent basis. Approximately 54 per cent of Mt Arthur Coal's employees resided in the local government areas (LGAs) of Muswellbrook, Upper Hunter and Singleton as at 30 June 2018.

5.4 Next reporting period

Forecast operations for the next reporting period, in particular significant changes in the mine, include:

- The first phase of the Tailings Dam Stage 2 raise project involving the downstream raising of an existing embankment by 10 meters to provide ongoing tailings storage capacity;
- Increased intensity in Ayredale Pit, with additional area prepared for mining in FY19;
- Relocation of infrastructure to facilitate the approved extension of Windmill Pit, including detailed planning and design work for the realignment of Edderton Road in accordance with alignment Option 2 presented in PA 09_0062 originally granted in 2010;
- Increasing the fill rate of the existing northern fill stand and construction of an additional water fill point for the Windmill Pit to reduce the turnaround time for water carts and increase dust suppression coverage;
- Installation of skid mounted communications hut and antenna at Windmill Pit and replacement of communications tower on Mount Arthur (subject to final approval by DPI Crown Lands and Water) to improve communications coverage;
- Relocation of powerlines to facilitate the forward mine plan;
- Installation of sediment control structures downstream of the southern conveyor corridor overburden emplacement area prior to dump construction;
- Installation of additional water pipelines and associated pumps to support ongoing water management strategies;
- A temporary deployment facility including carparks, bathhouse and ablutions and office buildings is proposed to be constructed on the north western side of the main pit; and
- Refurbishment of existing maintenance and office facilities in the Bayswater mine infrastructure area.

6. Actions required from previous Annual Review

DRG conducted a site inspection 13 February 2017 and notified HVEC by letter dated 27 April 2018 that the FY17 Annual Review satisfied the Minister for Resources and Secretary for the NSW Department of Planning and Environment.

DP&E acknowledged receipt of the FY17 Annual Review by letter dated 13 November 2017.

Regulator feedback following review of the FY17 Annual Review and initial submission of the FY18 Annual Review is summarised in Table 7. The FY18 Annual Review was amended and resubmitted on 14 December 2018.

Table 7: Actions Required from FY17 Annual Review and Initial Submission of FY18 Annual Review

Action required	Requested by	Action taken by HVEC	FY18 Annual Review section
Regulator feedback from FY17 Annual Review			
Specify correct reporting period	DP&E	Reporting period correctly stated	Section 3, Introduction
Report noise results to whole numbers	DP&E	Noise results reported as integers	Section 7.1 (Tables 8 & 9)
Provide further analysis where noise results are higher than EIS predictions	DP&E	Further discussion of noise results relative to environmental assessment predictions provided.	Section 7.1, Environmental Performance – Noise
Report air quality results to whole numbers	DP&E	Air quality results reported as integers (with exception of depositional dust)	Environmental Performance – Air Quality (Tables 12, 14 & 16)
Report pH monitoring results to one decimal place	DP&E	pH monitoring results reported to one decimal point.	Section 8.3 and Section 8.4 (Tables 23 & 25)
Describe contributing factors to areas of poor revegetation performance and detail ongoing corrective measures to be applied	DRG	Corrective measures arising from Annual Rapid Assessment monitoring have been discussed.	Section 7.5, Proposed Initiatives – Biodiversity Section 9, Rehabilitation
Potential for weed outbreak across newly shaped areas designated for woodland establishment needs to be managed well	DRG	Weed management activities on rehabilitated areas have been discussed.	Section 7.5, Environmental Performance – Biodiversity Section 7.5, Environmental Performance – Weed and Feral Animal Control
Introduction of grazing should be considered in areas beyond that of the grazing trial area with a view to progression to 'ecosystem sustainability' rehabilitation phase	DRG	Activities associated with grazing on rehabilitated land have been discussed.	Section 9, Rehabilitation
The MOP should focus on moving rehabilitation classification of MacDonalds 2003 woodland rehabilitation area beyond 'ecosystem establishment' phase	DRG	Initial assessment by ecological consultant has identified actions for rehabilitation progression beyond ecosystem establishment phase in consideration of the forward mine plan.	Section 7.5, Proposed Initiatives – Biodiversity

Action required	Requested by	Action taken by HVEC	FY18 Annual Review section
Saddlers grazing area appeared thin and patchy and contour drains appeared to be overtopping – monitoring and management of this area is required to ensure suitability for long term grazing	DRG	Landform stability monitoring is undertaken as part of the Annual Rapid Assessment. The forward mine plan includes further dumping in this area which will require rehabilitation in the future.	Section 7.5, Proposed Initiatives – Biodiversity
Regulator feedback from Initial Submission of FY18 Annual Review			
The report should be referred to as the Annual Review	DP&E	Report title amended.	All sections
Include numbering for sections and headings	DP&E	Numbering of section headings incorporated.	All sections
Include figure showing regional context of the site	DP&E	Regional locality map included.	Section 3 (Figure 1a)
Sufficient information is not provided in Table 13 to justify mine contribution for 24 PM_{10} 24hr average to be less than 50ug/m^3. Append reports to provide sufficient detail.	DP&E	Tables amended to include a summary of the investigation findings to justify mine contribution.	Section 7.4 (Tables 13 and 15)
Include measures implemented to address erosion identified in the 2017 Independent Environmental Audit and details on processes implemented to identify and manage dispersive soils. The correct reference for designing sediment basins on mine sites is *Managing Urban Stormwater – Soil and Construction Volume 2E – Mines and Quarries (DECC, 2008).*	DP&E	Included management activities to identify and manage dispersive soils, particularly in areas under rehabilitation. Reference to sediment basin design guideline updated.	Section 8.2 Section 8.2, Proposed Initiatives – Erosion & Sediment
Insufficient detail was provided to support the conclusion that mining did not influence groundwater trigger level exceedances. Append reports to provide sufficient detail.	DP&E	Additional information has been supplied in Table 26. The independent Mt Arthur Coal Groundwater Level Drawdown Analysis – 2017/2018 has been appended to this report.	Section 8.4 Appendix 3
Provide plan (missing from Appendix 5) showing the rehabilitation status of the project and post mine land uses. Include a discussion on rehabilitation recommendations from the 2017 Independent Environmental Audit and details of actions proposed	DP&E	Rehabilitation plan included. Audit recommendations (such as seed mix variation, herbivore and management) and proposed actions discussed. Further detail on improvements to mine rehabilitation is discussed in MAC's response to the DRG Inspection.	Appendix 5 Section 8.2 Section 9.6
Include 2017 Independent Environmental Audit report references and conditions and close-out dates in the Independent Environmental Audit table	DP&E	Independent Environmental Audit table updated to include report references and conditions and close-out dates.	Section 11

7. Environmental Performance

7.1 Noise

Environmental Management

Noise management at Mt Arthur Coal is managed in accordance with the:

- MAC-ENC-MTP-032 Noise Management Plan; and
- MAC-ENC-PRO-056 Noise Monitoring Program.

The Noise Management Plan was prepared to fulfil the requirements of project approval, meet conditions of Environmental Protection Licence (EPL) 11457, as well as manage and minimise mine noise impact on the community and environment.

Mt Arthur Coal has eight statutory monitoring locations as detailed in the Noise Monitoring Program and four real-time monitoring locations utilised for internal use. Noise monitoring locations are shown in Figure 3.

Environmental Performance

An analysis of monthly attended noise monitoring results indicates Mt Arthur Coal's operations did not exceed the $L_{Aeq\ (15min)}$ during the reporting period. The $L_{A1\ (1min)}$ statutory limit was exceeded at NP04, however this confirmatory retest result did not apply due to adverse weather conditions. The next highest $L_{A1\ (1min)}$ result (noise level exceeded for one per cent of the time) during the reporting period for NP04 was 38 dBA. A summary of results from Mt Arthur Coal's attended noise monitoring in the reporting period is provided in Table 8: Monthly attended noise monitoring results in decibels

Noise Monitoring Location	$L_{Aeq\ (15min)}$ dB			$L_{A1\ (1min)}$ dB		Trend / key management implications	Implemented/ proposed management actions
	Approval criteria	EIS prediction	Reporting period performance (min/log ave/max^)	Approval criteria	Reporting period performance (min/log ave/max^)		
NP04	38	38	25/31/35*	45	25/42/50*	Compliant	Continuation of management and monitoring in accordance with NMP
NP07	39	38	25/30/34	45	25/38/45		
NP10	39	38	28/34/39*	45	29/38/43*		
NP12	39	41	30/34/36	45	30/37/40		
NP13	35	N/A	20/26/30*	45	20/27/32*		
NP14	35	35	20/30/34*	45	20/37/41*		
NP15	35	36	26/32/34*	45	30/38/44*		
NP16	37	38	25/30/32	45	25/36/42		

. Where a remeasure was required on the same night to determine the sustained noise level, only the remeasure result has been used to calculate tabulated results.

A comparison of FY18 noise monitoring results to previous years is presented in Table 9. FY18 $L_{Aeq(15\ min)}$ noise levels are consistent with or below historical results, except for NP12, NP13, NP14 and NP15. Data capture was 100 per cent at all attended noise monitoring sites, however, on 10 occasions noise levels from Mt Arthur Coal were audible but too low to measure.

$L_{Aeq\ (15min)}$ noise level predictions modelled for 2016 in the 2013 noise impact assessment were used for comparison with monitoring results for this reporting period, as shown in Table 8: Monthly attended noise monitoring results in decibels

Noise Monitoring Location	$L_{Aeq\ (15min)}$ dB			$L_{A1\ (1min)}$ dB		Trend / key management implications	Implemented/ proposed management actions
	Approval criteria	EIS prediction	Reporting period performance (min/log ave/max^)	Approval criteria	Reporting period performance (min/log ave/max^)		
NP04	38	38	25/31/35*	45	25/42/50*	Compliant	Continuation of management and monitoring in accordance with NMP
NP07	39	38	25/30/34	45	25/38/45		
NP10	39	38	28/34/39*	45	29/38/43*		
NP12	39	41	30/34/36	45	30/37/40		
NP13	35	N/A	20/26/30*	45	20/27/32*		
NP14	35	35	20/30/34*	45	20/37/41*		
NP15	35	36	26/32/34*	45	30/38/44*		
NP16	37	38	25/30/32	45	25/36/42		

. Maximum $L_{Aeq\ (15min)}$ noise results are generally below or consistent with modelled predictions, except for NP10. Predicted 2016 night-time noise levels in receiver Zone E (corresponding to NP10) are in the range 37-39 dBA $L_{Aeq\ (15min)}$ so the maximum recorded level is consistent with the upper end of predictions within this noise management zone. This monitoring result was also adversely affected by weather conditions, with the logarithmic average result at NP10 during the reporting period of 33 dBA $L_{Aeq\ (15min)}$ being within the EIS prediction.

The additional impact of low frequency noise was assessed in accordance with the NSW Industrial Noise Policy (INP) and Broner method, with no exceedances of the project approval assessment criteria.

Complaints and Reportable Incidents

During the reporting period, 9 noise complaints were received, which is lower than the 14 complaints in FY17, and significantly lower than the 69 complaints received in FY16. All complaints were investigated, with noise levels (generated by Mt Arthur Coal) being measured within internal management benchmarks at the nearest real-time monitor. Mt Arthur Coal did not receive any government fines or penalties related to noise data during the reporting period and there were no related reportable incidents.

Table 8: Monthly attended noise monitoring results in decibels

Noise Monitoring Location	$L_{Aeq\ (15min)}$ dB			$L_{A1\ (1min)}$ dB		Trend / key management implications	Implemented/ proposed management actions
	Approval criteria	EIS prediction	Reporting period performance (min/log ave/max^)	Approval criteria	Reporting period performance (min/log ave/max^)		
NP04	38	38	25/31/35*	45	25/42/50*	Compliant	Continuation of management and monitoring in accordance with NMP
NP07	39	38	25/30/34	45	25/38/45		
NP10	39	38	28/34/39*	45	29/38/43*		
NP12	39	41	30/34/36	45	30/37/40		
NP13	35	N/A	20/26/30*	45	20/27/32*		
NP14	35	35	20/30/34*	45	20/37/41*		
NP15	35	36	26/32/34*	45	30/38/44*		
NP16	37	38	25/30/32	45	25/36/42		

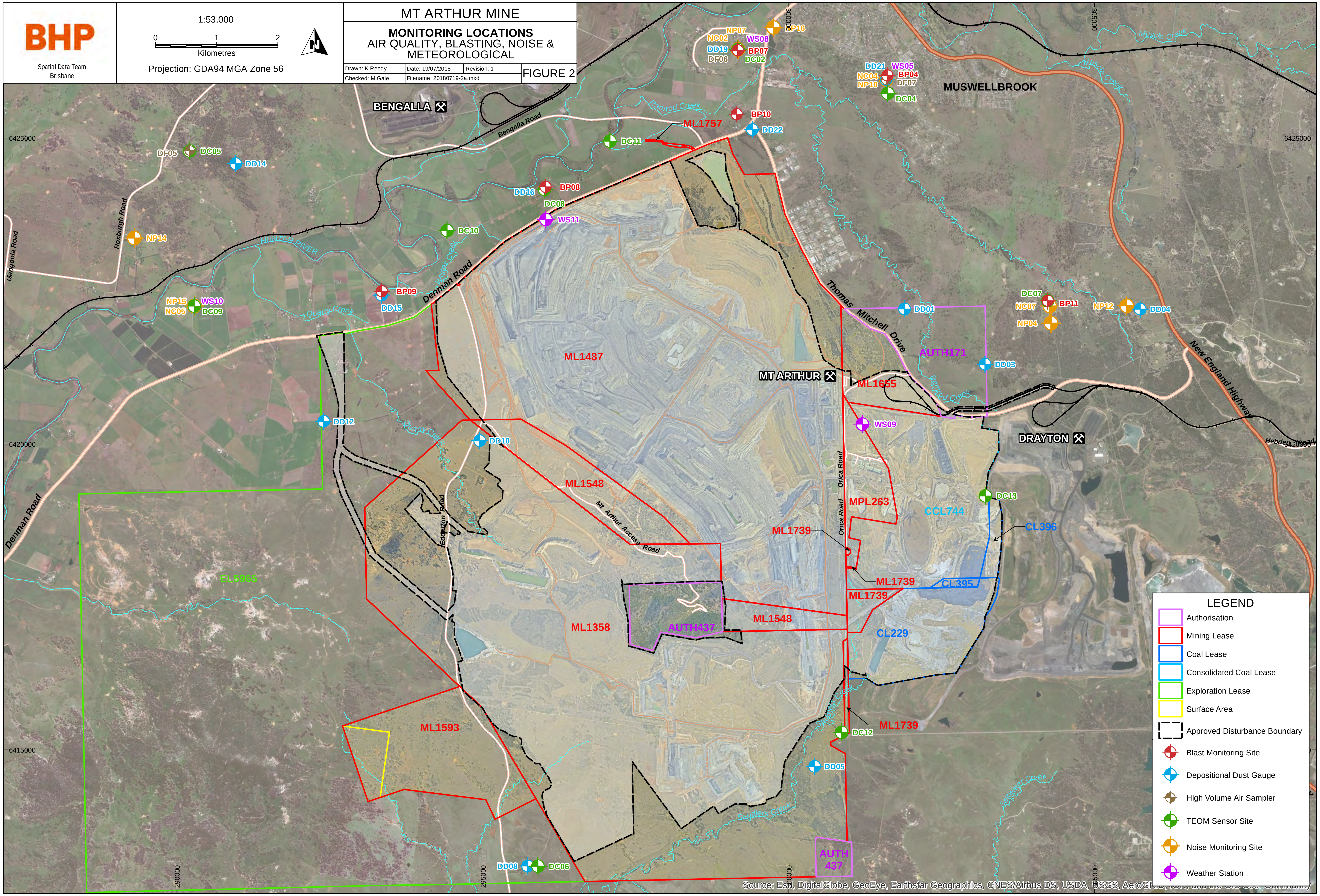
^ Measurable noise levels only – does not include *inaudible* or *not measurable* results
* Noise emission limits do not apply due to winds greater than 3 metres per second (at a height of 10 metres), or temperature inversion conditions greater than or equal to 4 degrees Celsius per 100 metres.

Table 9: Attended noise monitoring results in decibels in comparison to previous years

Monitoring Site	FY18		FY17		FY16		FY15		FY14	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
	($L_{Aeq(15\ min)}$)									
NP04	IA	35*	IA	35*	IA	34*	IA	35	IA	39*
NP07	IA	34	IA	34*	IA	38*	IA	34^	<30	38
NP10	IA	39*	IA	44*	IA	37*	IA	39	IA	39
NP12	IA	36	IA	33*	IA	33*	IA	36	IA	37
NP13	IA	30*	IA	22*	IA	<30*	IA	29*	IA	<30
NP14	IA	34*	IA	28*	IA	30*	IA	34*	IA	27
NP15	IA	34*	IA	28*	IA	33*	IA	37*	IA	31
NP16	IA	32*	IA	36*	IA	37*	IA	37*	NM	39
	($L_{Aeq(1\ min)}$)									
NP04	IA	50*	IA	37*	IA	44*	IA	41*	IA	44
NP07	IA	45	IA	37*	IA	45*	IA	45*	34	44
NP10	IA	43*	IA	38*	IA	40*	IA	44*	IA	45

Monitoring Site	FY18		FY17		FY16		FY15		FY14	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
NP12	IA	40	IA	38*	IA	41*	IA	43*	IA	43
NP13	IA	32*	IA	27*	IA	<30*	IA	33*	IA	31
NP14	IA	41*	IA	32*	IA	39*	IA	36*	IA	33
NP15	IA	44*	IA	31*	IA	41	IA	37*	IA	33
NP16	IA	42	IA	42*	IA	40*	IA	39*	NM	42

* Noise emission limits do not apply due to winds greater than 3 metres per second (at a height of 10 metres), or temperature inversion conditions greater than or equal to 4 degrees Celsius per 100 metres.
IA – Mt Arthur Coal's operations were inaudible.
NM – Mt Arthur Coal's operations were audible but not measurable.
^ Only one monitoring event in year
- – Site not included in monitoring program, no data available.


BHP
Spatial Data Team
Brisbane
1:53,000
0 1 2
Kilometres
Projection: GDA94 MGA Zone 56
MT ARTHUR MINE
MONITORING LOCATIONS
AIR QUALITY, BLASTING, NOISE & METEOROLOGICAL
Drawn: K.Reedy
Date: 19/07/2018
Revision: 1
Checked: M.Gale
Filename: 20180719-2a.mxd
FIGURE 2
LEGEND
Authorisation
Mining Lease
Coal Lease
Consolidated Coal Lease
Exploration Lease
Surface Area
Approved Disturbance Boundary
Blast Monitoring Site
Depositional Dust Gauge
High Volume Air Sampler
TEOM Sensor Site
Noise Monitoring Site
Weather Station
BENGALLA
MUSWELLBROOK
MT ARTHUR
DRAYTON
ML1757
ML1487
ML1655
ML1548
MPL263
ML1739
ML1358
ML1593
AUTH437
AUTH171
AUTH 437
CCL744
CL396
CL395
CL229
EL5965
Bengalla Road
Denman Road
Roxburgh Road
Mangoola Road
Thomas Mitchell Drive
Mt. Arthur Access Road
Edderton Road
Orica Road
New England Highway
Hebden Road
HUNTER RIVER
Ramrod Creek
Muscle Creek
Quarry Creek
Saddlers Creek
NP07
NC02
WS08
NP16
DD19
BP07
DF06
DC02
DD21
WS05
NC04
BP04
NP10
DF07
DC04
BP10
DD22
DC11
DF05
DC05
DD14
DD16
BP08
DC08
WS11
DC10
NP14
BP09
DD15
NP15
WS10
NC05
DC09
DD01
DD03
DC07
BP11
NC07
NP04
NP12
DD04
DD12
DD10
WS09
DC13
DC12
DD05
DD08
DC06
6425000
6420000
6415000
290000
295000
300000
305000
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Proposed Initiatives

Operational noise will continue to be managed and monitored in accordance with the Noise Management Plan and associated procedures. The Noise Management Plan will also be review and submitted to DP&E for approval.

7.2 Blasting

Environmental Management

Blasting at Mt Arthur Coal is managed in accordance with the:

- MAC-ENC-MTP-015 Blast Management Plan;
- MAC-ENC-PRO-055 Blast Monitoring Program; and
- MAC-ENC-MTP-024 Road Closure Management Plan.

The Blast Management Plan details the relevant blast overpressure and vibration impact assessment criteria and compliance procedures and controls related to open cut blasting activities. It also includes the blast fume management strategy, which aims to minimise visible blast fume and reduce potential for offsite fume migration. The Blast Management Plan was reviewed and approved by the DP&E during the reporting period.

Mt Arthur Coal has five statutory blast monitors:

- BP04 (South Muswellbrook);
- BP07 (Sheppard Avenue);
- BP09 (Denman Road West);
- BP10 (North Yammanie); and
- BP11 (Balmoral Road).

Blast monitoring locations are shown in Figure 2.

The modification project approval states a ground vibration limit for public infrastructure of 50 millimetres per second (mm/s), unless Mt Arthur Coal has a written agreement with the relevant owner of the public infrastructure to exceed these criteria and advises the DP&E in writing of the terms of the agreement.

Written agreements with Roads and Maritime Services (RMS), Telstra and Ausgrid are in place allowing an increase in the ground vibration blast impact assessment criteria:

- 150 mm/s with no allowable exceedances (RMS, Ausgrid);
- 10% of the total number of blasts over a period of 12 months allowed to exceed 100mm/s (Telstra, Ausgrid); and
- Notification prior to blasting for blasts predicted to exceed 100 mm/s at Denman Road (RMS).

Environmental Performance

During the reporting period, 149 blasts were undertaken. Blast data capture rates for the reporting period were 100 per cent at all statutory sites.

Blasting was only undertaken between 8 am and 5 pm Monday to Saturday, with no blasts being undertaken on Sundays or public holidays. No blast ground vibration monitoring results above the maximum 10 mm/s limit, or airblast overpressure results above the maximum 120 dBL limit were recorded at any of the statutory blast monitors during the reporting period. Of the 149 blast events fired during the reporting period, five (4%) exceeded the airblast overpressure criteria of 115 dBL and two (1.3 %) exceeded the ground vibration criteria of 5 mm/s which remained

below the five per cent allowable exceedance limit. No reportable blast fume events occurred during the reporting period, and no blast fume events resulted in fume rating above level 3.[1]

Results reflect predictions made in the 2013 consolidation environmental assessment and do not show a significant difference in average or maximum results compared to previous reporting periods. A comparison of FY18 blast monitoring results with previous years is provided in Table 10.

In accordance with the Blast Monitoring Program, potential impacts to public infrastructure were calculated for blasts in Windmill and Roxburgh pits with all blasts meeting the agreed criteria.

Table 10: Summary of statutory blast monitoring results

Parameter	Statistic	FY18	FY17	FY16	FY15	FY14
Ground vibration (mm/s)	Average	0.25	0.26	0.23	0.30	0.46
	Maximum valid result	9.78 at BP09 (Denman Road West)	3.23 at BP09 (Denman Road West)	5.09 at BP09 (Denman Road West)	7.06 at BP08 (Edinglassie)	5.99 at BP08 (Edinglassie)
	Valid blasts above 5 mm/s threshold	2	0	1	1	0
Airblast overpressure (dBL)	Average	97.2	95.6	95.4	93.9	96.1
	Maximum valid result	118.4 at BP09 (Denman Road West)	118.4 at BP09 (Denman Road West)	117.7 at BP10 (North Yammanie)	124.3 at BP08 (Edinglassie)	120.2 at BP08 (Edinglassie)
	Valid blasts above 115 dBL threshold	6	3	5	1	3

Complaints and Reportable Incidents

During the reporting period, three blast (overpressure, vibration and fume) complaints were recorded. This is a decrease from 16 complaints in FY17, and less than the 13 in FY16. All blast vibration and airblast overpressure results were within maximum regulatory criteria on dates when complaints were received in relation to these issues.

Proposed Initiatives

Initiatives to reduce the potential for blast fume impact will continue during the next reporting period. This will incorporate an updated regression analysis that includes recent blasting events. This has defined updated coefficients that will be used for more accurate vibration predictions moving forward.

The development of a predictive meteorological program (Weatherzone) was investigated during the reporting period. The intent was to assist with the prediction and tracking of weather patterns that have the potential to enhance blast

[1] Fume ratings as defined in: Australian Explosives Industry and Safety Group Inc. Code of Practice. Prevention and Management of Blast Generated NOx Gases in Surface Blasting. Edition 2. August 2011.

https://www.aeisg.org.au/wp-content/uploads/aeisg_cop_nox_edition_02aug2011.pdf

impacts. In addition, the blast supervisor will be enabled to make in the field decisions on when to blast, rather than relying on desktop applications. Further development of the tool will occur during the next reporting period.

7.3 Meteorological Data

Environmental Management

Meteorological monitoring at Mt Arthur Coal is managed in accordance with the:

- MAC-ENC-PRO-057 Air Quality Monitoring Program.

Mt Arthur Coal's primary statutory real-time meteorological station located at the mine's industrial area (WS09) is an essential component of the operation's environmental monitoring system. At the station, wind speed, wind direction, temperature, rainfall, solar radiation and humidity data is collected at 15 minute intervals and relayed using radio telemetry.

A secondary statutory real-time meteorological station, located off site to the north west of the mine at Wellbrook (WS10), also provides representative weather data for the mine site, including prevailing wind conditions, and is used in conjunction with WS09 to determine the presence and strength of temperature inversions in the local atmosphere as part of the pre-blast environmental assessment.

Both statutory meteorological stations comply with the Australian Standard 2923-1987 *Ambient Air – Guide for measurement of horizontal wind for air quality applications* and the NSW INP.

Environmental Performance

Meteorological data capture rate for the reporting period was 100 per cent at WS09 and 97 per cent at WS10 with the capture rate impacted by data logger issues.

Rainfall for the reporting period (319 mm) was significantly lower than the long-term average of 619 mm. Wind direction at Mt Arthur Coal (WS09) during the reporting period was predominantly from the north-west (Winter/Spring) and south-east (Summer/Autumn).

Proposed Initiatives

Mt Arthur Coal will continue to record and utilise meteorological data from its two statutory monitors during the next reporting period.

Mt Arthur Coal proposes to install additional meteorological instrumentation in the next reporting period.

7.4 Air Quality

Environmental Management

Air quality at Mt Arthur Coal is managed in accordance with:

- MAC-ENC-MTP-040 Air Quality and Greenhouse Gas Management Plan;
- MAC-ENC-PRO-057 Air Quality Monitoring Program; and
- MAC-PRD-PRO-122 Dust Management Procedure.

Mt Arthur Coal operates an air quality monitoring network consisting of:

- Six statutory dust deposition gauges recording dust fallout, which can be derived from mining or non-mining activities, and provide a useful measure of changing air quality.
- Three high volume air samplers (HVAS) monitoring fine dust particles (PM_{10}) for 24-hours every six days.
- Six statutory real-time dust monitors, referred to as tapered element oscillating microbalance samplers (TEOMs), which record PM_{10} levels on a continuous basis.

- One additional TEOM, which also records continuous PM_{10} levels, which is non-statutory and used for proactive internal management purposes.
- A real-time short message service (SMS) alarm system that provides notifications to operational staff, in response to air quality monitoring measurements at real-time monitors, enabling dust-generating activities to be adjusted.

Air Quality monitoring locations are shown in Figure 3.

A predictive dust model predicts maximum PM_{10} concentrations up to 72 hours in advance for operational dust management planning and notification of mining supervisors when adverse weather conditions are predicted.

A dust Trigger Action Response Plan (TARP) is triggered when internal guideline monitoring conditions are exceeded (and notified by SMS message). Dedicated supervisors facilitate dust TARP response, dust complaint inspections, off site environmental inspections and coordination of operational response.

Environmental Performance

Air dispersion modelling completed for the 2016 representative mining scenario, as part of the 2013 environmental assessment, has been used to evaluate monitoring results for the reporting period.

Depositional Dust Gauges

The results from the statutory depositional dust monitoring results are summarised in Table 11. Depositional dust gauge data capture rates for the reporting period were 100 per cent at all statutory sites.

For the reporting period, two statutory depositional dust gauges exceeded the annual average assessment criteria, as shown in Table 11. Assessment of wind direction concluded that the MAC was not likely the primary source of dust. The annual average exceedances at DD15 and DD19 were notified to DP&E along with the results of the wind direction assessment and determination of mine contribution. Annual average depositional dust results were generally higher than in FY17.

Monitoring results for the reporting period were generally higher than predictions modelled for 2016 in the 2013 air quality assessment, indicating that the dry conditions experienced throughout this reporting period and other local dust producing sources have had an influence on monitoring results.

Table 11: Comparison of annual average deposited dust results

Monitor Location	Approval criteria (Annual average)	Annual average Depositional Dust (g/m^2/ month)				Trend / key management implications	Implemented/ proposed management actions
		FY18	FY17	FY16	FY15		
Antiene (DD04)	4 g/m^2/ month	2.5	2.1	2.3	2.7	Compliant	Continue dust management in accordance with AQMP.
Edderton Homestead (DD08)		1.4	1.4	1.6	1.1		
Roxburgh Road (DD14)		2.3	1.6	1.8	2.1		
Denman Road West (DD15)		4.7*	4.0	3.0	2.9		
Sheppard Avenue (DD19)		4.6**	2.7	3.1	3.3		
South Muswellbrook (DD21)		2.3	1.7	1.8	2.2		

*During the reporting period, the wind was from the direction of MAC for 47% of the time. If all the deposited dust from this direction originated from MAC (an unlikely scenario), the contribution to the total from MAC would be 2.2 g/m^2/month. Sampling comments were included for DD15 as follows: Jan 2018: dusty cattle track next to gauge; May 2018: Recent harvesting and ploughing in the area.
**During the reporting period, the wind was from the direction of MAC for 10% of the time. If all the deposited dust from this direction originated from MAC, the contribution to the total from MAC would be 0.45 g/m^2/month. There were no sampling comments for DD19. Sources in the immediate area include unsealed roads and agricultural activities.

High Volume Air Samplers

A summary of results from the statutory HVAS PM_{10} monitoring sites for the reporting period is provided in Table 12 and further results can be found in Appendix 1 – Air Quality Monitoring Results.

During the period 26 December 2017 to 7 January 2018, HVAS DF07 malfunctioned and recorded unreliable values. This resulted in a total of three 24-hour results being missed and a data capture rate of 95% for the reporting period. Data capture rates for DF05 and DF06 were 100% for the reporting period.

The short term 24-hour impact assessment criteria was exceeded five times at HVAS monitoring site DF05, seventeen times at monitoring site DF06 and two times at monitoring site DF07. Investigations calculated Mt Arthur Coal's contribution to be less than 50 µg/m^3 for each exceedance, allocated on the proportion that wind direction was from the mining operation to receptor. Regional air quality trends at the time and localised influences or events were also considered during the investigations. 24-hour PM_{10} results and calculated Mt Arthur Coal contributions are summarised in Table 13.

During the reporting period, DF05 and DF07 remained below the long-term annual average impact assessment criteria, whereas DF06 exceeded the impact assessment criteria. The exceedance notified to DP&E along with the results of the wind direction assessment and determination of mine contribution.

Air dispersion modelling predictions based on the cumulative annual average PM_{10} for the 2016 mining scenario have been used to evaluate HVAS results, as summarised in Table 12.

Table 12: Summary of HVAS PM_{10} results

Monitor Location	Approval criteria (µg/m^3)	2016 – predicted cumulative µg/m^3	Monitoring results (µg/m^3)				Trend / key management implications	Implemented/ proposed management actions
			FY18		FY17			
			Max 24-hr result	Annual average	Max 24-hr result	Annual average		
Roxburgh Road (DF05)	Short term 24-hr average: 50 Long term annual average: 30	25	91*	24	56*	17	Compliant	Continue dust management in accordance with AQMP
Sheppard Avenue (DF06)		26	103*	40**	47^	23		
South Muswellbrook (DF07)		24	87*^	24	43	19		

* Table 12 results, which include air emissions from all sources, were all investigated as they exceeded the 24-hour impact assessment criterion of 50 µg/m^3. Investigations found that Mt Arthur Coal's contribution to these results was less than 50 µg/m^3 on all occasions.
** Table 12 results, which include air emissions from all sources, were all investigated as they exceeded the annual impact assessment criterion of 30 µg/m^3. Investigations found that Mt Arthur Coal's contribution to these results was less than the criterion.
^ This maximum result does not include results for DF06 from 12 January to 23 February 2017 and for DF07 from 26 December 2017 to 7 January 2018, due to malfunctioning during these times.

Table 13: 24-hour PM_{10} results and calculated Mt Arthur Coal contributions for HVAS

Date of event	Monitor location	24-hour PM_{10} result ($\mu g/m^3$)	Mt Arthur Coal contribution ($\mu g/m^3$)	Summary of investigation findings
3/09/2017	DF06	63	0	63 $\mu g/m^3$ was recorded at the Sheppard Avenue (DF06) HVAS monitor. This monitor was located downwind of Mt Arthur Coal's operations for zero per cent of the day. Calculated based on the HVAS 24hr PM10 result and wind direction, it is inferred that Mt Arthur Coal made a contribution of 0 $\mu g/m^3$.
9/09/2017	DF06	52	11	52 $\mu g/m^3$ was recorded at the Sheppard Avenue (DF06) HVAS This monitor was located downwind of Mt Arthur Coal's operations for 22 per cent of the day.. Calculated based on the HVAS 24hr PM10 result and wind direction, it is inferred that Mt Arthur Coal made a contribution of 11 $\mu g/m^3$.
27/09/2017	DF05 DF06	66 54	43 7	66 µg/m3 was recorded at the Roxburgh Road (DF05) HVAS. This monitor was located downwind of Mt Arthur Coal's operations for 66 per cent of the day Calculated based on the HVAS 24hr PM10 result and wind direction, it is inferred that Mt Arthur Coal made a contribution of 43 µg/m3. 54 µg/m3 was recorded at the Sheppard Avenue (DF06) HVAS monitor. This monitor was located downwind of Mt Arthur Coal's operations for 14 per cent of the day. Calculated based on the HVAS 24hr PM10 result and wind direction, it is inferred that Mt Arthur Coal made a contribution of 7 µg/m3.
8/12/2017	DF06	86	13	86 $\mu g/m^3$ was recorded at the Sheppard Avenue (DF06) HVAS monitor. This monitor was located downwind of Mt Arthur Coal's operations for 16 per cent of the day. Calculated based on the HVAS 24hr PM_{10} result and wind direction, it is inferred that Mt Arthur Coal made a contribution of 13 $\mu g/m^3$.
14/12/2017	DF06	70	5	70 $\mu g/m^3$ was recorded at the Sheppard Avenue (DF06) HVAS monitor. This monitor was located downwind of Mt Arthur Coal's operations for 7 per cent of the day. Calculated based on the HVAS 24hr PM_{10} result and wind direction, it is inferred that Mt Arthur Coal made a contribution of 5 $\mu g/m^3$.
20/12/2017	DF07	87	6	87 $\mu g/m^3$ was recorded at the South Muswellbrook (DF07) HVAS monitor, although it is noted that the machine may have been faulty during this sample run as it subsequently malfunctioned, so the validity of this result is uncertain. This monitor was located downwind of Mt Arthur Coal's operations for 7 per cent of the day. Calculated based on the HVAS 24hr PM_{10} result and wind direction, it is inferred that Mt Arthur Coal made a contribution of 6 $\mu g/m^3$.

Date of event	Monitor location	24-hour PM_{10} result ($\mu g/m^3$)	Mt Arthur Coal contribution ($\mu g/m^3$)	Summary of investigation findings
1/01/2018	DF05	63	31	63 $\mu g/m^3$ was recorded at the Roxburgh Rd (DF05) HVAS monitor. This monitor was located downwind of Mt Arthur Coal's operations for 49 per cent of the day. Calculated based on the HVAS 24hr PM_{10} result and wind direction, it is inferred that Mt Arthur Coal made a contribution of 31$\mu g/m^3$.
7/01/2018	DF06	89	0	89 $\mu g/m^3$ was recorded at the Sheppard Avenue (DF06) HVAS monitor. This monitor was not located downwind of Mt Arthur Coal's operations for any portion of the day. Calculated based on the HVAS 24hr PM_{10} result and wind direction, it is inferred that Mt Arthur Coal made a contribution of 0 $\mu g/m^3$.
13/01/2018	DF06	87	1	87 $\mu g/m^3$ was recorded at the Sheppard Avenue (DF06) HVAS monitor.. This monitor was located downwind of Mt Arthur Coal's operations for 1 per cent of the day. Calculated based on the HVAS 24hr PM_{10} result and wind direction, it is inferred that Mt Arthur Coal made a contribution of 1 $\mu g/m^3$.
19/01/2018	DF05 DF06	91 103	37 13	91 $\mu g/m^3$ was recorded at the Roxburgh Rd (DF05) HVAS monitor. This monitor was located downwind of Mt Arthur Coal's operations for 37 per cent of the day. Calculated based on the HVAS 24hr PM10 result and wind direction, it is inferred that Mt Arthur Coal made a contribution of 37$\mu g/m^3$. 103 $\mu g/m^3$ was recorded at the Sheppard Avenue (DF06) HVAS monitor. This monitor was located downwind of Mt Arthur Coal's operations for 13 per cent of the day. Calculated based on the HVAS 24hr PM10 result and wind direction, it is inferred that Mt Arthur Coal made a contribution of 13 $\mu g/m^3$.
25/01/2018	DF06	68	15	68 $\mu g/m^3$ was recorded at the Sheppard Avenue (DF06) HVAS monitor. This monitor was located downwind of Mt Arthur Coal's operations for 22 per cent of the day. Calculated based on the HVAS 24hr PM10 result and wind direction, it is inferred that Mt Arthur Coal made a contribution of 15 $\mu g/m^3$.
31/01/2018	DF06	57	5	57 $\mu g/m^3$ was recorded at the Sheppard Avenue (DF06) HVAS monitor. This monitor was located downwind of Mt Arthur Coal's operations for 9 per cent of the day. Calculated based on the HVAS 24hr PM_{10} result and wind direction, it is inferred that Mt Arthur Coal made a contribution of 5 $\mu g/m^3$.
6/02/2018	DF06	56	5	56 $\mu g/m^3$ was recorded at the Sheppard Avenue (DF06) HVAS monitor. This monitor was located downwind of Mt Arthur Coal's operations for 10 per cent of the day. Calculated based on the HVAS 24hr PM_{10} result and wind direction, it is inferred that Mt Arthur Coal made a contribution of 5 $\mu g/m^3$.

Date of event	Monitor location	24-hour PM_{10} result ($\mu g/m^3$)	Mt Arthur Coal contribution ($\mu g/m^3$)	Summary of investigation findings
12/02/2018	DF06	59	6	59 $\mu g/m^3$ was recorded at the Sheppard Avenue (DF06) HVAS monitor. This monitor was located downwind of Mt Arthur Coal's operations for 10 per cent of the day. Calculated based on the HVAS 24hr PM_{10} result and wind direction, it is inferred that Mt Arthur Coal made a contribution of 6 $\mu g/m^3$.
18/02/2018	DF05 DF06	55 62	25 19	62 $\mu g/m^3$ was recorded at the Sheppard Avenue (DF06) HVAS monitor. This monitor was located downwind of Mt Arthur Coal's operations for 41 per cent of the day. Calculated based on the HVAS 24hr PM_{10} result and wind direction, it is inferred that Mt Arthur Coal made a contribution of 25 $\mu g/m^3$. 55 $\mu g/m^3$ was recorded at Roxburgh Rd (DF05) HVAS monitor. This monitor was located downwind of Mt Arthur Coal's operations for 35 per cent of the day. Calculated based on the HVAS 24hr PM_{10} result and wind direction, it is inferred that Mt Arthur Coal made a contribution of 19 $\mu g/m^3$.
24/02/2018	DF06	71	13	71 $\mu g/m^3$ was recorded at the Sheppard Ave (DF06) HVAS monitor. This monitor was located downwind of Mt Arthur Coal's operations for 19 per cent of the day. Calculated based on the HVAS 24hr PM_{10} result and wind direction, it is inferred that Mt Arthur Coal made a contribution of 13 $\mu g/m^3$.
20/03/2018	DF05 DF06 DF07	71 94 59	36 17 20	71 $\mu g/m^3$ was recorded at Roxburgh Rd (DF05) HVAS monitor. This monitor was located downwind of Mt Arthur Coal's operations for 51 per cent of the day. Calculated based on the HVAS 24hr PM_{10} result and wind direction, it is inferred that Mt Arthur Coal made a contribution of 36 $\mu g/m^3$. 94 $\mu g/m^3$ was recorded at the Sheppard Avenue (DF06) HVAS monitor. This monitor was located downwind of Mt Arthur Coal's operations for 18 per cent of the day. Calculated based on the HVAS 24hr PM_{10} result and wind direction, it is inferred that Mt Arthur Coal made a contribution of 17 $\mu g/m^3$. 59 $\mu g/m^3$ was recorded at the South Muswellbrook (DF07) HVAS monitor. This monitor was located downwind of Mt Arthur Coal's operations for 33 per cent of the day. Calculated based on the HVAS 24hr PM_{10} result and wind direction, it is inferred that Mt Arthur Coal made a contribution of 20 $\mu g/m^3$.
1/04/2018	DF06	60	10	60 $\mu g/m^3$ was recoded at Sheppard Avenue (DF06) HVAS monitor. This monitor was located downwind of Mt Arthur Coal's operations for 17 per cent of the day. Calculated based on the HVAS 24hr PM_{10} result and wind direction, it is inferred that Mt Arthur Coal made a contribution of 10 $\mu g/m^3$.

Date of event	Monitor location	24-hour PM_{10} result ($\mu g/m^3$)	Mt Arthur Coal contribution ($\mu g/m^3$)	Summary of investigation findings
19/05/2018	DF06	58	11	58 µg/m³ was recoded at Sheppard Avenue (DF06) HVAS monitor. This monitor was located downwind of Mt Arthur Coal's operations for 19 per cent of the day. Calculated based on the HVAS 24hr PM_{10} result and wind direction, it is inferred that Mt Arthur Coal made a contribution of 11 $\mu g/m^3$.

Tapered Element Oscillating Microbalance Samplers

A summary of the results from the statutory real-time TEOM PM_{10} monitoring sites for the reporting period is provided in Table 14 and further results are provided in Appendix 1 – Air Quality Monitoring Results.

Except for the Sheppard Avenue monitoring site, data capture for reporting period ranged between 95 and 99 per cent and averaged 97% across all sites. The Sheppard Avenue monitor had a data capture rate of 93% over the reporting period due to a technical fault from 9 August to 31 August 2017.

During the reporting period, the short term 24-hour impact assessment criteria was exceeded seventy three times at statutory TEOM monitoring sites. With the exception of 27 September 2017 at Wellbrook, all other recorded exceedances found that Mt Arthur Coal's contribution was less than 50 $\mu g/m^3$. These exceedances are recorded below in Table 15. Exceedance investigations for each elevated result have been based on assessment of regional air quality influences and proportional mine-to-receptor wind direction, indicating the likely contribution from Mt Arthur Coal.

It should be noted that the dry conditions experienced throughout this reporting period have had an influence on the elevated results recorded. An extended drought, high temperatures, regional dust episodes and particulates from bushfires have been associated with the particularly dry conditions.

During the reporting period Mt Arthur Coal's statutory TEOM monitoring sites remained below the long-term annual impact assessment criteria. All statutory TEOMs experienced a rise in the average when compared with the FY17 results, this can be attributed to the dry conditions experienced throughout this reporting period.

Air dispersion modelling predictions for the 2016 mining scenario have been used to evaluate annual average TEOM PM_{10} results for the reporting period, as summarised in in Table 14. The monitored annual average PM_{10} is below the predicted cumulative annual average PM_{10} concentrations at all sites, with the exception of Sheppard Avenue where the predicted annual average result was exceeded by 3 $\mu g/m^3$, influenced by the dry conditions experienced throughout this reporting period.

Table 14: Summary of TEOM PM_{10} monitoring results

Monitor location	Approval criteria ($\mu g/m^3$)	2016 – predicted cumulative ($\mu g/m^3$)	TEOM PM_{10} Monitoring results ($\mu g/m^3$)				Trend / key management implications	Implemented/ proposed management actions
			FY18		FY17			
			Max 24-hour result	Annual average $\mu g/m^3$	Max 24-hour result	Annual average $\mu g/m^3$		
Sheppard Avenue (DC02)	Short term 24-hour average: 50 Long term annual average: 30	26	92*	29	76*	18	Compliant	Continue dust management in accordance with AQMP
South Muswellbrook (DC04)		24	65*	22	53*	19		
Roxburgh Road (DC05)		25	68*	19	40	10		
Edderton Homestead (DC06)		22	46	14	38	13		
Antiene (DC07)		20	67*	18	42	14		
Wellbrook (DC09)		21	78*	21	65*	14		

* These results, which include air emissions from all sources, were investigated as they exceeded the short term 24-hour impact assessment criterion of 50 µg/m^3. Investigations found that Mt Arthur Coal's contribution to these results was less than 50 µg/m^3 on all occasions.

Table 15: 24-hour PM_{10} results and calculated Mt Arthur Coal contributions for Statutory TEOMs

Date of event	Monitor location	24-hour PM_{10} result (µg/m^3)	Mt Arthur Coal contribution (µg/m^3)*	Summary of investigation findings
13/09/2017	DC02	60	0	60 ug/m^3 was recorded at the Sheppard Avenue (DC02) real-time monitor. This monitor was located downwind of Mt Arthur Coal's operations for zero per cent of the day. Calculated based on five minute TEOM data and wind direction, it is inferred that Mt Arthur Coal made a contribution of 0 µg/m^3.
23/09/2017	DC02	50	0	50 ug/m^3 was recorded at the Sheppard Avenue (DC02) real-time monitor.. This monitor was located downwind of Mt Arthur Coal's operations for zero per cent of the day. Calculated based on five minute TEOM data and wind direction, it is inferred that Mt Arthur Coal made a contribution of 0 µg/m^3.
24/09/2017	DC02	60	0	60 ug/m^3 was recorded at the Sheppard Avenue (DC02) real-time monitor This monitor was located downwind of Mt Arthur Coal's operations for zero per cent of the day. Calculated based on five minute TEOM data and wind direction, it is inferred that Mt Arthur Coal made a contribution of 0 µg/m^3.
25/09/2017	DC02 DC04	71 51	0 12	71 ug/m^3 was recorded at the Sheppard Avenue (DC02) real-time monitor. This monitor was located downwind of Mt Arthur Coal's operations for zero per cent of the day. Calculated based on five minute TEOM data and wind direction, it is inferred that Mt Arthur Coal made a contribution of 0 µg/m^3. 51 ug/m^3 was recorded at the South Muswellbrook (DC04) real-time monitor. This monitor was located downwind of Mt Arthur Coal's operations for 21.9 per cent of the day. Calculated based on five minute TEOM data and wind direction, it is inferred that Mt Arthur Coal made a contribution of 12 µg/m^3.
27/09/2017	DC05 DC09	61 55	46 51	61 ug/m^3 was recorded at the Roxburgh Road (DC05) real-time monitor. This monitor was located downwind of Mt Arthur Coal's operations for 65.6 per cent of the day. Calculated based on five minute TEOM data and wind direction, it is inferred that Mt Arthur Coal made a contribution of 46 µg/m^3. 55 ug/m^3 was recorded at the Wellbrook (DC09) real-time monitor. This monitor was located downwind of Mt Arthur Coal's operations for 83.3 per cent of the day. Calculated based on five minute TEOM data and wind direction, it is inferred that Mt Arthur Coal made a contribution of 51 µg/m^3.

Date of event	Monitor location	24-hour PM_{10} result ($\mu g/m^3$)	Mt Arthur Coal contribution ($\mu g/m^3$)*	Summary of investigation findings
28/09/2017	DC02	54	4	54 ug/m^3 was recorded at the Sheppard Avenue (DC02) real-time monitor. This monitor was located downwind of Mt Arthur Coal's operations for 7.3 per cent of the day. Calculated based on five minute TEOM data and wind direction, it is inferred that Mt Arthur Coal made a contribution of 4 $\mu g/m^3$.
30/09/2017	DC02	52	3	52 ug/m^3 was recorded at the Sheppard Avenue (DC02) real-time monitor. This monitor was located downwind of Mt Arthur Coal's operations for 4.2 per cent of the day. Calculated based on five minute TEOM data and wind direction, it is inferred that Mt Arthur Coal made a contribution of 3 $\mu g/m^3$.
2/10/2017	DC02	51	10	51 ug/m^3 was recorded at the Sheppard Avenue (DC02) real-time monitor. This monitor was located downwind of Mt Arthur Coal's operations for 24.0 per cent of the day. Calculated based on five minute TEOM data and wind direction, it is inferred that Mt Arthur Coal made a contribution of 10 $\mu g/m^3$.
8/12/2017	DC02	63	16	63 ug/m^3 was recorded at the Sheppard Avenue (DC02) real-time monitor. This monitor was located downwind of MAC's operations for 15.6% of the day. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 16 $\mu g/m^3$.
13/12/2017	DC09	78	7	78 ug/m^3 was recorded at the Wellbrook (DC09) real-time monitor. This monitor was located downwind of MAC's operations for 21.9% of the day. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 7 $\mu g/m^3$.
14/12/2017	DC02	52	3	52 ug/m^3 was recorded at the Sheppard Avenue real-time monitor. This monitor was located downwind of MAC's operations for 7.3% of the day. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 3 $\mu g/m^3$.
15/12/2017	DC02 DC05 DC09	62 54 56	5 40 40	62 ug/m^3 was recorded at the Sheppard Avenue (DC02) real-time monitor. This monitor was located downwind of MAC's operations for 10.4% of the day. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 5 $\mu g/m^3$. 54 ug/m^3 was recorded at the Roxburgh Road (DC05) real-time monitor. This monitor was located downwind of MAC's operations for 61.5% of the day. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 40 $\mu g/m^3$. 56 ug/m^3 was recorded at the Wellbrook real-time monitor. This monitor was located downwind of MAC's operations for 83.0% of the day. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 45 $\mu g/m^3$.

Date of event	Monitor location	24-hour PM_{10} result (µg/m^3)	Mt Arthur Coal contribution (µg/m^3)*	Summary of investigation findings
20/12/2017	DC02	58	1	58 ug/m^3 was recorded at the Sheppard Avenue real-time monitor. This monitor was located downwind of MAC's operations for 3.1% of the day. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 1 µg/m^3.
8/01/2018	DC02 DC09	54 52	7 21	54 µg/m^3 was recorded Sheppard Avenue (DC02) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 12.5% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 7 µg/m^3. 52 µg/m^3 was recorded at Wellbrook (DC09) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 30% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 21 µg/m^3.
13/01/2018	DC02	66	1	66 µg/m^3 was recorded at Sheppard Avenue (DC02) real-time monitor. This monitor was recorded as being downwind of MAC's operations for less than 1% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 1 µg/m^3.
16/01/2018	DC02	57	7	57 µg/m^3 was recorded at Sheppard Avenue (DC02) real-time monitor. This monitor was recorded as being downwind of MAC's operations for less than 20% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 7 µg/m^3.
18/01/2018*	DC02	52	3	52 µg/m^3 was recorded at Sheppard Avenue (DC02) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 13% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 3 µg/m^3.
19/01/2018	DC02 DC05	66 56	3 17	66. µg/m^3 was recorded at the Sheppard Avenue (DC02) real-time monitor. This monitor was recorded as being downwind of MAC operations for approximately 7% of the 24-hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 3 µg/m^3. 56µg/m^3 was recorded at the Roxburgh Road TEOM (DC05) real-time monitor. This monitor was recorded as being downwind of MAC operations for approximately 41% of the 24-hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 17 µg/m^3.
20/01/2018	DC02	56	6	56 µg/m^3 was recorded at Sheppard Avenue (DC02) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 8% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 6 µg/m^3.

Date of event	Monitor location	24-hour PM_{10} result ($\mu g/m^3$)	Mt Arthur Coal contribution ($\mu g/m^3$)*	Summary of investigation findings
22/01/2018	DC02	61	15	61 $\mu g/m^3$ was recorded at Sheppard Avenue (DC02) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 18% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 15 $\mu g/m^3$.
23/01/2018	DC02 DC04 DC05 DC09	79 52 62 63	6 3 35 19	79 $\mu g/m^3$ was recorded at Sheppard Avenue (DC02) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 14% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 6 $\mu g/m^3$. 52 ug/m^3 was recorded at the South Muswellbrook (DC04) real-time monitor. This monitor was located downwind of Mt Arthur Coal's operations for 6 per cent of the day. Calculated based on five minute TEOM data and wind direction, it is inferred that Mt Arthur Coal made a contribution of 3 $\mu g/m^3$. 62 $\mu g/m^3$ was recorded at the Roxburgh Road TEOM (DC05) real-time monitor. This monitor was recorded as being downwind of MAC operations for approximately 36% of the 24-hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 35 $\mu g/m^3$. 63 $\mu g/m^3$ was recorded at Wellbrook (DC09) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 22% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 19 $\mu g/m^3$.
24/01/2018	DC02 DC04	60 52	1 2	60 $\mu g/m^3$ was recorded at Sheppard Avenue (DC02) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 14% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 1 $\mu g/m^3$. 52 ug/m^3 was recorded at the South Muswellbrook (DC04) real-time monitor. This monitor was located downwind of Mt Arthur Coal's operations for 3 per cent of the day. Calculated based on five minute TEOM data and wind direction, it is inferred that Mt Arthur Coal made a contribution of 2 $\mu g/m^3$.
26/01/2018	DC04	55	4	52 ug/m^3 was recorded at the South Muswellbrook (DC04) real-time monitor. This monitor was located downwind of Mt Arthur Coal's operations for 7 per cent of the day. Calculated based on five minute TEOM data and wind direction, it is inferred that Mt Arthur Coal made a contribution of 4 $\mu g/m^3$.
30/01/2018	DC02	52	6	52 $\mu g/m^3$ was recorded at Sheppard Avenue (DC02) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 11% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 6 $\mu g/m^3$.

Date of event	Monitor location	24-hour PM_{10} result (µg/m^3)	Mt Arthur Coal contribution (µg/m^3)*	Summary of investigation findings
3/02/2018	DC02	79	0	79 µg/m^3 was recorded at Sheppard Avenue (DC02) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 0% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 0 µg/m^3.
9/02/2018	DC02 DC05 DC09	92 68 62	8 15 6	92 µg/m^3 was recorded at Sheppard Avenue (DC02) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 9% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 8 µg/m^3. 68 µg/m^3 was recorded at the Roxburgh Road TEOM (DC05) real-time monitor. This monitor was recorded as being downwind of MAC operations for approximately 22% of the 24-hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 15 µg/m^3. 62 µg/m^3 was recorded at Wellbrook (DC09) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 12% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 6 µg/m^3.
11/02/2018	DC02 DC09	60 53	3 9	60 µg/m^3 was recorded at Sheppard Avenue (DC02) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 6% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 3 µg/m^3. 53 µg/m^3 was recorded at Wellbrook (DC09) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 16% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 9 µg/m^3.
14/02/2018	DC02	60	1	60 µg/m^3 was recorded at Sheppard Avenue (DC02) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 2% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 1 µg/m^3.
15/02/2018	DC02 DC04 DC09	80 61 68	16 11 19	80 µg/m^3 was recorded at Sheppard Avenue (DC02) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 19% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 16 µg/m^3. 61 ug/m^3 was recorded at the South Muswellbrook (DC04) real-time monitor. This monitor was located downwind of Mt Arthur Coal's operations for 16 per cent of the day. Calculated based on five minute TEOM data and wind direction, it is inferred that Mt Arthur Coal made a contribution of 11 µg/m^3. 68 µg/m^3 was recorded at Wellbrook (DC09) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 24% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 19 µg/m^3.

Date of event	Monitor location	24-hour PM_{10} result ($\mu g/m^3$)	Mt Arthur Coal contribution ($\mu g/m^3$)*	Summary of investigation findings
16/02/2018	DC02	86	0	86 $\mu g/m^3$ was recorded at Sheppard Avenue (DC02) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 0% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 0 $\mu g/m^3$.
19/02/2018	DC02	88	6	88 $\mu g/m^3$ was recorded at Sheppard Avenue (DC02) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 7% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 6 $\mu g/m^3$.
19/03/2018	DC02 DC04 DC05 DC07 DC09	79 73 57 60 57	4 11 20 10 10	79 $\mu g/m^3$ was recorded at Sheppard Avenue (DC02) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 6% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 4 $\mu g/m^3$. 73 ug/m^3 was recorded at the South Muswellbrook (DC04) real-time monitor. This monitor was located downwind of Mt Arthur Coal's operations for 14 per cent of the day. Calculated based on five minute TEOM data and wind direction, it is inferred that Mt Arthur Coal made a contribution of 11 $\mu g/m^3$. 57 $\mu g/m^3$ was recorded at the Roxburgh Road TEOM (DC05) real-time monitor. This monitor was recorded as being downwind of MAC operations for approximately 24% of the 24-hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 20 $\mu g/m^3$. 60 $\mu g/m^3$ was recorded at the Antiene TEOM (DC07) real-time monitor. This monitor was recorded as being downwind of MAC operations for approximately 24% of the 24-hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 10 $\mu g/m^3$. 57 $\mu g/m^3$ was recorded at Wellbrook (DC09) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 17% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 10 $\mu g/m^3$.

Date of event	Monitor location	24-hour PM_{10} result ($\mu g/m^3$)	Mt Arthur Coal contribution ($\mu g/m^3$)*	Summary of investigation findings
20/03/2018	DC02 DC04 DC05 DC07 DC09	75 60 60 55 54	4 8 12 15 7	75 $\mu g/m^3$ was recorded at Sheppard Avenue (DC02) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 6% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 4 $\mu g/m^3$. 60 ug/m^3 was recorded at the South Muswellbrook (DC04) real-time monitor. This monitor was located downwind of Mt Arthur Coal's operations for 14% of the day. Calculated based on five minute TEOM data and wind direction, it is inferred that Mt Arthur Coal made a contribution of 8 $\mu g/m^3$. 60 $\mu g/m^3$ was recorded at the Roxburgh Road TEOM (DC05) real-time monitor. This monitor was recorded as being downwind of MAC operations for approximately 25% of the 24-hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 12 $\mu g/m^3$. 55 $\mu g/m^3$ was recorded at the Antiene TEOM (DC07) real-time monitor. This monitor was recorded as being downwind of MAC operations for approximately 25% of the 24-hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 15 $\mu g/m^3$. 54 $\mu g/m^3$ was recorded at Wellbrook (DC09) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 17% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 7 $\mu g/m^3$.
9/04/2018	DC02	61	3	61 $\mu g/m^3$ was recorded at Sheppard Avenue (DC02) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 2% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 3 $\mu g/m^3$.

Date of event	Monitor location	24-hour PM_{10} result ($\mu g/m^3$)	Mt Arthur Coal contribution ($\mu g/m^3$)*	Summary of investigation findings
15/04/2018	DC02 DC04 DC05 DC07 DC09	73 71 51 65 63	0 0 0 12 0	73 $\mu g/m^3$ was recorded at Sheppard Avenue (DC02) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 0% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 0 $\mu g/m^3$. 71 ug/m^3 was recorded at the South Muswellbrook (DC04) real-time monitor. This monitor was located downwind of Mt Arthur Coal's operations for 0% of the day. Calculated based on five minute TEOM data and wind direction, it is inferred that Mt Arthur Coal made a contribution of 0 $\mu g/m^3$. 51 $\mu g/m^3$ was recorded at the Roxburgh Road TEOM (DC05) real-time monitor. This monitor was recorded as being downwind of MAC operations for approximately 0% of the 24-hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 0 $\mu g/m^3$. 65 $\mu g/m^3$ was recorded at the Antiene TEOM (DC07) real-time monitor. This monitor was recorded as being downwind of MAC operations for approximately 28% of the 24-hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 12 $\mu g/m^3$. 63 $\mu g/m^3$ was recorded at Wellbrook (DC09) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 0% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 0 $\mu g/m^3$.
29/04/2018	DC09	62	38	62 $\mu g/m^3$ was recorded at Wellbrook (DC09) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 43% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 38 $\mu g/m^3$.
4/05/2018	DC02	68	3	68 $\mu g/m^3$ was recorded at Sheppard Avenue (DC02) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 9% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 3 $\mu g/m^3$.
11/05/2018	DC02	68	0	68 $\mu g/m^3$ was recorded at Sheppard Avenue (DC02) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 0% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 0 $\mu g/m^3$.
28/05/2018	DC02	56	9	56 $\mu g/m^3$ was recorded at Sheppard Avenue (DC02) real-time monitor. This monitor was recorded as being downwind of MAC's operations for 28% of the 24 hour period. Calculated based on five minute TEOM data and wind direction, it is inferred that MAC made a contribution of 9 $\mu g/m^3$.

*The results reported in this table are based on unvalidated data, as reported to regulators.

Total Suspended Particulates

TEOM PM_{10} monitoring data is used to calculate annual average total suspended particulate (TSP) levels. TSP results were calculated by multiplying the annual average PM_{10} results by 2.5, in accordance with the approved Air Quality Monitoring Program. During the reporting period, TSP remained below the long-term annual impact assessment criteria at all statutory sites. TSP at each of the monitoring locations were above the reported values for FY17, attributed to the dry conditions experienced throughout this reporting period.

Table 16: Summary of Total Suspended Particulate results

Site name	Approval criteria	TSP annual average monitoring results (µg/m³)				Trend / key management implications	Implemented/ proposed management actions
		FY18	FY17	FY16	FY15		
Sheppard Avenue (DC02)	Long term annual average: 90µg/m³	71	44	48	49	Compliant	Continue dust management in accordance with AQMP
South Muswellbrook (DC04)		55	46	45	50		
Roxburgh Road (DC05)		47	26	35	40		
Edderton Homestead (DC06)		35	33	30	31		
Antiene (DC07)		44	35	35	36		
Wellbrook (DC09)		51	35	35	36		

Complaints and Reportable Incidents

During the reporting period, 13 dust-related complaints were received, which is lower than FY17 (27 complaints), and lower than FY16 (26 complaints). Complaint investigations indicated that real-time dust levels and 24-hour averages remained within regulatory limits at the monitoring location nearest to the complainant.

Mt Arthur Coal received one dust related fine during the reporting period as detailed in the Incidents and Non-compliances section of this report. A Penalty Notice of $15,000 and an Official Caution were issued by the EPA for the alleged breach of 64(1) of the POEO Act, being failure to comply with condition O3.1 of the MAC EPL that occurred on 17 November 2017.

Mt Arthur Coal also received an official caution from the Department of Planning and Environment as detailed in the Incidents and Non-compliances section of this report. This was based on events that occurred over the month of December.

There were no dust related reportable incidents in the reporting period.

Proposed Initiatives

Mt Arthur Coal proposes to upgrade components of the air quality monitoring network and real time monitoring system in the next reporting period to improve system accuracy and reliability.

7.5 Biodiversity

Environmental Management

Flora and fauna at Mt Arthur Coal is managed in accordance with the:

- MAC-ENC-MTP-047 Rehabilitation Strategy;
- MAC-ENC-PRO-012 Land Management;
- MAC-ENC-MTP-050 Biodiversity Management Plan (BMP);
- MAC-ENC-PRG-007 Onsite and Near Offsite Offset Management Program;
- MAC-ENC-PRG-008 Offset Management Program – Middle Deep Creek Offset Area; and
- MAC-ENC-PRO-080 Rehabilitation and Ecological Monitoring Procedure.

The BMP together with the Offset Management Programs (OMPs) effectively manage habitat areas within and in the vicinity of the mine and associated conservation and biodiversity offset areas, reducing potential impacts and improving general habitat quality.

The biodiversity offset areas managed by Mt Arthur Coal, including expansions and additions in the reporting period, are:

- Mount Arthur Conservation Area (101 hectares);
- Saddlers Creek Conservation Area (431.3 hectares);
- Thomas Mitchell Drive Offsite Offset Area (492 hectares);
- Thomas Mitchell Drive Onsite Offset Area (219 hectares);
- Roxburgh Offset Area (109 hectares); and
- Middle Deep Creek Offset Area and Oakvale Offset Area (1257 hectares).

In accordance with the modification project approval, long-term security for the Mt Arthur Coal biodiversity offset areas is provided through conservation agreements, for which completion of formal registration on title was achieved during the reporting period.

Mt Arthur Coal undertakes annual flora and fauna monitoring to track progress against the management plan and MOP objectives. The monitoring program tracks the condition of habitat areas over time and ensures that the management plan's established performance indicators and project approval requirements are being met. The program includes 24 monitoring sites throughout site woodland rehabilitation areas and remnant vegetation areas onsite and within offset areas. Remnant vegetation monitoring sites are used to assess mine impact and natural regeneration, as well providing reference data for comparative assessment of rehabilitation monitoring sites.

During the reporting period owing to extended drought conditions in the Hunter region the planting work to be undertaken at Thomas Mitchell Drive Onsite Offset and Middle Deep Creek Offset was put on hold. The areas planned for rehabilitation were ripped but have to date remained unplanted. The DP&E was notified of the proposed change on 8 May 2018 and again on 6 August 2018.

Weed and Feral Animal Control

As well as an annual weed survey conducted by independent consultants, weed impact and feral animal presence is continually monitored through scheduled inspections and workforce feedback. Information from these sources is used to plan the weed and feral animal control programs across the mine site and all biodiversity offset and conservation areas.

Weed control programs primarily target weeds that are locally declared under the *Noxious Weeds Act 1993*. Other weed species were also treated when in the vicinity of noxious weeds.

The vertebrate pest management program continued during the reporting period, with a campaign utilising 1080 baiting to target wild dogs (*Canis lupus familiaris*) and foxes (*Vulpes vulpes*).

Environmental Performance

The annual ecological development monitoring program, consisting of vegetation community assessment and fauna surveys, was undertaken in late November 2017 by independent consultants. The annual survey assessed diversity and habitat condition across nine sites in accordance with the rotational schedule of the monitoring program. Those sites consisted of:

- Two rehabilitation sites in the mine site woodland corridor (MCV2 and VB3);
- One offsite regeneration site at the Roxburgh offset area (RX2);
- One offsite reference revegetation site at the Edderton offset are (ED1); and
- Three remnant revegetation reference sites in both onsite and offsite offsets (RX1, SC2 and TMDON1).

Four nesting box monitoring locations (MACT, TMD Onsite, Saddlers Creek and Mt Arthur) were also monitored.

Biodiversity Monitoring Results

Results of flora and vertebrate fauna species for the monitoring sites are provided in Table 17, along with a condition assessment score, which indicates ecological health based on condition attributes such as canopy health, erosion, vegetation patch shape, epicormic growth, weed invasion, mid strata density, ground strata density and connectivity.

Rehabilitation Areas

It is noted that the dataset at MCV2 is not large enough to identify strong trends but the data (including qualitative information) indicate that at this point in time, the rehabilitation is progressing well. The MCV2 rehabilitation site was established in 2003 and first monitored in FY15. It has now been monitored four times. The cumulative dataset indicates that in many ways, the attributes of the MCV2 rehabilitation site at FY18 are consistent with the previous three years, notwithstanding minor variations in diversity and abundance values.

There is no major dieback of vegetation in any stratum that would indicate failure of establishment or serious problems with the rehabilitation. There are no major outbreaks of invasive weeds or indications of native species suppression due to competition with introduced species. Regeneration of native canopy species indicates natural recruitment is taking place, which is desirable and negates the need for supplementary planting. Rehabilitated vegetation at MCV2 appears to be developing into distinct canopy, middle and understorey layers, with pioneering species, such as *Acacia,* senescing progressively as the canopy trees grow. This is considered to be a natural process in the development of the vegetation.

The floristic assemblage at MCV2 is generally consistent with the species composition and structure criteria for Central Hunter Ironbark – Spotted Gum – Grey Box Forest as outlined in Table 13 of the MOP. It contains a canopy dominated by Corymbia maculata (Spotted Gum), an understorey supported by *Acacia salicina* (Cooba) and a small number of native and introduced grass and herb species that are listed in the Baseline Ecological Study of Mt Arthur Coal Biodiversity Offset and Conservation Areas (Section 4.2.9, Umwelt, 2014).

The average native species diversity at MCV2 is lower than the average native species diversity at relevant reference sites, as would be expected at this stage of rehabilitation development. The floristic assemblage at MCV2 is generally consistent with the species composition and structure criteria for *Central Hunter Ironbark – Spotted Gum – Grey Box Forest* as outlined in Table 11 of the current MOP; however, planting with respect to introducing target shrub and ground cover species would increase the number of target species in the understorey.

The diversity of fauna species at MCV2 in FY18 is slightly higher than fauna diversity recorded in FY17 and the greatest species richness recorded on the site since monitoring began. The Vulnerable Speckled Warbler (*Chthonicola sagittata*) and Eastern Bentwing-bat (*Miniopterus orianae oceanensis*) were recorded at MCV2 consistently over the three years of monitoring.

Rehabilitation at the MCV2 site is currently 15 years old and vegetation at this site is now at *Phase 4 Ecosystem and Landuse Establishment*. An assessment of the rehabilitation sites against specific performance and completion criteria for *Domain D Rehabilitation – Native Woodland* rehabilitated vegetation is shown in Table 18.

The VB3 rehabilitation site was established in 2006 and FY18 was the first year of monitoring for the site. The native species diversity at VB3 is lower than the average native species diversity at the TMDON1 reference site, which is consistent with expectations. The average introduced species diversity at VB3 is higher than recorded at Mt Arthur NE Slopes, which is also consistent with expectations.

It is noted that the dataset at VB3 is not large enough to identify trends but the data (including qualitative information) indicates that at this point in time, the rehabilitation is progressing well. There is no major dieback of vegetation in any stratum that would indicate failure of establishment or serious problems with the rehabilitation. There are no major outbreaks of invasive weeds or indications of native species suppression due to competition with introduced species. No regeneration of native canopy species was observed as only shrubs were present which are likely the original tubestocks planted in FY13. The density of canopy species in the shrub layer was observed to be low with only a 1% projected foliage cover. As a result additional is planned to be conducted until natural recruitment of canopy species occurs.

The floristic assemblage at VB3 consists of a species composition similar to Central Hunter Box – Ironbark Woodland as outlined in Table 11 of the MOP; however, the structure is not similar to this community, which is to be expected at this early stage of the rehabilitation.

As this site has not been previously monitored, no comparison can be made to previous years fauna monitoring. During the FY18 EDMP (when both VB3 and TMDON1 were monitored) the native species diversity at VB3 was significantly lower than at TMDON1. With reference to the average native species diversity, the data demonstrates that the native species diversity at VB3 is also lower than the average native species diversity at the TMDON reference site. The results are to be expected during the early stages of rehabilitation as VBS lacks microhabitats suitable for fauna usage.

Table 17: Flora and fauna species recorded and condition assessment scores

Parameter	Rehabilitation Site		Regeneration Site	Reference (Revegetation) Site	Reference (Existing) Site		
	MCV2	VB3	RX2	ED1	RX1	SC2	TMD ON1
Native flora species (No.)	17	14	27	35	46	43	42
Native flora species (% of total)	53	64	57	90	87	78	69
Introduced flora species (No.)	15	8	20	4	7	12	19
Introduced flora species (% of total)	47	36	43	10	13	22	31
Total flora species	32	22	47	39	53	55	61
Total condition score out of 32	25	10	28	30	30	30	29
Amphibians	0	0	0	0	1	0	0
Reptiles	3	1	1	5	7	3	4
Birds	17	8	18	21	15	16	16
Mammals	8	3	10	7	10	10	7
Total fauna species	28	12	29	33	33	29	27
Threatened fauna species^	2	0	3	3	3	4	2
Introduced fauna species	0	2	0	0	1	0	0

^ Does not include migratory- or marine-listed species declared under the EPBC Act

Conservation and Offset Areas Results

The remnant vegetation monitoring sites established in the conservation and offset areas are also used as reference sites against which rehabilitation sites can be measured.

Performance indicators relevant to the first four years of management of the conservation and offset areas are provided in the MOP under *Domain F - Onsite Conservation and Offset Areas*. Compliance with these performance indicators and the relevant management actions in the BMP is evaluated in Table 19. Compliance with the broader scope and requirements of the BMP will be evaluated through the Independent Environmental Audit and/or Biodiversity Audit process.

Nest Box Monitoring Results

Nest box occupancy rates during the reporting period were:

- Mt Arthur - 48% (12 of 25);
- MACT - 43% (6 of 14 located);
- TMD Onsite - 14% (1 of 7); and
- Saddlers Creek - 0% (0 of 9).

A comparison of the nest box results in FY18 with earlier monitoring years indicates that Mt Arthur continues to have the highest occupancy rates over time compared with the other nest box sites. Occupancy rates remained unchanged relative to FY17. Prior to this, occupancy rates increased since monitoring in FY16 and FY15.

Occupancy rates at TMD Onsite and Saddlers Creek have been variable, but low, since FY15. Due to the low numbers of nest boxes at these sites, a difference in occupation at one or two nest boxes can produce large variations.

The continued low occupancy rates at Saddlers Creek may potentially be related to the heights of the nest boxes and the open and rather exposed nature of the woodland vegetation at this site. The continued low occupancy rates at TMD Onsite is generally likely due to the lack of connectivity with other woodland areas. Connectivity in this area will increase with time as the Rehabilitation Woodland Corridor to the west of this area develops.

Table 18: Status of management actions from the BMP

Relinquishment Criteria	MCV2 (Domain D)
Phase – 4. Ecosystem and Landuse Establishment	
All areas shown as Native Woodland vegetation community in Plan 4, planted with a native species mix (seed or tubestock) targeted at establishing an open grassy woodland vegetation community.	Compliant for isolated stand of woodland at this monitoring site. On a whole of site basis, this criterion will not be fully compliant until all rehabilitation has been undertaken in the woodland corridor.
Rehabilitation species composition (seed mix or tubestock) drawn from the species list in Section 7.2 for Central Hunter Box – Ironbark Woodland or Central Hunter Ironbark - Spotted Gum – Grey Box Forest	Partially compliant with Central Hunter Ironbark - Spotted Gum – Grey Box Forest. Canopy and ground strata species are compliant but shrub layer missing except for *Acacia salicina*. Ground cover includes six compliant species. Note: A new seed mix for this rehabilitation area has been proposed which includes additional shrub species characteristic of the community. The implementation of this new seed mix should enhance the species diversity within the shrub layer over time.
All structural dominant species represented compared with analogue site	Partially compliant.
The diversity, percentage and density of shrubs and juvenile trees with a stem diameter <5cm is comparable to that of the local remnant vegetation.	Compliant
The total number of live native plant species is greater than or comparable to the local remnant vegetation	Not compliant
The number of tree, shrub and sub-shrub species is comparable to that of the local remnant vegetation	Compliant
Species composition for revegetation will be aimed at establishing a complex community structure consisting of groundcover, understory and canopy.	Compliant
Nesting boxes (various bird, squirrel glider, possum and bat) and natural habitat features (including large rocks, logs/coarse woody debris, hollow bearing timber) are placed in established native woodland rehabilitation.	Compliant. Large (habitat) logs have been placed in clumps within the stand of woodland.
Number of weed species and surface area comparable to reference sites	Compliant
Program implemented for fuel load assessment and reduction, with advice from NSW Rural Fire Service	Compliant

Relinquishment Criteria	MCV2 (Domain D)
Pest animal infestation comparable to reference sites, with ongoing control program in place.	Compliant
Where adjacent to selected grazing or operational mining land, adequate fencing and signage is installed and maintained to prevent unintentional vehicle and livestock access.	Compliant
Rehabilitated native vegetation distribution will link areas of onsite and near-site native vegetation, and be consistent with the biodiversity corridors consistent with the latest version of the DRE Synoptic Plan.	Compliant

Relinquishment Criteria	VB3 (Domain D)
Phase – 4. Ecosystem and Landuse Establishment	
All areas shown as Native Woodland vegetation community in Plan 4, planted with a native species mix (seed or tubestock) targeted at establishing an open grassy woodland vegetation community.	Compliant for isolated stand of woodland at this monitoring site. On a whole of site basis, this criterion will not be fully compliant until all rehabilitation has been undertaken in the woodland corridor.
Rehabilitation species composition (seed mix or tubestock) drawn from the species list in Section 7.2 for Central Hunter Box – Ironbark Woodland or Central Hunter Ironbark - Spotted Gum – Grey Box Forest	Partially compliant with Central Hunter Ironbark Woodland. Canopy tubestock species plantings are compliant but shrub layer does not contain any compliant species. Ground cover includes seven compliant species.
All structural dominant species represented compared with analogue site	Partially compliant.
The diversity, percentage and density of shrubs and juvenile trees with a stem diameter <5cm is comparable to that of the local remnant vegetation.	Not compliant
The total number of live native plant species is greater than or comparable to the local remnant vegetation	Not compliant
The number of tree, shrub and sub-shrub species is comparable to that of the local remnant vegetation	Not compliant
Species composition for revegetation will be aimed at establishing a complex community structure consisting of groundcover, understory and canopy.	Compliant
Nesting boxes (various bird, squirrel glider, possum and bat) and natural habitat features (including large rocks, logs/coarse woody debris, hollow bearing timber) are placed in established native woodland rehabilitation.	Compliant. Large (habitat) logs have been placed in clumps within the stand of woodland.
Number of weed species and surface area comparable to reference sites	Not compliant
Program implemented for fuel load assessment and reduction, with advice from NSW Rural Fire Service	Compliant
Pest animal infestation comparable to reference sites, with ongoing control program in place.	Compliant

Relinquishment Criteria	VB3 (Domain D)
Where adjacent to selected grazing or operational mining land, adequate fencing and signage is installed and maintained to prevent unintentional vehicle and livestock access.	Compliant
Rehabilitated native vegetation distribution will link areas of onsite and near-site native vegetation, and be consistent with the biodiversity corridors consistent with the latest version of the DRE Synoptic Plan.	Compliant

Table 19: Status of rehabilitation sites against MOP completion criteria

Criteria	SC2	RX1	RX2	TMDON1
MOP Relinquishment Criteria for Phase – 5. Ecosystem and Landuse Sustainability (for Domain F – Onsite Conservation and Offset Areas)				
Compliance with management actions presented in the site Biodiversity Management Plan, as evidenced through the most recent Independent Environmental Audit and/or Biodiversity Audit.	Compliant	Compliant	Compliant	Compliant
BMP Section 5.1 – Offset Area Revegetation/Regeneration Works				
Natural regeneration encouraged and facilitated through livestock exclusion, fencing and access control, weed and pest management and bushfire management	Compliant (natural regeneration phase)	Compliant (natural regeneration phase)	Compliant (natural regeneration phase)	Compliant (natural regeneration phase)
All active revegetation works will be designed with structural and floristic diversity suitable to meet the benchmark vegetation community targets	N/A – no active revegetation required at this stage	N/A – no active revegetation required at this stage.	N/A – no active revegetation required at this stage.	N/A – no active revegetation required at this stage.
All active revegetation will involve use of local provenance seed.	N/A – no active revegetation required at this stage	N/A – no active revegetation required at this stage	N/A – no active revegetation required at this stage	N/A – no active revegetation required at this stage
Revegetation areas will be subject to a monitoring program developed.	N/A – no active revegetation required at this stage.	N/A – no active revegetation required at this stage.	N/A – no active revegetation required at this stage	N/A – no active revegetation required at this stage.
BMP Section 5.2 – General Offset Area Management Measures				
Fencing will only be used within the offset and conservation areas to replace existing fencing, or where potential vegetation disturbance by land use impacts warrants additional protection	Compliant	Compliant	Compliant	Compliant
Identification of areas with potential for impact on ecological values from human, vehicle or stock access	Compliant	Compliant	Compliant	Compliant
Fencing will be used to delineate those areas that are being actively regenerated, to exclude grazing impacts and allow vegetation to regenerate naturally.	Compliant	Compliant	Compliant	Compliant
Appropriate signage will be used at key access points to the offset and conservation area to identify that the areas are of high ecological significance.	Compliant	Compliant	Compliant	Compliant

Weed and Feral Animal Control

Annual weed assessments were conducted by land management consultants on the Mt Arthur Coal site in September 2017, and the biodiversity offset and conservation areas in November 2017.

Six Class I to Class III declared noxious weed species were identified in the FY18 reporting period:

- African boxthorn (*Lycium ferocissimum*)
- Blue Heliotrope (*Heliotropium amplexicaule*)
- Coolatai Grass (*Hyparrhenia Hirta*)
- Mother-of-millions (*Chrysanthemoides Monilifera*)
- Pampas Grass (*Cortaderia* species)
- Prickly Acacia *(Acacia Nilotica)*

Mt Arthur Coal targeted over 286 hectares of land for weed treatment during the reporting period. Priority areas for treatment included the mine site boundary, rehabilitation areas and the biodiversity offset and conservation areas. Weed control methods included chemical spraying, cut and paste and manual removal. Target species included African boxthorn (*Lycium ferocissimum*), Galenia (*Galenia pubescens*), Prickly Pear (*Cylindropuntia* species) and St Johns Wort (*Hypericum perforatum*).

During May and June 2018, a wild dog and fox baiting campaign was completed across Mt Arthur Coal mine site and adjacent conservation areas. During the campaign, 102 baits were laid across 31 locations, with 9 wild dog takes and 29 fox takes. At Middle Deep Creek and Roxburgh Rd Offset Areas 177 baits were laid across 59 locations, with 28 wild dog takes and 13 fox takes.

Complaints and Reportable Incidents

Mt Arthur Coal did not receive any government fines or penalties related to biodiversity during the reporting period and there were no related reportable incidents.

Proposed Initiatives

Mt Arthur Coal will continue to implement the Ecological Development Monitoring Program during the next reporting period, with monitoring of woodland rehabilitation, remnant woodland community sites and regeneration areas within conservation areas. Mt Arthur Coal will also continue to implement annual landform stability assessments of existing rehabilitation in the next reporting period.

Additional planting at VD1 and MacDonalds woodland rehabilitation areas will be conducted to progress these areas towards closure criteria.

Mt Arthur Coal will continue removing waste items and repairing sections of fence that require maintenance in conservation and biodiversity offset areas during the next reporting period.

During the next reporting period Mt Arthur Coal will execute 3 year plan that includes an annual weed assessment, weed strategy and weed management review. Weed management priorities will be revised based on the outcomes of the reviews with the aim of improving strategies for weed control across the site with particular focus on newly established rehabilitation.

During the next reporting period, Mt Arthur Coal will also implement another vertebrate pest management program on site and across all conservation and offset areas.

7.6 Visual Amenity and Lighting

Environmental Management

Visual amenity and lighting management at Mt Arthur Coal is managed in accordance with the:

- MAC-ENC-PRO-071 Visual Assessment Procedure;
- MAC-PRD-PRO-073 Procedure for Lighting Plant Movement and Setup; and
- MAC-ENC-PRO-077 Light Management Procedure.

Mt Arthur Coal's visual assessment procedure ensures overburden emplacement development is monitored and assessed against modelled predictions in the consolidation environmental assessment.

Management measures presented in the Light Management Procedure aim to control and reduce the impact of lighting on the surrounding area. The procedure is used in conjunction with the procedure for lighting plant movement and setup, which advises operational staff on correct alignment of lights to avoid offsite impact.

Environmental Performance

Visual impact inspections were completed in July 2017. Inspections indicated that locations to the east of Mt Arthur Coal have extensive views of rehabilitated overburden dumps, with reduced visual contrast to surrounding non-mined landforms and peripheral visual impact from active mining activities. From locations to the north and west, a distinct visual contrast between mining activity and the surrounding non-mined landscape is evident due to exposure to low wall overburden dumps. For all locations the shape and size of the overburden dumps are within the predicted model shown in the consolidation environmental assessment.

Complaints and Reportable Incidents

During the reporting period, 14 lighting complaints were received, which was lower than FY17 (18 complaints) and FY16 (19 complaints). Where complaints were received at night, immediate action was taken to locate and redirect the offending light, to address the complainant concerns.

Mt Arthur Coal did not receive any government fines or penalties related to lighting or visual amenity during the reporting period and there were no related reportable incidents.

Proposed Initiatives

During the reporting period Mt Arthur Coal continued to incorporate fluvial geomorphic principles into the design of overburden emplacements. Rehabilitated landforms were reshaped to facilitate natural surface flow processes, resulting in a final shape that more closely mimics the adjacent non-mined landscape and reduces visual impact. This process will be developed further in subsequent reporting periods.

Lighting from Mt Arthur Coal will continue to be implemented in accordance with the Light Management Procedure and managed to minimise impacts on the local community whilst maintaining the minimum level necessary for operational and safety needs.

7.7 Aboriginal Cultural Heritage

Environmental Management

Aboriginal cultural heritage at Mt Arthur Coal is managed in accordance with the:

- MAC-ENC-MTP-042 Aboriginal Heritage Management Plan.

Mt Arthur Coal has implemented a management plan that provides the framework to identify, assess, monitor, conserve and manage Aboriginal cultural heritage. The management plan assists Mt Arthur Coal to mitigate the impacts of its operations on Aboriginal cultural heritage, comply with the requirements of the *National Parks and Wildlife Act 1974*, EP&A Act and the modification project approval and continue its active partnership with the Aboriginal community.

Environmental Performance

During March 2018, salvage works were undertaken in the Edderton Road realignment area in collaboration with Gillian Goode from RPS archaeologists with the assistance of the registered Aboriginal parties. A small number of artefacts were salvaged and recorded in accordance with the methodology detailed in the Aboriginal Heritage Management Plan.

Further monitoring occurred in relation to the grinding grooves at Fairfield 1. These grinding grooves need to be salvaged and relocated and in collaboration with Gillian Goode from RPS and the Registered Aboriginal parties this area was assessed for relocation. In June 2018, Registered Aboriginal parties monitored geotechnical work at this site in order to test the strength of the rock and the likely success of future removal and relocation. It is likely that these grinding grooves can be successfully relocated and it is intended to invite the Registered Aboriginal Parties to attend a meeting at Mt Arthur Coal to provide them with a briefing on the proposed salvage methodology and to seek their advice regarding the best site for relocation. 3D imaging has also been undertaken to enable the site to be reproduced at a future date, if appropriate.

Complaints and Reportable Incidents

Mt Arthur Coal did not receive any government fines or penalties related to Aboriginal cultural heritage during the reporting period and there were no related reportable incidents.

Proposed Initiatives

The Mt Arthur Coal cultural heritage management plan will be reviewed and updated in FY19, to update the disturbance boundary, cultural heritage site data as well as information about the grinding groove relocation. Visual inspections of the other grinding grooves will be undertaken.

7.8 European Cultural Heritage

Environmental Management

European cultural heritage at Mt Arthur Coal is managed in accordance with the:

- MAC-ENC-MTP-046 European Heritage Management Plan;
- MAC-ENC-MTP-048 Edinglassie and Rous Lench Conservation Management Plan - Volume 1;
- MAC-ENC-MTP-049 Edinglassie and Rous Lench Conservation Management Plan - Volume 2; and
- MAC-ENC-PRG-004 Edinglassie and Rous Lench Heritage Management Program.

Mt Arthur Coal has implemented several management plans that provide the framework to identify, assess, monitor, conserve and manage European cultural heritage. Mt Arthur Coal owns and manages five heritage-listed homesteads as follows:

- Edinglassie Homestead (state significance);
- Rous Lench Homestead (state significance);
- Edderton Homestead Complex (local significance);
- Belmont Homestead Complex (local significance); and
- Balmoral Homestead (local significance).

The two State-significant historic heritage items with possible impacts from the Mt Arthur Coal operation are the Edinglassie and Rous Lench homesteads.

The European heritage management plan assists Mt Arthur Coal to coordinate and manage the European heritage items affected or potentially affected by its operations, comply with the requirements of the Heritage Act 1977 and the consolidation project approval and mitigate impacts of its operations on European cultural heritage.

Environmental Performance

During the reporting period, Mt Arthur Coal inspected all of its historic homesteads and related buildings located on freehold land to ensure properties were maintained to an acceptable standard.

Complaints and Reportable Incidents

Mt Arthur Coal did not receive any government fines or penalties related to European cultural heritage during the reporting period and there were no related reportable incidents.

Proposed Initiatives

All heritage structures are planned to remain in situ during the next reporting period with no impacts predicted from the current mine plan. Inspections and maintenance measures will continue to be implemented during the next reporting period to conserve all historic homesteads and related buildings owned by Mt Arthur Coal.

7.9 Contaminated Land and Hydrocarbon Contamination

Environmental Management

Contaminated land at Mt Arthur Coal is managed in accordance with the:

- MAC-ENC-PRO-028 Storage of Fuels and Chemicals;
- MAC-ENC-PRO-029 Spill Response;
- MAC-ENC-PRO-074 Contaminated Land Management; and
- MAC-STE-PRO-013 Hazardous Materials Management Procedure.

Hydrocarbons and other hazardous substances are kept in designated storage compounds designed and managed in accordance with relevant standards and procedures. Monitoring and inspection programs are maintained for these facilities to ensure hazardous materials and wastes are being adequately stored and disposed and that any spills or leaks are promptly reported and managed.

Environmental Performance

During the reporting period, all spills were controlled and contained immediately using emergency spill kits or earthmoving equipment to form a temporary bund. Small spills were disposed of offsite by Mt Arthur Coal's waste contractor. Mt Arthur Coal is considering options regarding management of larger scale contaminated soils on site.

Complaints and Reportable Incidents

Mt Arthur Coal did not receive any government fines or penalties related to contaminated land or hydrocarbon contamination during the reporting period and there were no related reportable incidents.

Proposed Initiatives

Mt Arthur Coal will continue to manage contaminated land and hydrocarbon contamination in accordance with project approval and legislative requirements.

7.10 Spontaneous Combustion

Environmental Management

Spontaneous combustion at Mt Arthur Coal is managed in accordance with the:

- MAC-ENC-PRG-002 Spontaneous Combustion Control Program.

Mt Arthur Coal has implemented a spontaneous combustion control program to prevent, monitor, control and report outbreaks of spontaneous combustion.

Environmental Performance

Spontaneous combustion at Mt Arthur Coal is predominantly confined to old mining areas at Bayswater No. 2 and the Drayton sublease area. This is a result of the higher levels of carbon and sulphuric material in the coal seams mined in these Greta measures in comparison to those mined in current active mining areas.

During the reporting period there was an increase in the area recorded as being affected by spontaneous combustion at Mt Arthur Coal. A total of 349 m² of land was treated for spontaneous combustion in the reporting period. A summary of spontaneous combustion in the reporting period is shown in Table 20.

Figure 4 shows locations of spontaneous combustion at Mt Arthur Coal at start and end of reporting period.

Table 20: Summary of spontaneous combustion at Mt Arthur Coal in FY18

Month	Area affected at start of month m^2	Area naturally extinguished m^2	Area treated m^2	New or recurring areas m^2	Area affected at end of month m^2
July	1229	0	0	302	1531
August	1531	0	0	291	1822
September/October	1822	0	291	0	1531
November	1531	0	0	0	1531
December	1531	0	7	0	1524
January	1524	0	0	8	1544
February	1544	0	0	0	1544
March	1544	0	0	0	1544
April	1544	0	51	94	1586
May	1586	0	0	65	1652
June	1652	0	0	119	1771
Total		**0**	**349**	**880**	

Complaints and Reportable Incidents

During the reporting period, no complaints were received regarding odour from spontaneous combustion, which is consistent with FY17 and FY16.

Mt Arthur Coal did not receive any government fines or penalties related to spontaneous combustion during the reporting period.

BHP

Mapping Services, Brisbane

1:55,000

0 1 2

Kilometres

Projection: GDA94 MGA Zone 56

MT ARTHUR MINE

SPONTANEOUS COMBUSTION FOR START & END OF REPORTING PERIOD

Drawn: K.Reedy	Date: 16/08/2018	Revision: 0	**FIGURE 3**
Checked: M.Gale	Filename: 20180719-2c.mxd		

BENGALLA

MUSWELLBROOK

MT ARTHUR

DRAYTON

ML1757

ML1487

ML1548

ML1358

ML1593

ML1655

ML1739

MPL263

CCL744

CL396

CL395

CL229

AUTH171

AUTH437

EL5965

HUNTER RIVER

Ramrod Creek

Muscle Creek

Whites Creek

Quarry Creek

Saltwater Creek

Saddlers Creek

6425000

6420000

6415000

290000

295000

300000

305000

Spontaneous Combustion (FY18)

- Start of Reporting Period
- End of Reporting Period
- Mining Lease
- Authorisation
- Coal Lease
- Consolidated Coal Lease
- Exploration Lease
- Approved Disturbance Boundary

Initiatives

Mt Arthur Coal will continue to monitor spontaneous combustion during the next reporting period, and cap readily accessible areas.

In accordance with the approved mine operations plan, overburden material will continue to be emplaced over current emplacement areas at Bayswater No. 2. This will be carried out in alignment with the design of the extension of the existing tailings storage facility, which is planned to encompass most of this area, and will ultimately treat a significant portion of identified spontaneous combustion areas.

7.11 Bushfire

Environmental Management

Bushfire at Mt Arthur Coal is managed in accordance with the:

- MAC-ENC-PRO-076 Bushfire Prevention Procedure; and
- MAC-STE-PRO-010 Emergency Procedure – Bushfires.

Specific prevention and fire suppression control measures are implemented in order to protect remnant vegetation communities as well as Mt Arthur Coal infrastructure. Preventative measures include fuel load assessment and reduction programs, the establishment and maintenance of fire breaks and the prevention of ignition sources. Fire suppression and control is achieved through on-site fire-fighting equipment, including a rescue truck and water carts, facilitated by a network of roads and vehicle access trails, which provide access to all areas of Mt Arthur Coal owned land. Mt Arthur Coal also maintained a trained emergency response team on each shift, and fire extinguishers are fitted in vehicles and buildings.

Environmental Performance

A small grassfire occurred in Thomas Mitchell Drive Offsite Offset Area, ignited from hot works activities being conducted at an adjacent industrial premises. A small area was burned and the fire was brought under control quickly. Revegetation areas in the offset area were unaffected.

Complaints and Reportable Incidents

Mt Arthur Coal did not receive any government fines or penalties related to bushfire during the reporting period and there were no related reportable incidents.

Initiatives

During the next reporting period Mt Arthur Coal will continue to manage bushfire risk in accordance with relevant procedures and will put a tank and pump in at Middle Deep Creek Offset for firefighting purposes in FY17.

7.12 Greenhouse Gas and Energy

Environmental Management

Greenhouse gas and energy at Mt Arthur Coal are managed in accordance with the:

- MAC-ENC-MTP-040 Air Quality and Greenhouse Gas Management Plan.

Mt Arthur Coal undertakes regular reviews and monitoring of greenhouse gas emissions and energy efficiency initiatives to ensure that greenhouse gas emissions per tonne of product coal are kept to the minimum practicable level. During the reporting period Mt Arthur Coal continued greenhouse gas and energy consumption monitoring with the use of a centralised database to assist with monthly tracking and reporting of key emission sources. A key focus during the reporting period was to ensure the operation complied with the regulations under the *National Greenhouse and Energy Reporting* (NGER) *Act 2007*.

Environmental Performance

Total emissions were 514 kt CO2-e in the FY18 reporting period, of which direct (scope 1) emissions accounted for 84 per cent, and scope 2 emissions from the use of grid-based electricity accounted for the remaining 16 per cent. As in the previous reporting period, Mt Arthur Coal used NGER Method 2 measurement of its open fugitive emissions, which decreased in absolute terms (to 24 kt CO2-e) and as a proportion of total scope 1 emissions (5%). Notwithstanding this reduction, fugitive emissions are expected to increase over time as mining progresses into areas with higher in-situ methane contents. Fuel combustion will continue to constitute the bulk of emissions from Mt Arthur Coal. Fuel use accounted for almost 95% of scope 1 emissions and almost 80% of total emissions in the reporting period. Energy use was similarly dominated by diesel fuel (93%), with other fuels accounting for 1% and electricity making up the balance.

Complaints and Reportable Incidents

Mt Arthur Coal did not receive any government fines or penalties related to greenhouse gas or energy during the reporting period and there were no related reportable incidents.

Proposed Initiatives

Mt Arthur Coal will continue to investigate and, where feasible, implement projects to reduce fossil energy consumption and greenhouse gas emissions in accordance with BHP's sustainability commitments, including the company's GHG emission targets.

7.13 Waste Management

Environmental Management

Waste at Mt Arthur Coal is managed in accordance with the:

- MAC-ENC-PRO-033 Waste Handling and Disposal.

Environmental Performance

During the reporting period Mt Arthur Coal's activities, generated approximately 3,910 tonnes of waste sent off site for management, which was approximately a 4 percent increase on the previous financial year's result of 3,758 tonnes. Approximately 81.1 percent of the total waste produced and sent off site for management was recycled, as shown in Figure 4. This is a slightly lower result compared with FY17 (88.3 percent).

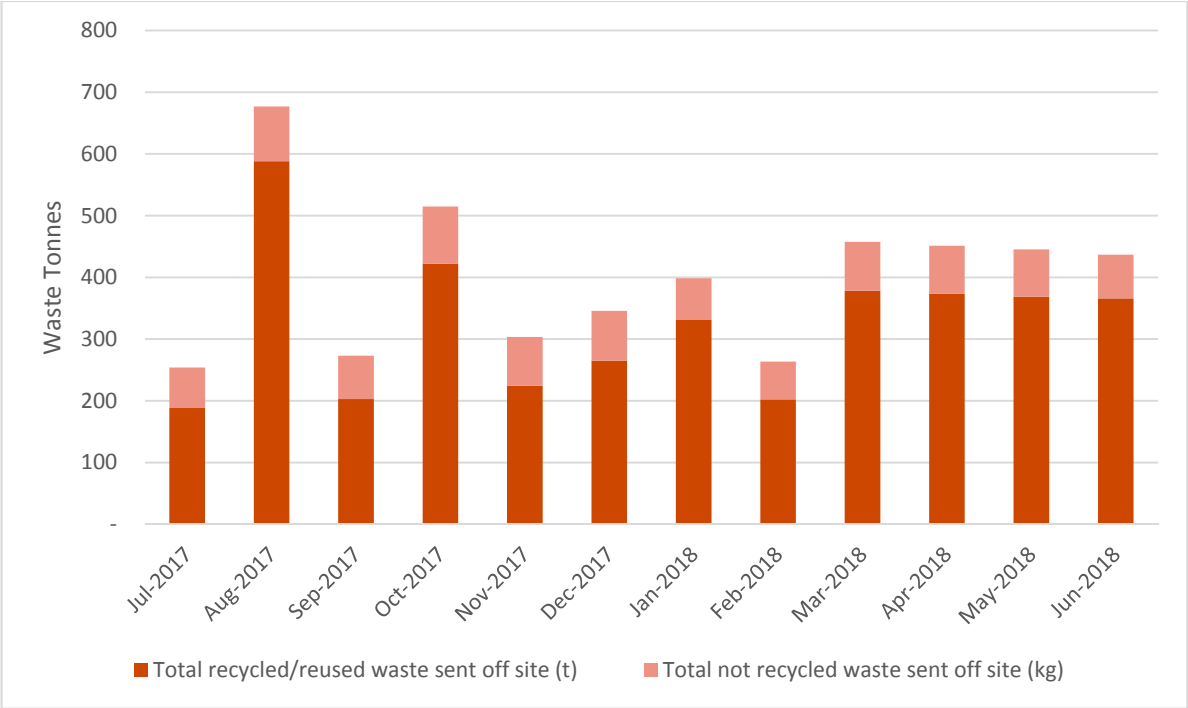


Figure 5: Waste disposal from Mt Arthur Coal

Complaints and Reportable Incidents

Mt Arthur Coal did not receive any government fines or penalties related to waste during the reporting period and there were no related reportable incidents.

Proposed Initiatives

General awareness through toolbox talks and other site communications will continue during the next reporting period to ensure Mt Arthur Coal achieves high levels of compliance in the areas of waste segregation and tracking.

7.14 Public Safety

Environmental Management and Performance

During the reporting period Mt Arthur Coal maintained a boundary security fence around much of the perimeter of its site to ensure no unauthorised access to mining areas. A number of boom gates also exist to restrict unauthorised or unintentional access to the active mining and infrastructure areas. Routine patrols of these boundaries and access points are conducted through the engagement of third party security specialists and by internal statutory compliance personnel with no identified security or access breach occurring.

Reportable Incidents

Mt Arthur Coal did not receive any government fines or penalties related to public safety during the reporting period and there were no related reportable public safety incidents.

Further Improvements

Mt Arthur Coal has completed implementation of the BHP Minerals Australia Training and Access Management System (TAMS) during the reporting period. TAMS comprises a significant upgrade of boundary fences, physical access controls and monitoring systems to ensure only persons who are approved, competent and fit for work are able to access active mining areas.

Mt Arthur Coal is changing the way the site responds in the event of an emergency. This change is part of the business's ongoing continuous improvement efforts, with the aim to standardise and simplify a number of work practices across BHP sites within Australia. A new dedicated team of 17 BHP Emergency Services Officers and Paramedics are being recruited as part of this standardisation. The existing emergency response team will remain and continue to support the new team as needed.

8. Water Management

8.1 Water Balance

Mt Arthur Coal's water management system includes surface and ground water management, and maintenance of a site water balance to assist with modelling and prediction of water supply and usage under different climatic scenarios. This model is generally in accordance with the Minerals Council of Australia Water Accounting Framework.

During the reporting period there were no variations from the current MOP related to water management activities.

Mt Arthur Coal did not discharge any water to the Hunter River from its licensed discharge point under the Hunter River Salinity Trading Scheme (HRSTS) during the reporting period.

During the reporting period, Mt Arthur Coal used approximately 6,879 ML of water for coal handling and processing, dust suppression, potable consumption and use in the industrial area, most of which is recycled back into the water management system. This is an increase in water usage compared to the 6,678 ML used in FY17.

In line with predictions in the consolidation environmental assessment and the modification project environmental assessment, the majority of the operation's water supply was sourced from catchment runoff. The second largest water input to site was licensed extraction from the Hunter River of 3244.4 megalitres (ML), as shown in Table 21.

Mt Arthur Coal also continued to source water from the MSC treated effluent scheme to reduce the demand from other external sources. The site water balance indicated that outputs for the reporting period exceeded inputs by 3,115 ML.

Table 21: Water take for FY18

Water Licence Number	Water sharing plan, source and management zone (as applicable)	Committed Orders	Use
20AL201127	REGULATED RIVER (GENERAL SECURITY)	4173.0 ML	3244.4 ML
20AL201126	REGULATED RIVER (HIGH SECURITY)	0 ML	0 ML

8.2 Erosion and Sediment

Environmental Management

Erosion and sediment at Mt Arthur Coal is managed in accordance with:

- MAC-ENC-PRO-060 Erosion and Sediment Control Plan (ESCP);
- MAC-ENC-PRO-061 Surface Water Monitoring Program; and
- MAC-ENC-PRO-063 Surface and Ground Water Response Plan.

Environmental Performance

Total suspended solids (TSS) results remained low during the reporting period at the majority of statutory sites with below average rainfall limiting the number of samples collected as monitoring points were recorded as dry. However, two reportable exceedances were recorded at SW03. These exceedances were the result of the below average rainfall causing Saddlers Creek to become as series of isolated ponds and were not a result of mine operations. The TSS results were mostly consistent compared with results from previous financial years. TSS results are summarised in Table 23, with further results presented in Appendix 2 - Surface Water Quality Monitoring Results. Water management structures were also routinely inspected after rain events > 25mm and maintained to ensure they are performing to design and prevent impacts on downstream waters.

During the reporting period monitoring of riparian vegetation was undertaken as part of the annual riparian vegetation and channel stability assessment (RVCSA), in accordance with the Surface Water Monitoring Program. Table 22 summarises the results of the riparian vegetation assessment undertaken at the monitoring sites. The results of the FY18 channel stability assessment are generally consistent with FY17, with most sites showing increased native species and improved or consistent condition scores. This indicates that Saddlers Creek, Quarry Creek, Ramrod Creek and White's Creek Diversion are generally stable and/or stabilising with regenerating riparian vegetation and ground cover.

Table 22: Riparian Vegetation Assessment- species diversity and total condition scores for FY17

	SW03 (Saddlers Creek)		SW04 (Quarry Creek)		SW12 (Ramrod Creek)		SW15 (White's Creek Diversion)	
	FY18	FY17	FY18	FY17	FY18	FY17	FY18	FY17
Number of native species (% of total)	59 (76)	40 (65)	15 (56)	14 (38)	17 (46)	22 (56)	8 (31)	10 (31)
Number of introduced species (% of total)	19 (24)	22 (35)	12 (44)	23 (62)	20 (54)	17 (44)	18 (69)	22 (69)
Total number of species	78	62	27	37	37	39	26	32
Total condition score (% of 32)	26 (81)	26 (81)	25 81	24 (75)	25 81	24 (75)	24 (75)	24 (75)

Improvements during the reporting period include:

- The amelioration of dispersive soils were made as part of the FY18 rehabilitation program;
- Maintenance on Ayredale South Dam, including updated pumping infrastructure was conducted;
- New sediment controls including diversion drains; and
- Erosion and sediment controls are implemented as part of the MAC Permit to Disturb process and inspected on an as needed basis.

Complaints and Reportable Incidents

Mt Arthur Coal did not record any water release incidents during the reporting period.

Proposed Initiatives

New sediment dams constructed for expanded overburden emplacements in the conveyor corridor will be designed in accordance with the provisions for sediment retention basins in the Managing Urban Stormwater – Soil and Construction Volume 2E – Mines and Quarries Guidelines (DECC, 2008).

Areas prone to erosion with exposed dispersive soils are focused in freshly established rehabilitation areas. These areas undergo annual landform stability assessments as per Rehabilitation and Ecological Monitoring Procedure (MAC-ENC-PRO-080). Plans for improvements to soil amelioration as per the response to DRG will be developed during the next reporting period, following a more detailed sampling and independent advice. Plans include the more detailed assessments of soil characteristics to target ameliorants and investigation of the use of temporary stabilisation of freshly established rehabilitation whilst ground cover establishes.

Update of the MAC Erosion and Sediment Control Plan (MAC-ENC-PRO-060) is scheduled to be completed as part of the MAC Water Management Plan, however, this is dependent on review and approval of other management plans. This update will provide a more detailed inspection process.

8.3 Surface Water

Environmental Management

Surface water at Mt Arthur Coal is managed in accordance with the:

- MAC-ENC-MTP-034 Site Water Management Plan;
- MAC-ENC-PRO-061 Surface Water Monitoring Program;
- MAC-ENC-PRO-059 Site Water Balance;
- MAC-ENC-PRO-063 Surface and Ground Water Response Plan (SWMP); and
- MAC-ENC-PRO-032 Water Management.

Water quality downstream of Mt Arthur Coal's operation is currently monitored by an independent consultant at five statutory monitoring sites, plus Mt Arthur Coal's licensed discharge point and Saddlers Creek flow monitoring gauge.

Mt Arthur Coal's Site Water Management Plan outlines measures for managing water on site, while the Surface Water Monitoring Program establishes impact assessment criteria against which monitoring results are compared. Impact assessment criteria are presented as trigger values which, if exceeded, lead to a response such as more intensive monitoring, investigation and if required, remedial action.

Environmental Performance

A summary of the surface water quality data for statutory sites during the reporting period is provided in Table 23, with further results provided in Appendix 2 - Surface Water Quality Monitoring Results.

Water quality parameters in natural watercourses surrounding the mine including Saddlers Creek (SW02 and SW03), Quarry Creek (SW04), Ramrod Creek (SW12) and Whites Creek (SW15) were subject to normal variations in response to the ephemeral nature of the creeks, local geology and weather conditions. Water quality parameters are only recorded at the HRSTS discharge point (SW28) during discharge, and no HRSTS discharge occurred during the reporting period.

Surface water pH measured at individual statutory sites remained relatively constant during the reporting period and within the impact assessment trigger levels of 6.5-9.0 at all times. Surface water EC and TSS measured at individual statutory sites remained below impact assessment trigger levels during the reporting period.

Data capture during the reporting period was 100 per cent for SW3 with the exception of a sample bottle for the analysis of oil and grease being lost in transit. SW02 was either dry or too low to sample during the reporting period, giving a capture rate of 0 percent. SW04 was too low to sample in five months, giving a capture rate of 58 percent. SW12 was too low to sample on one month giving 92 per cent data capture. SW15 was either too low or dry to sample in ten months giving a data capture of 1 percent.

Surface water monitoring results were also recorded for flow, EC and turbidity at the SWGS1 monitoring station in Saddlers Creek. As it is an ephemeral creek, Saddlers Creek was mostly dry over the reporting period. No real flow was recorded during the reporting period. Turbidity and EC results were recorded in late late July 2017 and correspond with rainfall events creating isolated ponds. Flow, EC and turbidity results for SWGS1 for the reporting period are summarised in Table 24, with reporting period results presented as plots in Appendix 2 - Surface Water Quality Monitoring Results.

Surface water monitoring locations are shown in Figure 6.

BHP

Spatial Data Team
Brisbane

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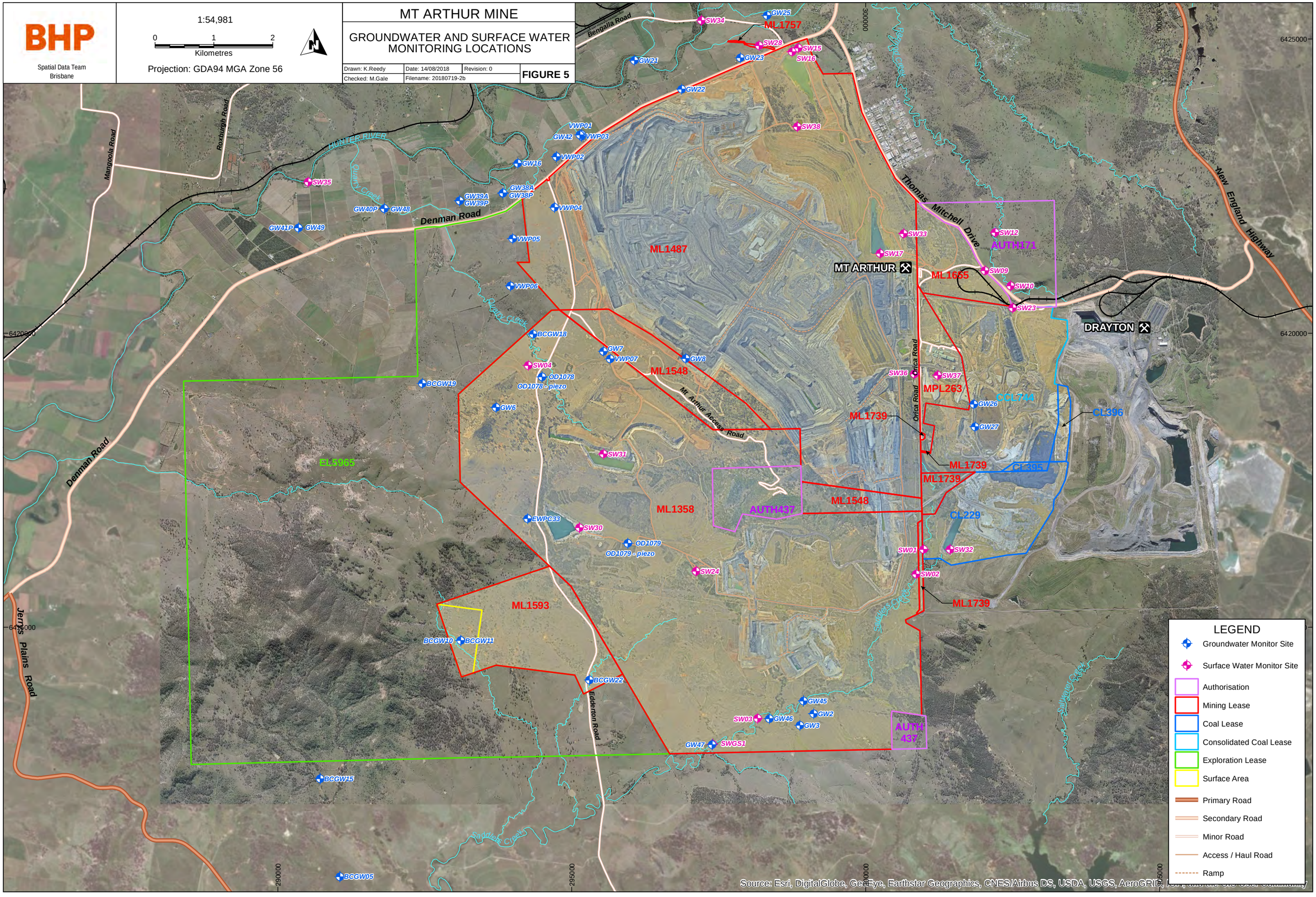
Kilometres

Projection: GDA94 MGA Zone 56

MT ARTHUR MINE

GROUNDWATER AND SURFACE WATER MONITORING LOCATIONS

Drawn: K.Reedy	Date: 14/08/2018	Revision: 0	**FIGURE 5**
Checked: M.Gale	Filename: 20180719-2b		



LEGEND

- Groundwater Monitor Site
- Surface Water Monitor Site
- Authorisation
- Mining Lease
- Coal Lease
- Consolidated Coal Lease
- Exploration Lease
- Surface Area
- Primary Road
- Secondary Road
- Minor Road
- Access / Haul Road
- Ramp

Table 23: Summary of statutory surface water quality monitoring results

Site	Impact Assessment Criteria Trigger Values			Monitoring Results			Trend / key management implications	Implemented/ proposed management actions
				min	ave	max		
SW2	pH	6.5 – 9.0		-	-	-	No assessment criteria triggered	Continue managing surface water in accordance with site WMP
	EC (µS/cm)	Stage 1	12,365	-	-	-		
		Stage 2	13,900					
	TSS (mg/L)	Stage 1	219	-	-	-		
		Stage 2	277					
SW3	pH	6.5 – 9.0		7.7	7.8	8.0	No assessment criteria triggered	
	EC (µS/cm)	Stage 1	10,133	4820	7112	9820		
		Stage 2	11,402					
	TSS (mg/L)	Stage 1	37	5	25.11	80	Stage 2 criteria exceeded on 2 occasions as a result of below average rainfall not mine activity	
		Stage 2	46					
SW4	pH	6.5 – 9.0		7.8	8.6	9.3	Assessment criteria exceeded on 1 occasion as the result of below average rainfall not mine activity	
	EC (µS/cm)	Stage 1	10,133	10620	11841	15460		
		Stage 2	11,402					
	TSS (mg/L)	Stage 1	37	6	8.50	11	No assessment criteria triggered	
		Stage 2	46					
SW12	pH	6.5 – 9.0		6.9	7.7	8.0	No assessment criteria triggered	
	EC (µS/cm)	Stage 1	10,133	2840	6355	10830	Stage 1 criteria Stage 2 criteria exceeded on 1 and 3 occasions respectively as a result of below average rainfall not mine activity	
		Stage 2	11,402					
	TSS (mg/L)	Stage 1	37	5	27.86	120	No assessment criteria triggered	
		Stage 2	46					
SW15	pH	6.5 – 9.0		7.7	7.8	7.8		
	EC (µS/cm)	Stage 1	10,133	1122	1183	1244		
		Stage 2	11,402					
	TSS (mg/L)	Stage 1	37	<5	8.3	14		
		Stage 2	46					

Table 24: Summary of SWGS1 surface water gauging station monitoring results on Saddlers Creek

FY16	Flow (ML/day)	Average Daily EC (µS/cm)	Average Daily Turbidity (NTU)
Minimum	0	0	3.6
Maximum	56	169.9	13.9
Average	0.4	0.95	6.7

Complaints and Reportable Incidents

Mt Arthur Coal did not have any reportable incidents relating to surface water and did not receive any government fines or penalties related to surface water during the reporting period.

Proposed Initiatives

Mt Arthur Coal will continue to use site water collected in both in-pit and out-of-pit storages prior to the use of water from the Hunter River. Where plans indicate that there would be sufficient water stored on site, water allocations for the Hunter River will continue to be offered to leaseholders and near neighbours as a temporary transfer.

Due to the ongoing below average rainfall Mt Arthur is currently undertaking a water security program aimed at increasing enhancing efficiencies in site water use.

8.4 Ground Water

Environmental Management

Ground water at Mt Arthur Coal is managed in accordance with the:

- MAC-ENC-MTP-034 Site Water Management Plan;
- MAC-ENC-PRO-062 Ground Water Monitoring Program; and
- MAC-ENC-PRO-063 Surface and Ground Water Response Plan.

Mt Arthur Coal's Site Water Management Plan aims to minimise any adverse impacts on aquifers in proximity to the operation, including the two major aquifer areas, the hard rock coal measures and the shallow alluvial deposits associated with the Hunter River.

The Ground Water Monitoring Program outlines program requirements for monitoring of potential groundwater impacts from mining operations. A program to upgrade ground water monitoring bores, and improve monitoring accuracy, was completed during the FY16 reporting period. A review of groundwater quality monitoring quality assurance (QA) measures was also completed by an independent consultant during the reporting period. Observations and recommendations from that review will be incorporated into ground water monitoring programs, where required.

The Surface and Ground Water Response Plan outlines the response actions to be implemented, should ground water monitoring trigger values be exceeded. Management measures associated with the alluvial ground water cut-off wall and flood levee constructed parallel to Denman Road along the northern boundary of the site to prevent both surface and subsurface migration from the Hunter River to the active pit, have also been incorporated into the Surface and Ground Water Response Plan.

Environmental Performance

Drawdown and cut off wall performance

Piezometric pressure head, or drawdown, for each statutory bore was calculated for both the total monitoring period and for the reporting period. Drawdown contours and tabulated data for the reporting period are presented in Appendix 3 – Groundwater Monitoring Results. Drawdown in the Permian sequence is evident around the main open cut pit, and extends southwest in the vicinity of the Bayswater mine area. Drawdown within the alluvium is limited and less than the trigger value of 1 m.

During 2013 and 2014, a bentonite wall was installed along Denman Road to minimise groundwater level drawdown in the alluvium due to seepage through the alluvium/regolith from the Hunter River alluvium toward the mine. To the northwest of the bentonite wall, variable drawdown has been recorded since monitoring commenced in August 2011 ranging from 46.24 m within a localised fault (F4 Fault), through 55.04 m in the Edinglassie Seam, to 60.83 m in the deeper Ramrod Creek Seam. Future drawdown to the west of this wall within the alluvium is likely to be minimal.

In contrast, nearby Hunter River Alluvial aquifer monitoring bores GW16 and GW21 have remained relatively static. GW42 is located adjacent to the VWP installations and has also remained relatively static, displaying oscillations in the groundwater level that are consistent with the Hunter River level. The relatively static groundwater levels within the alluvium indicates the depressurisation observed in the underlying Permian coal seam does not appear to have

propagated upwards into the Hunter River Alluvium in the vicinity of GW16 and GW21. A nominal decline observed in nearby alluvium monitoring bores is most likely a response to seasonal conditions, with higher levels in GW42 coinciding with periods of Hunter River water level above 1.5m stage height.

The FY18 modelled head was extracted for all model slices from the Consolidation Project groundwater model and compared to measured June 2018 data. A figure showing the comparative results is presented in Appendix 3 – Groundwater Monitoring Results. Negative values show where the model over predicts impacts (depicted by red orange and yellow markers on the figure).

Groundwater Quality

A summary of the ground water quality data for each key aquifer during the reporting period is provided in Table 25. Plots of ground water quality data during the reporting period for all statutory sites are provided in Appendix 3 - Ground Water Monitoring Results.

Assessment criteria for groundwater monitoring results consists of a two stage trigger process for EC, and pH results outside the trigger range of 6.5 to 9.0 over three consecutive readings.

Table 25: Summary of ground water monitoring results by aquifer

Aquifer	**Sites**	**pH**			**EC (µS/cm)**			**Depth to water from top of casing (m)**		
FY18	**Site references**	**Min.**	**Max**	**Avg**	**Min.**	**Max.**	**Avg**	**Min.**	**Max.**	**Avg**
Saddlers Creek Alluvial	GW45, GW46, GW47	6.9	7.6	7.1	734	8,220	3,987	6.9	11.4	8.8
Saddlers Creek tributary alluvium	BCGW22A	6.8	7.1	7.0	10,850	11,810	11,347	3.5	4.1	3.8
Hunter River Alluvial	GW16, GW21,GW25, GW38A,GW39A, GW40A,GW41A, GW42	6.2	8.0	7.2	764	7,700	4,362	7.2	11.0	9.4
Permian	GW2,GW3,GW6, GW7,GW23, GW38P,GW39P, GW43,GW48, GW49,BCGW18, BCGW19,BCGW22, EWPC33	6.0	11.9	7.6	2,230	10,680	4,796	3.7	83.7	26.4
West Cut Groundwater	GW26,GW27	6.6	6.9	6.7	5,610	6,070	5,852	51.3	52.8	52.2
FY17	**Site references**	**Min.**	**Max**	**Avg**	**Min.**	**Max.**	**Avg**	**Min.**	**Max.**	**Avg**
Saddlers Creek Alluvial	GW45, GW46, GW47	6.5	8	7.2	638	6,360	3,995	6.5	10.5	8
Hunter River Alluvial	GW16, GW21,GW25, GW38A,GW39A, GW40A,GW41A	6.7	8.6	7.3	737	7,770	4,001	7.2	10.2	9.0

Aquifer	Sites	pH			EC (µS/cm)			Depth to water from top of casing (m)		
Permian	GW2,GW3,GW6, GW7,GW23, GW38P,GW39P, OD1078, OD1078-Piezo, OD1079-Piezo, BCGW05, BCGW10, BCGW11,BCGW12, BCGW15,BCGW18, BCGW19,EWPC33	6.9	12.5	8	2,130	12,480	5,263	3.2	55.8	21.6
West Cut Groundwater	GW26,GW27	6.4	6.7	6.5	4,980	6,730	5,601	50.1	51.3	51.8
FY16	**Site references**	**Min.**	**Max**	**Avg**	**Min.**	**Max.**	**Avg**	**Min.**	**Max.**	**Avg**
Saddlers Creek Alluvial	GW2, GW3	7.4	7.7	7.6	3,310	4,500	4,011	5.8	8.94	7.4
Hard Rock Ground Water (north west)	GW6, GW7, GW8	7.0	7.5	7.21	4,040	5,140	4,756	23.4	80.8	45.8
Hunter River Alluvial	GW16, GW21, GW22, GW23, GW25	5.9	7.6	7.2	669	5,640	3,091	9.3	80.6	24.4
West Cut Ground Water	GW26, GW27	6.4	6.7	6.5	4,150	5,960	5,241	47.7	49.2	48.6

One exceedance of assessment criteria was recorded for pH and for EC in groundwater at GW39A and GW2 respectively. There were a number of exceedances of groundwater level triggers during the reporting period. All exceedances have been listed in Table 26. A single Stage-2 EC trigger value was exceeded during the reporting period (GW2 in May 2018); however, this result was not representative of the overall ground water quality trends for the reporting year, and is believed to be an anomaly.

Table 26: Groundwater level and quality exceedances

Site references	Elevated months	Investigation results
Level		
GW2	Jul 2017 to May 2018	GW2 exceeded the groundwater level trigger in every month, with a maximum depth to water of 10.74m. Investigations revealed that the bore did not appear to be impacted by mining activities as the groundwater levels oscillate based on recharge with periods of elevated groundwater levels following periods of above average rainfall. With below average rainfall during the reporting period groundwater levels have fallen. The groundwater trigger value was revised following the completion of the Interim Groundwater Monitoring Program and will be applied for the FY19 monitoring period. Further updates to trigger values may be applicable to following the update to the groundwater model.
GW3	Jul 2017 to May 2018	Investigations revealed that the bore did not appear to be impacted by mining activities. The groundwater level trend is influenced by rainfall recharge and the exceedances are well within the historic data range. With below average rainfall during the reporting period groundwater levels have fallen.

		The groundwater trigger value was revised following the completion of the Interim Groundwater Monitoring Program and will be applied for the FY19 monitoring period. Further updates to trigger values may be applicable to following the update to the groundwater model.
GW21	Sep, Nov & Jan 2017	GW21 exceeded the groundwater level trigger in September (9.94m), November (9.94m) and January (9.73m). Investigations revealed that the change in groundwater level was likely to be caused by depressurisation of the Vaux seam and was consistent with modelled predictions in the EA. The groundwater trigger value was revised following the completion of the Interim Groundwater Monitoring Program and will be applied for the FY19 monitoring period. Further updates to trigger values may be applicable to following the update to the groundwater model.
GW23	Jul 2017 to May 2018	GW23 exceeded the groundwater level trigger in every monitoring month, with a maximum depth to water of 50.97m. Investigations revealed that the change in ground water level was likely be related to the mining depressurisation of the coal seam and was consistent with modelled predictions in the EA.
GW39P	Jul 2017 to May 2018	GW39P exceeded the groundwater level trigger in every month, with a maximum depth to water of 10.34m. Investigations revealed that the depressurisation of the coal seams within the open cut mine was the likely cause of the decreasing water level in GW39P and the drawdown was within the predicted order of magnitude which was comparable to model predictions.
EC		
GW2	May 2018	Stage 2 trigger in May 2016 (4630 µS/cm). The bore did not appear to be impacted by mining activities. Historically, EC values show a correlation with both rainfall trends and groundwater elevations and during 2016, the site received less than average rainfall. The below average rainfall is now impacting EC through evaporation concentrating dissolved salts.
pH		
GW39A	Mar 2018	Lower pH trigger value (6.5) was exceeded when assessing the pH in the field (6.17). However, review against the laboratory pH (7.53) indicated that groundwater conditions are more likely to be neutral.

* Refer to Appendix 3 for details on the drawdown analysis.

Data capture for manual sampling was 100% at all monitoring sites, with the exception of those five discussed below. Monitoring has reverted to quarterly sampling and groundwater level measurement following completion of the Interim Groundwater Monitoring Program described in Appendix 3 of the Mt Arthur Coal Groundwater Monitoring Program. Several monitoring bores also have data gaps in water level logger data during the reporting period, primarily due to issues with logger battery life. This issue was reviewed as part of the Interim Groundwater Monitoring Program and will be resolved during FY19.

No water quality data was able to be obtained from GW44 for the entire reporting period as this new bore is very deep and low flow sampling methodologies have proven not been effective at this site thus far. GW44 has been removed from the water quality monitoring program in favour of collecting level data only following review of the Interim Groundwater Monitoring Program. Issues with the landholder prevented access to bores BCGW05, BCGW10, BCGW11 and BCGW15 for the entire reporting period, so no water level or quality data was obtained for these bores. Following review of the Interim Groundwater Monitoring Program it has been determined that these wells do not need to be monitored as sufficient background data can be obtained via the accessible bores.

Complaints and Reportable Incidents

Mt Arthur Coal did not receive any complaints, government fines or penalties related to ground water during the reporting period.

Proposed Initiatives

During the next reporting period, Mt Arthur Coal will continue to monitor hydro-geomorphological conditions and evidence of any ground water ingress as operations progress towards the Hunter River alluvials, including monitoring of the alluvial cut-off wall.

Following review of the Interim Groundwater Monitoring Program Mt Arthur Coal has revised the groundwater monitoring program the groundwater monitoring program has been revised with a quarterly sampling schedule and revised trigger values. This will be form part of the update of the site Water Management Plan planned for FY19.

There is planned work on reviewing the Mt Arthur Coal groundwater model in FY19. This may result in further revision of groundwater assessment trigger values.

9. Rehabilitation

9.1 Buildings and Infrastructure

No buildings or infrastructure were decommissioned or demolished during the reporting period.

9.2 Topsoil

Topsoil management at Mt Arthur Coal focuses on maintaining the quality of the topsoil resource as a rehabilitation growth medium. Activities undertaken during the reporting period included:

- Prioritising direct placement of topsoil;
- Testing topsoil to determine appropriate depths for stripping and recovery as well as ameliorant requirements;
- Felling and mulching trees in situ on disturbance areas to increase organic content within the topsoil that was used directly on rehabilitation areas; and
- Reusing felled trees from disturbance areas on new rehabilitation areas to provide habitat.

Additional measures generally undertaken when topsoil stockpiling include;

- restricting stockpile height generally to three metres or less, consistent with the MOP, to minimise compaction and anaerobic conditions within topsoil stockpiles,
- locating stockpiles so as to reduce the requirement for re-handling and establishing cover crops and;
- spraying topsoil stockpiles to manage weeds.

Topsoil was placed and spread to an approximate depth of 200 to 300 millimetres on rehabilitation areas. The newly spread topsoil surface was contour cultivated prior to sowing to provide a suitable environment that encourages water infiltration in the soil. Large rocks were removed from the ripped soil surface prior to sowing.

9.3 Landform Design

Mt Arthur Coal aims to create rehabilitation that is safe, stable and non-polluting that is self-sustaining and comparable to the surrounding natural landscape. Landform and rehabilitation incorporates micro-relief and natural drainage lines for landforms designed and constructed post the current approval. Design and implementation of Appllied Geofluv™ (Geofluv) has been constructed on several areas in the northern dump areas (landforms). This natural landform design has been integrated into the Rehabilitation Strategy and MOP in which completion criteria are outlined. The current approved Rehabilitation Strategy and MOP are available on the BHP website.

Geofluv rehabilitation technique is the use of a three-dimensional model to create a landform design that is based on natural analogues from the local environment. The use of this technique sees a landform profile and drainage lines that mimic the natural environment to establish landforms consistent with the erosion rate of natural features in the area. This process requires the development of a fully integrated mine rehabilitation plan and differs significantly compared to more generic linear designs widely used in the Hunter Valley of NSW, and on site at Mt Arthur Coal previously.

The MacLeans emplacement (Figure 7, Figure 8) and areas of the visual emplacements have been designed and rehabilitated with the Geofluv design during FY18. Although Geofluv design has been implemented on other sites within NSW and also worldwide there are many defining characteristics that restrict its use such as space, waste characterisation, availability of suitable rock availability of mulch, landform height and steepness of the landform. Mt

Arthur has one larger and higher landforms to apply Geofluv and is also space constrained for emplacement area. The resultant design aligns with industry best practice, but will be monitored over the coming years to ensure further natural landform design incorporates learnings and improvement from the current work.

The current Geofluv work has been completed as a trial to understand time, cost, stability and volume constraints. The assessment of the Geofluv results will be written into a report that will identify other potential suitable locations at Mt Arthur Coal and or how natural drainage lines and natural landform design can be implemented across new landforms. The Rehabilitation Strategy will be submitted to DPE and DRG in 2018 with updated information in regards to the design use.

9.4 Disturbed Land

Rehabilitation of land is carried out in accordance with the:

- Mt Arthur Coal's FY16-FY20 MOP;
- Rehabilitation Strategy MAC-ENC-MTP-047;
- Biodiversity Management Plan MAC-ENC-MTP-050; and the
- Land Management Procedure.

Rehabilitation is designed to achieve a stable final landform compatible with the surrounding environment and to meet the landform commitments presented in the MOP.

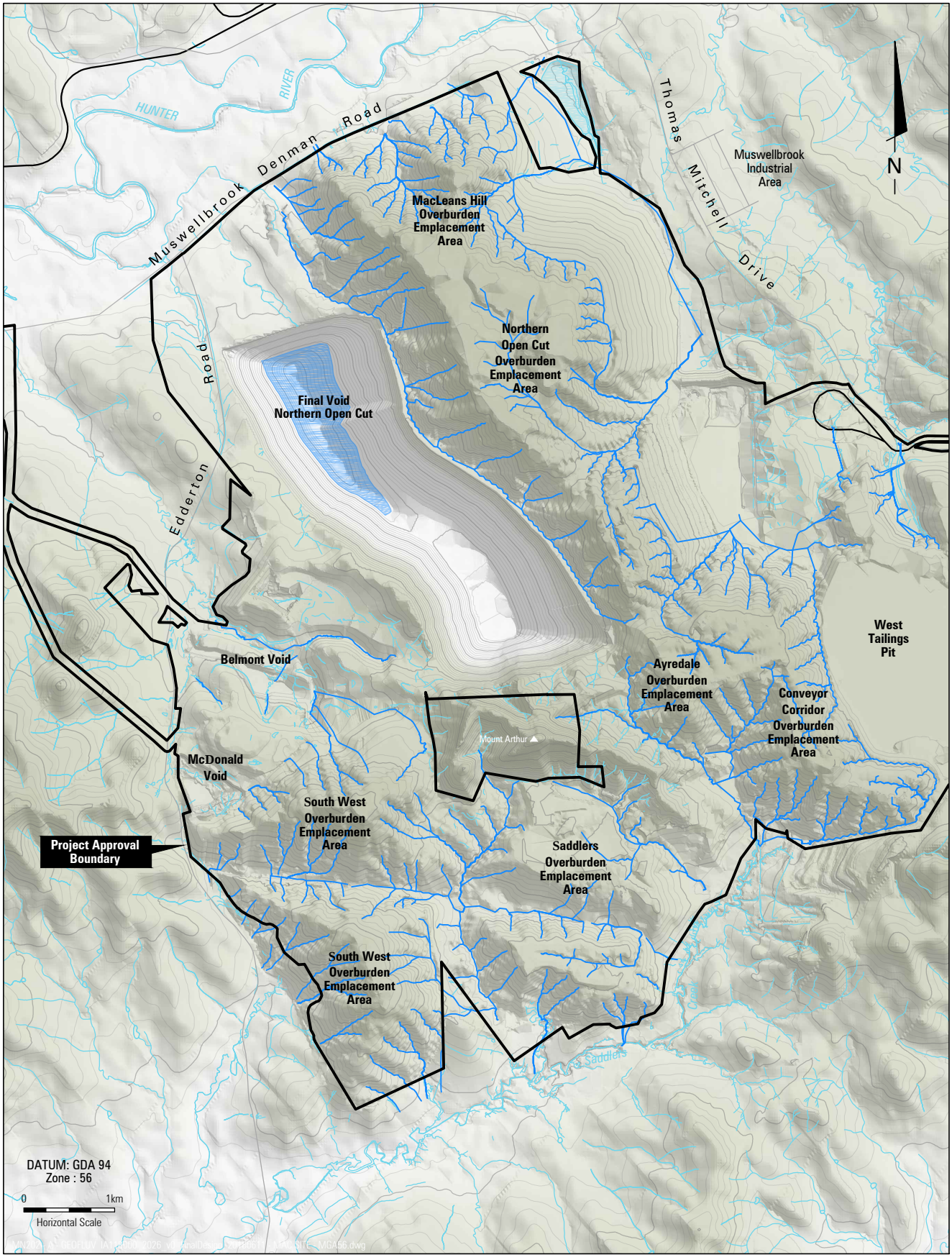
During the reporting period Mt Arthur Coal completed 35.1 hectares of rehabilitation across two areas as specified in the MOP. The rehabilitation result is in accordance with the total rehabilitation proposed in the current MOP for FY18, which was 32 hectares. There were some minor variations in the locational distribution of rehabilitation, compared to what was proposed in the current MOP, due to availability of emplacement areas to be reshaped.

Table 27 includes 8 hectares of grazing pasture rehabilitation (land capability class six), 18.9 hectares of native woodland rehabilitation, and 14 hectares of box-gum woodland rehabilitation. The methodology for revegetation of rehabilitated areas was selected to support the designated post-mining land use, as presented in the MOP. Figure 9 shows an example of rehabilitated woodland.

Both woodland and pasture seed mixes and rates have been revised in consultation with an independent specialist, as specified in the MOP.

Table 27: Mt Arthur Coal rehabilitation claimed for FY18

Location	FY18 MOP commitment (hectares)	FY18 rehabilitated area (hectares)
CD1	12	18.9
VD5	20	16.2
Total	32	35.1



MT ARTHUR COAL MINE

bhpbilliton | Hansen Bailey ENVIRONMENTAL CONSULTANTS

Proposed Final Landform Site Overview

Figure 8: Rehabilitation at Macleans emplacement using natural landform design

Figure 9: Open native woodland rehabilitation at McDonalds Pit which was rehabilitated in 2003

Table 28: Mt Arthur Coal rehabilitation summary

Mine Area Type	Previous Reporting Period (FY17 Actual)	This Reporting Period (FY18 Actual)	Next Reporting Period (FY19Forecast)
A. Total mine footprint[6]	4468.3	4700	4939
B. Total active disturbance[7]	3297.0	3502*	3710
C. Land being prepared for rehabilitation[8]	0.0	0.0	0.0
D. Land under active rehabilitation[9]	1171.3	1198*	1229
E. Completed rehabilitation[10]	0.0	0.0	0.0

6 Total mine footprint includes all areas within a mining lease that either have at some point in time or continue to pose a rehabilitation liability due to mining and associated activities.

7 Total active disturbance includes all areas ultimately requiring rehabilitation.

8 Land being prepared for rehabilitation – includes the sum of mine disturbed land that is under the following rehabilitation phases – decommissioning, landform establishment and growth medium development (as defined in DRE MOP/RMP Guidelines).

9 Land under active rehabilitation - includes areas under rehabilitation and being managed to achieve relinquishment.

10 Completed rehabilitation – requires formal sign-off by DRE that the area has successfully met the rehabilitation land use objectives and completion criteria.

* Reconciled via survey from FY18

9.5 Other Activities

During the reporting period other rehabilitation related activities undertaken included:

- Collection of approximately 22.6 kilograms of seed from remnant native vegetation located on Mt Arthur Coal owned land in the vicinity of the operation within conservation and offset areas for use in rehabilitation of Due to poor weather conditions no supplementary planting occurred during the reporting period
- A cattle grazing trial on rehabilitated land was finalised with good results. The trials had beef cattle grazed on rehabilitated land on Coal & Allied's Hunter Valley Operations (HVO) mine site and BHP's Mt Arthur Coal site. At the same time, cattle are grazed on analogue sites located nearby but on unmined land and results between rehabilitated and unmined paddocks are independently monitored and compared.

  The study was designed and monitored by the Department of Primary Industries in collaboration with the Upper Hunter Mining Dialogue Joint Working Group - Land Management, including representatives from agricultural groups, local farmers, environmental groups, state and local government and the mining industry.

  The trial also monitored the health of the cattle through blood tests and monitors the pasture, providing valuable information on the growth rates and feed quality of the rehabilitated land.

  Results: Steers grazing on the rehabilitated mine site pastures were found to gain more weight, have better condition (fat cover) and be worth more money than steers grazing on the analogue native pastures. At the Muswellbrook (Mt Arthur Coal) site where soil fertility and pasture availability were similar, the steers grazing rehabilitated pasture were found to have an advantage of 46kg/head and 68kg/head for groups one and two respectively.
- Rehabilitation maintenance activities, including slashing, fencing, weed spraying, soil management, minor earthworks repairs and feral animal control.
- Topsoil testing of pre-strip areas and stockpiling to a maximum of three metres ahead of re-use on rehabilitated areas.

- Topsoil stockpiles were seeded with a suitable cover crop to minimise weed infestation and also stabilise the surface for air quality and visual amenity purposes.

9.6 Rehabilitation activities for next reporting period (FY19)

The FY18 – FY19 MOP was approved in June 2017 (v1.1 as amended 7 Dec 2017) by DRG (formerly DRE) for the period of 1 July 2017 to 30 June 2019. Performance indicators and completion criteria were developed for the MOP and are representative of current site techniques and information derived from monitoring data. This will be dynamic over the life of the mine in consultation with DRG progressing towards rehabilitation being self-sustaining on site.

Rehabilitation activities for the FY19 reporting period include the continuation of natural landform design rehabilitation techniques and the inclusion of habitat in new areas as they become available. Rehabilitation targets will align with those in the FY18 and FY19 MOP with an annual rehabilitation area target of 90 ha.

New rehabilitation of land will be carried out in accordance with the:

- Mt Arthur Coal's FY18 & FY19 MOP;
- Rehabilitation Strategy MAC-ENC-MTP-047;
- Biodiversity Management Plan MAC-ENC-MTP-050; and the
- Land Management Procedure.

Additional focus on improving the quality of rehabilitation of VD1 will continue in FY19 with the aim of establishing self-sustaining Box Gum woodland based vegetation community as described in the MOP. Potential expansion of the grazing trial to other rehabilitation areas will be investigated if weather conditions are favourable.

The rehabilitation at VD1 was assessed as part of the Rehabilitation Annual Rapid Assessment (ARA) in June 2018. Recommendation from the ARA will be used to drive the rehabilitation plan for FY19. The plan seeks to address the issues raised in the ARA including establishment of both seeded areas and areas with tubestock planting, herbivore predation, topsoil condition and drought mitigation. Drought is the most difficult issue to address and across the Hunter Valley many rehabilitation sites as well as farming in general are being adversely affected by lack of rainfall. Providing actions that result in the best topsoil conditions for the planting is the best mitigation action available to assist with success in low rainfall seasons. The rehabilitation progression plan includes the following rehabilitation processes that will enable box gum woodland development at VD1:

- Weed management – Weeds including introduced pasture grasses will be managed using options from the MOP TARP including scarifying, spraying, mulching and ripping to allow the box gum woodland species to establish on existing rehabilitation;
- Topsoil and subsoil testing – testing of the topsoil will be completed to understand changes since the topsoil was spread and will inform the fertiliser and amelioration requirements of topsoil;
- Topsoil preparation - prepare the topsoil for planting and seeding will include options of ripping, mulch, organic medium, fertiliser and ameliorants such as gypsum. Mulch may be used to assist in weed control, moisture retention and stability while the vegetation establishes;
- Herbivore management - Kangaroos and other herbivores have been identified as an issue to plant establishment. Herbivore management will be implemented to reduce predation on the new rehabilitation;
- Progressive maintenance – Maintenance has been discussed with consultants and a program will be established to manage rehabilitation progression of existing wooded areas by use of thinning and replanting of species that are not as successfully sown by seed;
- Research – Research with Royal Botanical Garden Society on Box Gum Woodland establishment gaps in box gum woodland establishment and opportunities to improve the rehabilitation progression; and
- Document updates – The Rehabilitation Strategy and Mine operations plan will be updated with improvements from the VD1 plan.

The results of the rehabilitation at VD1 will be monitored using the existing ARA and Ecological monitoring program with recommendations from the monitoring to drive improvement or remedial actions.

10. Community

10.1 Community Interaction

Mt Arthur Coal invites feedback about its activities through a free-call 24-hour Community Response Line (1800 882 044), which is advertised in the local newspapers and at www.bhp.com.

During the reporting period, Mt Arthur Coal received 39 complaints from community members and near neighbours. A comparison of complaints received during the reporting period against previous financial years is shown in Figure 10 and a complete register of complaints is presented in Appendix 4 - Community Complaints.

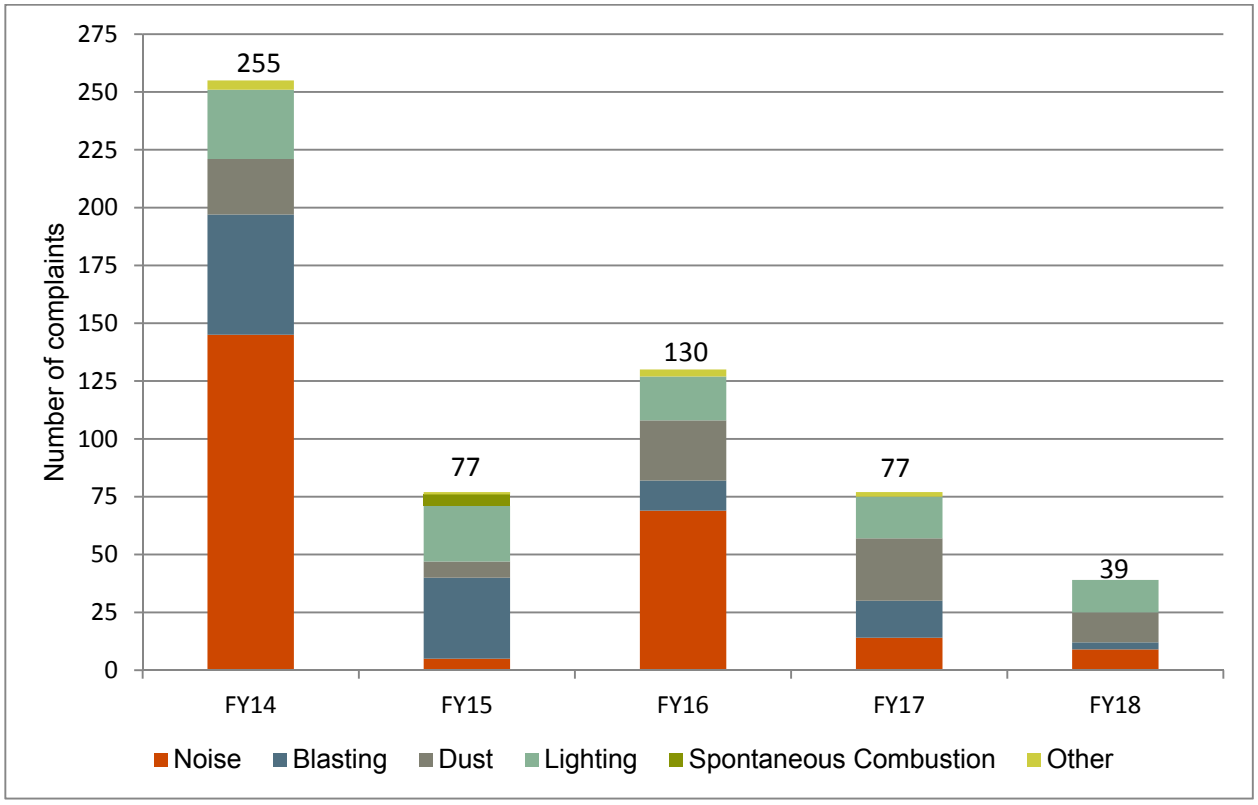


Figure 10: Comparison of complaints received during current and previous financial years

Website and Media

Mt Arthur Coal provides information about the operation through the BHP website at www.bhp.com, including project approval documents, blast schedules, coal transport information, Community Consultative Committee (CCC) meeting minutes, community complaint records, environmental monitoring information, environmental audits, environmental management plans and Annual Reviews.

Community Consultative Committee

During the reporting period, Mt Arthur Coal coordinated four CCC meetings in accordance with the Department of Planning and Environment Guidelines for Community Consultative Committees. CCC meetings were held on:

- 12 September 2017
- 20 December 2017
- 22 March 2018
- 20 June 2018

And participated in one Joint CCC meetings with Maxwell Infrastructure Malabar Coal, held on:

- 20 December 2017

A second joint CCC was scheduled for the 20 June 2018 however was postponed until 4 July 2018.

10.2 Community Investment

During the reporting period Mt Arthur Coal contributed $587,892 to the local community. Central to Mt Arthur Coal's commitment to the local community is its Voluntary Planning Agreement (VPA) with MSC, of which $500,000 is provided annually toward the Mt Arthur Coal Community Fund. Established under the EP&A Act, the VPA contributes to public amenities and services that may be impacted by the growth in mining operations.

11. Independent Audit

An independent environmental audit was undertaken at Mt Arthur Coal in June 2017, covering the audit period between 1 July 2014 and 30 June 2017. The audit was undertaken by an audit team led by Peter Horn from Jacobs, approved by the DP&E. The audit assessed the environmental performance of the project and compliance with the conditions of the project approval, EPL and mining leases including associated assessments, plans or programs. It also reviewed the adequacy of strategies, plans or programs required under these approvals.

A following summary of the audit results was provided in the audit report (Jacobs), December 2017):

"A total of 1,526 conditions and commitments were assessed as part of this audit. 33 issues resulted in 38 non-compliances, of which 28 of the non-compliances were administrative.

A basic risk assessment was conducted for all non-compliances with Low/Medium/High risk levels provided as results. For the non-compliances that were not administrative, there were 6 Low and 4 Medium results. No High risk non-compliances were identified in the audit.

Complaints have reduced over the previous few years results (apart from a spike in complaints in 2015-16). Reportable incidents totalled 7 in the audit period, with the incidents closed out adequately."

The audit report together with the response to audit recommendations is available on the BHP website.

The next Independent Environmental Audit will be undertaken in FY20.

Progress of actions arising from audit recommendations is presented in Table 29.

Table 29: Progress on 2017 Independent Environmental Audit Actions

Audit Report Reference	Issue	Audit Finding	Conditions and Commitments Found Not Compliant	Status
Section 4.1, Table 5 Item 1 (page 9) / Section 4.2, Table 6 Item 1 (page 12)	A comprehensive system utilising meteorological monitoring and predictive forecasting for noise management was not in place at the time of the audit.	Not Compliant Low Risk	PA 09_0062 Sch.3 C8(b)	**In progress** A system was under development during the audit and has since been finalised. The Noise Management Plan is currently undergoing review. The new system will be implemented within one month of approval of the revised Noise Management Plan by DP&E. **Action assigned** (within one month of approval of NMP by DPE).
Section 4.1, Table 5 Item 2 (page 9) / Section 4.2, Table 6 Item 2 (page 12)	Due to an administrative Non-compliance in the Noise Management Plan, DPE consider it not implemented.	Not Compliant Administrative	PA 09_0062 Sch. 3 C9	
Section 4.1, Table 5 Item 3 (page 9) / Section 4.2, Table 6 Item 2 (page 12)	Due to an administrative Non-compliance in the PA and the Blast Management Plan, DPE consider it not implemented.	Not compliant Administrative	PA 09_0062 Sch. 3 C17	**Complete** The review of the Blast Management Plan (BMP) has now been completed and approved by the DP&E. **Action completed** (approved by DP&E 7 June 2018).
Section 4.1, Table 5 Item 4 (page 9) / Section 4.2, Table 6 Item 4 (page 12)	The Blast Management Plan does not include the requirement for active participation in Muswellbrook Council's online blasting portal.	Not Compliant Administrative	PA 09_0062 Sch.3 C17(d)	
Section 4.1, Table 5 Item 5 (page 9) / Section 4.2, Table 6 Item 5 (page 12)	The site was not able to demonstrate the coordination of air quality management with neighbouring mines Drayton, Mangoola and Bengalla. MAC is involved in the Upper Hunter Mining Dialogue.	Not Compliant Low Risk	PA 09_0062 Sch.3 C23(g)	**Complete** Mt Arthur Coal believes its inclusion in the Upper Hunter Mining Dialogue satisfies the intent of this condition. Data is also shared on an ad hoc basis for monitoring sites that aid in management of air quality as required. **Action assigned** (a protocol to coordinate air quality management will be developed by June 2019).

Audit Report Reference	Issue	Audit Finding	Conditions and Commitments Found Not Compliant	Status
Section 4.1, Table 5 Item 6 (page 10) / Section 4.2, Table 6 Item 6 (page 13)	Due to a Non-compliance in the Air Quality Management Plan, DPE consider it not implemented.	Not Compliant Low Risk	PA 09_0062 Sch. 3 C24	**In progress** The revised Air quality and Greenhouse Gas Management Plan waiting on approval from DP&E. **Action in progress** (final version of the AQMP submitted to DP&E 27 September 2018)**.**
Section 4.1, Table 5 Item 7 (page 10) / Section 4.2, Table 6 Item 7 (page 13)	Due to a Non-compliance in the Water Management Plan, DPE consider it not implemented	Not Compliant Low Risk	PA 09_0062 Sch. 3 C29	**In progress** A revision of the Water Management Plan (WMP) is in progress, however the DP&E have requested that the revised management plans for revision will be submitted sequentially to avoid overloading the reviewers. A system is being developed to record all required reviews of management plans listed in PA 09_0062. **Action assigned** (completion of WMP review DP&E dependent, system for recording of reviews to be implemented by 30 June 2019).
Section 4.1, Table 5 Item 8 (page 9) / Section 4.2, Table 6 Item 8 (page 12)	There was no evidence of consultation with Muswellbrook Council with regard to the Thomas Mitchell Drive offset area (offsite).	Not Compliant Administrative	PA 09_0062 Sch.3 C39	**Complete** Mt Arthur Coal will advise Muswellbrook Shire Council in writing that the Conservation Agreement has already been registered on title. **Action completed** (completed on 31 May 2018).

Audit Report Reference	Issue	Audit Finding	Conditions and Commitments Found Not Compliant	Status
Section 4.1, Table 5 Item 9 (page 10) / Section 4.2, Table 6 Item 9 (page 13)	Due to an administrative Non-compliance in the Biodiversity Management Plan, DP&E consider it not implemented.	Not Compliant Administrative	PA 09_0062 Sch. 3 C40	**In Progress** Mt Arthur Coal has reviewed and updated the Biodiversity Management Plan. The Plan currently has Federal Government interim approval and is awaiting State Government approval. **Action assigned** (the Biodiversity Management Plan submitted to DP&E 4 December 2018)**.**
Section 4.1, Table 5 Item 10 (page 9) / Section 4.2, Table 6 Item 10 (page 12)	The Biodiversity Management Plan does not include: 1) Details for targeted rehabilitation efforts in creeks and drainage lines. 2) Detail on the proposed landscaping associated with public roads.	Not Compliant Administrative	PA 09_0062 Sch.3 C40(c)	**In Progress** Mt Arthur Coal has reviewed and updated the Biodiversity Management Plan to address all requirements from PA 09_0062 Sch.3 C40(c) iii, iv, v and vi. The Plan currently has Federal Government interim approval and is awaiting State Government approval. **Action assigned** (the Biodiversity Management Plan submitted to DP&E 4 December 2018).
Section 4.1, Table 5 Item 11 (page 10) / Section 4.2, Table 6 Item 11 (page 15)	There was no evidence of lodgement of the Conservation Bond.	Not Compliant Medium Risk	PA 09_0062 Schedule 3 C41(b)	**Complete** Evidence of the lodging of the bond was submitted to the auditor after the audit. **No further action required** (bond submitted and accepted at DP&E on 15 January 2018).

Audit Report Reference	Issue	Audit Finding	Conditions and Commitments Found Not Compliant	Status
Section 4.1, Table 5 Item 12 (page 10) / Section 4.2, Table 6 Item 12 (page 15)	Due to an administrative Non-compliance in the Aboriginal Heritage Management Plan, DPE consider it not implemented.	Not Compliant Administrative	PA 09_0062 Schedule 3 Condition 45	**In progress** A revision of the Aboriginal Heritage Management Plan (AHMP) is in progress, however the DP&E have requested that the revised management plans for revision will be submitted sequentially to avoid overloading the reviewers. A system is being developed to record all required reviews of management plans listed in PA 09_0062. **Action assigned** (completion of AHMP review DP&E dependent, system for recording of reviews to be implemented by the end of 30 June 2019).
Section 4.1, Table 5 Item 13 (page 10) / Section 4.2, Table 6 Item 13 (page 15)	Due to an administrative Non-compliance in the Environmental Management Strategy, DPE consider it not implemented.	Not Compliant Administrative	PA 09_0062 Schedule 5 Condition 1	**In Progress** The Environmental Management Strategy will be revised following the approval of the revised Air Quality & GHG, Noise, Blast and Water Management Plans by DP&E. **Action assigned** (completion within one month of approval of revised Air Quality & GHG, Noise, Blast and Water Management Plans by DP&E).

Audit Report Reference	Issue	Audit Finding	Conditions and Commitments Found Not Compliant	Status
Section 4.1, Table 5 Item 16 – 19 (page 10) / Section 4.7, Table 8 Items 1 and 5 (page 17) / Section 4.8, Table 9 Items 1 (page 17-19)	There was no evidence of the approval of flow metering devices by NSW Office of Water (or DPI Water).	Not Compliant Low Risk	Water Licence 20BL171995 C2 Water Licence 20BL171995 C8 Water Licence 20BL168155 C7 Water Licence 20BL171995 C3 Water Licence 20BL171995 C5 Water Licence 20BL171995 C7	**In progress** Further investigation into this groundwater licence condition and Mt Arthur Coal's compliance with it will be undertaken. The Office of Water will be notified of the outcomes of the investigation and any specific actions/due dates that come out of it. Work on this action has been delayed due to focus on other actions from the IAA. **Action assigned** (completion by 31 June 2020).
Section 4.1, Table 5 Item 20 (page 10) / Section 4.16, Table 10 Item 1 (page 19)	Renewal of ML 1358 was not notified to landowners within 3 months of renewal.	Not Compliant Low Risk	ML 1358 C46	**Complete** Landholder notification requirements associated with mining lease conditions are now managed and monitored within the LandAssist tenement management system. A system generated reminder is now sent to the person responsible for landholder notifications following lease renewal, to prevent reoccurrence of this non-compliance. **No further action required (completed 30 June 2018).**

Audit Report Reference	Issue	Audit Finding	Conditions and Commitments Found Not Compliant	Status
Section 4.1, Table 5 Item 21 (page 10) / Section 4.21, Table 11 Item 1 (page 20)	The Annual Compliance Report for ML 263 was submitted late.	Complete	ML 263 C4	**Complete** Reporting requirements associated with mining lease conditions are now managed and monitored within the LandAssist tenement management system. A system generated reminder is now sent to the person responsible for preparing and submitting the Annual Compliance Report to prevent reoccurrence of this non-compliance. **No further action required (completed 30 June 2018).**
Section 4.1, Table 5 Item 22 (page 11) / Section 4.22, Table 12 Item 1 (page 20)	The ROM pad was excessively dusty at the time of the site inspection.	Not Compliant Medium Risk	AQGGMP S3.1	The site inspection was undertaken on 20 September 2017. There were no exceedances of air quality impact assessment criteria recorded and no evidence of dust leaving site on 20 September, hence dust management controls applied were considered adequate by Mt Arthur Coal. **No further action required.**
Section 4.1, Table 5 Item 23 (page 11) / Section 4.22, Table 12 Item 2 (page 22)	A minor road beside Edderton Road was being used by large (not light) vehicles and was excessively dusty at the time of the site inspection. It was not adequately watered at the time of the inspection.	Not Compliant Medium Risk	AQGGMP S3.1	The site inspection was undertaken on 20 September 2017. Seven water carts were operational across the mine site on this day. Although a water cart was not specifically observed on this minor road at the time of the site inspection by the audit team, dust controls on haul roads and minor roads across site were being applied on the day and no dust was observed leaving the site, hence dust management controls were considered adequate by Mt Arthur Coal. **No further action required.**

Audit Report Reference	Issue	Audit Finding	Conditions and Commitments Found Not Compliant	Status
Section 4.1, Table 5 Item 24 (page 11) / Section 4.22, Table 12 Item 3 (page 21)	Evidence was not provided of the submission of an air quality report with the EPL 11457 Annual return.	Not Compliant Administrative	AQGGMP S5	**In Progress** No specific air quality monitoring report is required by the EPA to be submitted with the Annual Return. Any exceedances or non-compliances are detailed in the Annual Return forms. The review of the Air quality and Greenhouse Gas Management Plan has been revised and is waiting on approval from DP&E. **Action in progress** (final version of the AQMP submitted to DP&E 27 September 2018)**.**
Section 4.1, Table 5 Item 25 (page 11) / Section 4.24, Table 13 Item 2 (page 21)	No evidence of the audit of the Blast Management Plan (every 3 years) in the audit period.	Not Compliant Administrative	BMP App 5 S8	**Completed** The review of the Blast Management Plan (BMP) has now been completed and approved by the DP&E. **Action completed** (approved by DP&E 7 June 2018). **In progress** A system is being developed to record all required reviews of management plans listed in PA 09_0062. **Action in progress** (system for recording of reviews to be implemented by 30 June 2018

Audit Report Reference	Issue	Audit Finding	Conditions and Commitments Found Not Compliant	Status
Section 4.1, Table 5 Item 26 (page 11) / Section 4.24, Table 13 Item 1 (page 21)	Contractors engaged in undertaking drill and blast tasks at MAC are required to understand and follow the Blast Management Plan but no evidence of this was able to be provided.	Not Compliant Low Risk	BMP App 5 S7	**Completed** MAC is going through the process of updating induction requirements for all of site in a complete overhaul of the induction process. This will include assigning requirements for all relevant drill and blast contractors to make everyone aware of the Plan and requirements that need to be followed. **Action in progress** (awareness sessions for relevant contractors will be conducted by 31 March 2019).
Section 4.1, Table 5 Item 27 (page 11) / Section 4.26, Table 14 Item 1 (page 22)	The EMS needs to be updated as it quotes procedures that were no longer used and could not be found.	Not Compliant Administrative	EMS Table 2	**In Progress** The Environmental Management Strategy will be revised following the approval of the revised Air Quality & GHG, Noise, Blast and Water Management Plans by DP&E. **Action assigned** (completion within one month of approval of revised Air Quality & GHG, Noise, Blast and Water Management Plans by DP&E).
Section 4.1, Table 5 Item 28 (page 11) / Section 4.28, Table 15 Item 1 (page 22)	The Thomas Mitchell Drive offset area has been fenced in accordance with the AHMP but the access protocols were not determined through consultation with the Indigenous Stakeholders.	Not Compliant Administrative	AHMP S5.1	**In Progress** Mt Arthur Coal will consult with Indigenous Stakeholders regarding opening hours and supervision of third parties accessing the TMD Offsite Offset Area and document the outcomes of the consultation process. A meeting between Indigenous Stakeholders have taken place with actions assigned on 10 December 2018, no formal agreements have been put in place yet. **Action assigned** (completion by 31 July 2019).

Audit Report Reference	Issue	Audit Finding	Conditions and Commitments Found Not Compliant	Status
Section 4.1, Table 5 Item 29 (page 11) / Section 4.28, Table 15 Item 2 (page 23)	The commitments from Section 5.8 of the AHMP are not followed through in the site induction package.	Not Compliant Administrative	AHMP S5.8	**In Progress** MAC is going through the process of updating induction requirements for all of site in a complete overhaul of the induction process. This will include assigning requirements for all levels of staff regarding environmental and cultural heritage awareness. Mt Arthur Coal will update the site induction package accordingly. **Action assigned** (completion by 31 July 2019).
Section 4.1, Table 5 Item 30 (page 11) / Section 4.28, Table 15 Item 3 (page 23)	The audit team were not able to determine whether all reviews required by Section 7 of the AHMP had been completed.	Not Compliant Administrative	AHMP S7.0	**In Progress** A system is being developed to record all required reviews of management plans listed in PA 09_0062. **Action assigned** (system for recording of reviews to be implemented by the end of 30 June 2018).

Audit Report Reference	Issue	Audit Finding	Conditions and Commitments Found Not Compliant	Status
Section 4.1, Table 5 Item 31 (page 11) / Section 4.28, Table 15 Item 4 (page 23)	The offset management plans do not refer to Cultural Heritage issues.	Not Compliant Administrative	AHMP App 4	**In progress** A revision of the Aboriginal Heritage Management Plan (AHMP) is in progress, however the DP&E have requested that the revised management plans for revision will be submitted sequentially to avoid overloading the reviewers. A system is being developed to record all required reviews of management plans listed in PA 09_0062. **Action assigned** (completion of AHMP review DP&E dependent, system for recording of reviews to be implemented by the end of 30 June 2019).
Section 4.1, Table 5 Item 31 (page 11) / Section 4.29, Table 16 Item 1 (page 24)	It was not able to be established if all the required reviews of the European Heritage Management plan had taken place.	Not Compliant Administrative	EHMP S6	**In Progress** A system is being developed to record all required reviews of management plans listed in PA 09_0062. **Action assigned** (system for recording of reviews to be implemented by the end of 30 June 2019).

Audit Report Reference	Issue	Audit Finding	Conditions and Commitments Found Not Compliant	Status
Section 4.1, Table 5 Item 33 (page 11) / Section 4.31, Table 17 Item 1 (page 25)	Evidence of an annual review of the Groundwater Monitoring Program was not able to be provided.	Not Compliant Administrative	GMP S1.2	A system will be developed to record all required reviews of management plans listed in PA 09_0062. The Interim Monitoring Program of the upgraded monitoring network concluded February 2018. An assessment and analysis of interim monitoring program data has been completed. Sufficient reference dataset has been collected to revise and set new groundwater triggers and monitoring frequency. The Groundwater Monitoring Program will be revised and submitted with the updated WMP. DP&E have requested that the revised management plans for revision will be submitted sequentially to avoid overloading the reviewers. **Action assigned** (completion of WMP review DP&E dependent).
Section 4.1, Table 5 Item 34 (page 11) / Section 4.32, Table 18 Item 1 (page 23) / Section 4.45, Table 26 Item 2 (page 30)	The audit team were not able to verify that all of the required reviews of the NMP had taken place.	Not Compliant Administrative	NMP S9.2	**In Progress** A system is being developed to record all required reviews of management plans listed in PA 09_0062. **Action assigned** (system for recording of reviews to be implemented by the end of 30 June 2019).
		Not Compliant Administrative	EA 2013 S4.10.3	

Audit Report Reference	Issue	Audit Finding	Conditions and Commitments Found Not Compliant	Status
Section 4.1, Table 5 Item 35 (page 11) / Section 4.35, Table 19 Item 1 (page 26)	The site water balance requires updating and has not been updated since 2012.	Not Compliant Low Risk	Site Water Balance S2.2.2	**In Progress** The site water balance model was recently updated and a calibration completed in January 2018. The corresponding Site Water Balance management document will be updated accordingly with the WMP. DP&E have requested that the revised management plans for revision will be submitted sequentially to avoid overloading the reviewers. **Action assigned** (completion of WMP review DP&E dependent).
Section 4.1, Table 5 Item 36 (page 11) / Section 4.36, Table 20 Item 1 (page 26)	The audit team were not able to verify that all of the required reviews of the WMP had taken place.	Not Compliant Administrative	Site WMP S10	**In Progress** A system will be developed to record all required reviews of management plans listed in PA 09_0062. **Action assigned** (system for recording of reviews to be implemented by the end of 30 June 2019).
Section 4.1, Table 5 Item 37 (page 11) / Section 4.37, Table 21 Item 1 (page 27)	Evidence of the annual review of the Surface Water and Groundwater Response Plan was not able to be provided.	Not Compliant Administrative	Surface Water and Ground Water Response Plan S1.2	**In Progress** A system will be developed to record all required reviews of management plans listed in PA 09_0062. **Action assigned** (system for recording of reviews to be implemented by the end of 30 June 2019).

Audit Report Reference	Issue	Audit Finding	Conditions and Commitments Found Not Compliant	Status
Section 4.1, Table 5 Item 38 (page 11) / Section 4.38, Table 22 Item 1 (page 27)	Evidence of the annual review of the Surface Water Monitoring Program was not able to be provided.	Not Compliant Administrative	Surface WMP S1.2	**In Progress** A system will be developed to record all required reviews of management plans listed in PA 09_0062. **Action assigned** (system for recording of reviews to be implemented by the end of 30 June 2019).
Section 4.1, Table 5 Item 39 (page 12) / Section 4.40, Table 23 Item 1 (page 28)	Evidence of the annual review of the Biodiversity MP was not able to be provided.	Not Compliant Administrative	Biodiversity MP S11	**In Progress** A system will be developed to record all required reviews of management plans listed in PA 09_0062. **Action assigned** (system for recording of reviews to be implemented by the end of 30 June 2019). The Biodiversity MP was reviewed and submitted to Government on 29 June 2017. The Plan currently has interim Federal Government approval and is State Government awaiting approval. **Action assigned** (the Biodiversity Management Plan submitted to DP&E 4 December 2018)).
Section 4.1, Table 5 Item 40 (page 12) / Section 4.41, Table 24 Item 1 (page 28) / Section 4.42, Table 25 Item 1 (page 29)	Evidence of review of the offset strategies was not able to be provided.	Not Compliant Administrative	Onsite and Near Offsite Offset Management Program S7	During the 29 June 2017 review of the Biodiversity MP it was decided that the OMPs were not needed. The intent of the OMPs is now incorporated into the revised Biodiversity MP, which currently has State Government approval and is awaiting Federal Government approval. **No further action required.**
		Not Compliant Administrative	Offset Management Program - Middle Deep Creek Offset Area S7	

Audit Report Reference	Issue	Audit Finding	Conditions and Commitments Found Not Compliant	Status
Section 4.1, Table 5 Item 41 (page 12) / Section 4.45, Table 26 Item 1 (page 30)	The Aboriginal Heritage Management Plan should have been updated in consultation with the Aboriginal community and the OEH to specify management and mitigation measures relevant to the 2013 Modification area.	Not Compliant Administrative	EA 2013 S4.7.3	The Aboriginal Heritage Management Plan will be reviewed and revised by Mt Arthur Coal, in consultation with OEH, the Aboriginal community, MSC and relevant landowners. A revision of the Aboriginal Heritage Management Plan (AHMP) is in progress, however the DP&E have requested that the revised management plans for revision will be submitted sequentially to avoid overloading the reviewers. **Action assigned** (completion of AHMP review DP&E dependent, system for recording of reviews to be implemented by the end of 30 June 2019).

12. Incidents and Non-compliances

Excessive Wheel Generated Dust – 14 November 2017

On Tuesday 17 November Mt Arthur Coal mine (MAC) received an invitation to show cause from the Environmental Protection Agency (EPA) regarding haul road dust suppression practices on 14 November 2017. The EPA alleged that a number of dump trucks were utilising the haul road adjacent Denman Road without adequate dust suppression. The EPA further alleged that dust was observed leaving the mine site for a period of 15 minutes from approximately 1422 hours. The EPA alleged that the following Environmental Protection Licence (EPL) conditions were breached as a result:

- O3.1 – not maintaining the premises in a condition which minimises or prevents the emission of dust from the premises.
- O3.2 – conducting activities on the premises in a manner that did not minimise the generation of emission of wind-blown or traffic generated dust from the premises.

MAC responded to the show cause notice detailing how dust management practices were implemented at the time of the alleged EPL breach. These included:

- The use of dust forecasting air quality mode that includes forecast wind speed, wind direction and operational data;
- Strategic water cart deployment;
- Use of haul road surface treatment products; and
- Reduction of haul road speed limits.

Following receipt of MAC's response the EPA determined that the following course of action was appropriate:

- To issue MAC with one Official Caution for the alleged breach of Section 64(1) of the POEO Act being failure to comply with condition O3.1 of the MAC EPL; and
- To issue MAC with one Penalty Notice of $15,000 for the alleged breach of Section 64(1) of the POEO Act being failure to comply with condition O3.2 of the MAC EPL.

Inadequate response to real-time air quality alarms – 14-15 December 2017

Over the following dates: 8, 13, 14, 15 and 20 December 2017 elevated 24 hour average PM_{10} results were recorded at DC02, DC05 and DC09. MAC issued a notification to the Department of Planning and Environment (DP&E) on 27 December 2017 detailing the findings of internal investigations into the exceedances of the MAC 24 hour average PM_{10} trigger value (50 µg/m^3). In this initial investigation it was determined that only one exceedance was determined to have been the result of contribution from MAC (DC05 on 15 December 2017 51.8 µg/m^3).

Following the notification DP&E requested additional data to assist in determining compliance with Schedule 3, condition 20 of PA09_0062. This data included:

- Data from DC02, DC05 and DC09 for the period 12pm 14 December 2017 to 12am 15 December 2017 (i.e. 30 hour period);
- Meteorological conditions for the above period;
- Water cart log for the above period;
- OCE log which notes RT alarm responses for the above period (including shut downs, diversions, etc);
- Location of operations for the above period; and
- Any other relevant information.

In the subsequent investigation MAC determined that original estimate of contribution form the site was incorrectly calculated (40.1 µg/m^3). Subsequent to the additional data being supplied, DP&E issued a show cause notice as to why DP&E should not take action regarding potential breaches of:

- Schedule 3 Condition 20 (exceedance of air quality impact assessment criteria); and
- Schedule 3 Condition 24 (failure to implement the Air Quality Management Plan).

MAC then organised a meeting with DP&E to discuss the show cause notice. The result of the meeting was that the DP&E issued MAC with an official caution, forming the view that MAC has breached Schedule 3 Condition 24 of the project approval. While the caution was accepted, MAC did not agree that a breach had occurred.

Late submission of compliance report – 5 March 2018

Compliance report to be submitted in accordance with condition 14 of *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) approval 2011/5866 was submitted by the due date. The DoEE accepted the compliance report and elected to take no further action in relation to the late submission.

13. Activities during next reporting period

Mt Arthur Coal has established the following targets for the next reporting period:

- upgrade components of the air quality monitoring network and real time monitoring system to improve system accuracy and reliability; and
- execute three year plan that includes an annual weed assessment, weed strategy and weed management review. Weed management priorities will be revised based on the outcomes of the reviews with the aim of improving strategies for weed control across the site with particular focus on newly established rehabilitation.

These targets will be closely monitored and an update on the status of each will be reported in the next Annual Review.

Table 30 outlines a progress summary of Mt Arthur Coal's performance against targets set for the FY18 period.

Table 30: Mt Arthur Coal's performance against targets for FY18

Target	Status	Performance
Continue the rehabilitation grazing study project	Ongoing	The grazing trial was completed in 2017 with a final report provided to the NSWMC. MAC will continue the current grazing monitoring schedule of three yearly monitoring in order to review and understand the grazing rehabilitation sustainability. HVEC will work with the NSWMC if there is to be further work on the grazing trials but currently there are no further grazing trials planned.
Employ at least eight first-year apprentices from the local community	Complete	Six apprentices were employed during the reporting period.
Continue study on natural design locations for Mt Arthur Coal	Complete	Conceptual designs for the landforms across MAC have been developed and were submitted to DP&E on 29 June 2018. The design focused on minimising flows to the voids and maximising flow to the natural systems. Furthermore visual characteristics have been integrated with the proposed land uses of grazing and woodland. The designs will continue to be updated as the mine progresses to align with actual mine spoil volumes and mining activities.
Continue study and development of void management plan	Complete	A Final Void Management Plan (FVMP) has been prepared in accordance with regulatory requirements and submitted to DPE on 29 June 2018. The FVMP outlines the approach to aspects and issues regarding final voids at MAC and provides information on what studies will be implemented to enhance and update the plan into the future. The FVMP also describes, in detail, relevant aspects of the void design and management in relation to the objectives and closure criteria as safe, stable and non-polluting. MAC has considered the plan options within the constraints of the current approval and taken positive actions to minimise the extent of final voids.

Appendix 1 - Air Quality Monitoring Results

High Volume Air Sampler (HVAS) PM_{10} Results

Date	DF05	DF06	DF07	Regulatory Criteria
	24-hour PM_{10}	24-hour PM_{10}	24-hour PM_{10}	Short term (24-hour)
5/07/2017	1.0	14.0	7.0	
11/07/2017	14.0	23.0	21.0	
17/07/2017	21.0	50.0	22.0	
23/07/2017	14.0	46.0	33.0	
29/07/2017	6.0	27.0	10.0	
4/08/2017	0.0	6.0	4.0	
10/08/2017	9.0	17.0	8.0	
16/08/2017	4.0	44.0	31.0	
22/08/2017	33.0	45.0	32.0	
28/08/2017	28.0	42.0	24.0	
3/09/2017	21.0	63.0	45.0	
9/09/2017	13.0	52.0	12.0	
15/09/2017	7.0	19.0	10.0	
21/09/2017	21.0	50.0	21.0	
27/09/2017	66.0	54.0	39.0	
3/10/2017	19.0	37.0	22.0	
9/10/2017	13.0	30.0	15.0	
15/10/2017	22.0	21.0	16.0	
21/10/2017	16.0	19.0	16.0	
27/10/2017	10.0	14.0	12.0	
2/11/2017	29.0	43.0	26.0	
8/11/2017	18.0	14.0	10.0	
14/11/2017	25.0	14.0	26.0	50
20/11/2017	39.0	23.0	14.0	
26/11/2017	29.0	28.0	26.0	
2/12/2017	7.0	18.0	7.0	
8/12/2017	32.0	86.0	37.0	
14/12/2017	25.0	70.0	28.0	
20/12/2017	26.0	44.0	87.0	
26/12/2017	17.0	18.0		
1/01/2018	63.0	47.0		
7/01/2018	25.0	89.0		
13/01/2018	42.0	87.0	31.0	
19/01/2018	91.0	103.0	44.0	
25/01/2018	46.0	68.0	46.0	
31/01/2018	19.0	57.0	33.0	
6/02/2018	35.0	56.0	25.0	
12/02/2018	43.0	59.0	40.0	
18/02/2018	55.0	62.0	43.0	
24/02/2018	1.0	71.0	22.0	
2/03/2018	32.0	26.0	21.0	
8/03/2018	26.0	21.0	17.0	
14/03/2018	35.0	37.0	29.0	
20/03/2018	71.0	94.0	59.0	
26/03/2018	7.0	17.0	15.0	

Date	DF05	DF06	DF07	Regulatory Criteria
	24-hour PM_{10}	24-hour PM_{10}	24-hour PM_{10}	Short term (24-hour)
1/04/2018	32.0	60.0	31.0	
7/04/2018	38.0	31.0	19.0	
13/04/2018	13.0	26.0	11.0	
19/04/2018	30.0	38.0	18.0	
25/04/2018	16.0	32.0	20.0	
1/05/2018	24.0	23.0	12.0	
7/05/2018	23.0	46.0	20.0	
13/05/2018	4.0	37.0	15.0	
19/05/2018	15.0	58.0	31.0	
25/05/2018	34.0	45.0	28.0	
31/05/2018	5.0	22.0	12.0	
6/06/2018	14.0	17.0	15.0	
12/06/2018	3.0	17.0	14.0	
18/06/2018	3.0	22.0	10.0	
24/06/2018	22.0	27.0	22.0	
30/06/2018	8.0	26.0	19.0	
Annual Average Regulatory Criteria	30.0			
Annual Average	24.0	40.2^	23.8	

24-hour result exceeding regulatory criteria, all investigations deemed MAC contribution below criteria

Malfunctioning HVAS monitor - results unreliable or unreadable

^ Investigation deemed MAC contribution below criteria

Tapered Element Oscillating Microbalance (TEOM) PM_{10} Validated Results

Date	24-hour PM_{10}					
	DC02	DC04	DC05	DC06	DC07	DC09
	Sheppard Avenue	South Muswellbrook	Roxburgh Road	Edderton Road	Antiene	Wellbrook
1/07/2017	10	17	10	9	7	7
2/07/2017	14	18	12	7	10	8
3/07/2017	9	15	7	7	7	7
4/07/2017	11	12	3	7	10	5
5/07/2017	8	9	4	4	5	4
6/07/2017	8	13	5	6	7	9
7/07/2017	13	18	5	6	12	6
8/07/2017	18	18	8	6	18	15
9/07/2017	19	20	7	6	12	11
10/07/2017	16	17	12	14	9	12
11/07/2017	15	17	15	11	11	10
12/07/2017	20	26	18	18	16	18
13/07/2017	10	16	22	14	7	17
14/07/2017	15	16	8	8	9	8
15/07/2017	8	15	3	5	6	3
16/07/2017	11	17	8	9	8	7
17/07/2017	12	18	7	11	8	6
18/07/2017	14	15	5	8	10	6
19/07/2017	16	12	6	5	10	6
20/07/2017	20	16	5	6	11	8
21/07/2017	19	21	14	10	12	15
22/07/2017	15	16	7	17	9	11
23/07/2017	14	10	5	11	7	15
24/07/2017	30	34	7	6	15	33
25/07/2017	17	17	6	11	11	13
26/07/2017	45	26	10	12	22	17
27/07/2017	23	22	18	14	13	22
28/07/2017	28	22	8	12	20	14
29/07/2017	17	12	7	19	8	20
30/07/2017	35	28	9	9	19	13
31/07/2017	34	36	24	17	28	27
1/08/2017	9	13	6	7	6	7
2/08/2017	14	15	27	25	11	18
3/08/2017	16	17	26	18	15	18
4/08/2017	6	6	0	4	2	1
5/08/2017	7	8	2	5	7	3
6/08/2017	10	8	3	5	5	3
7/08/2017	19	15	4	12	9	5
8/08/2017	21	12	4	4	11	5

Date	24-hour PM_{10}					
	DC02	DC04	DC05	DC06	DC07	DC09
	Sheppard Avenue	South Muswellbrook	Roxburgh Road	Edderton Road	Antiene	Wellbrook
9/08/2017		9	2	5	5	7
10/08/2017		9	4	8	4	5
11/08/2017		18	9	8	16	9
12/08/2017		12	5	7	11	6
13/08/2017		14	12	12	11	16
14/08/2017		17	10	12	12	16
15/08/2017		23	10	15	17	24
16/08/2017		22	12	11	23	13
17/08/2017		15	7	8	11	8
18/08/2017		26	9	6	28	11
19/08/2017		13	3	3	8	5
20/08/2017		19	12	8	11	16
21/08/2017		20	17	15	13	22
22/08/2017		25	37	21	22	36
23/08/2017		27	21	27	19	24
24/08/2017		21	24	14	18	33
25/08/2017		18	12	10	17	15
26/08/2017		20	10	14	12	17
27/08/2017		18	6	16	13	18
28/08/2017		19	11	6	14	13
29/08/2017		16	22	17	14	22
30/08/2017		22	18	19	16	18
31/08/2017		26	20	13	23	17
1/09/2017	20	21	25	17	16	25
2/09/2017	27	23	15	16	16	25
3/09/2017	42	32	16	18	24	26
4/09/2017	36	19	9	10	15	12
5/09/2017	44	18	8	7	14	10
6/09/2017	47	20	7	7	16	10
7/09/2017	36	16	6	5	16	9
8/09/2017	30	17	7	7	15	11
9/09/2017	26	18	9	10	18	13
10/09/2017	29	24	23	16	19	30
11/09/2017	29	19	21	18	19	28
12/09/2017	30	21	10	29	17	29
13/09/2017	60	46	23	22	41	38
14/09/2017	20	16	5	5	14	6
15/09/2017	15	13	7	7	11	9
16/09/2017	27	18	12	7	14	11
17/09/2017	17	20	17	13	18	16
18/09/2017	23	20	15	25	14	17

Date	24-hour PM_{10}					
	DC02	DC04	DC05	DC06	DC07	DC09
	Sheppard Avenue	South Muswellbrook	Roxburgh Road	Edderton Road	Antiene	Wellbrook
19/09/2017	44	30	17	19	19	22
20/09/2017	36	30	25	17	21	31
21/09/2017	35	19	20	26	14	25
22/09/2017	41	24	14	31	18	38
23/09/2017	50	31	20	27	25	28
24/09/2017	60	41	27	26	40	35
25/09/2017	71	51	17	14	46	24
26/09/2017	46	28	16	14	34	22
27/09/2017	45	40	61	36	37	55
28/09/2017	54	34	36	27	35	36
29/09/2017	44	30	9	10	23	13
30/09/2017	52	30	9	8	22	16
1/10/2017	35	27	26	22	24	28
2/10/2017	51	34	43	28	28	47
3/10/2017	29	26	17	15	18	18
4/10/2017	30	22	26	19	17	23
5/10/2017	21	17	12	16	14	17
6/10/2017	39	28	25	14	27	16
7/10/2017	22	22	30	16	18	20
8/10/2017	26	25	21	19	20	19
9/10/2017	18	18	7	9	14	8
10/10/2017	26	29	30	20	26	25
11/10/2017	23	21	24	22	17	25
12/10/2017	35	18	4	9	16	13
13/10/2017	29	30	25	22	25	24
14/10/2017	19	19	16	13	15	15
15/10/2017	8	11	8	9	9	11
16/10/2017	19	18	15	13	15	15
17/10/2017	23	21	23	18	17	18
18/10/2017	17	18	17	14	14	17
19/10/2017	25	18	17	20	14	20
20/10/2017	18	12	8	8	7	16
21/10/2017	12	17	13	13	14	14
22/10/2017	18	16	15	13	12	12
23/10/2017	10	11	11	9	8	8
24/10/2017	14	13	7	14	10	7
25/10/2017	28	16	9	14	11	16
26/10/2017	31	22	24	25	19	24
27/10/2017	13	14	10	10	9	10
28/10/2017	15	14	9	21	11	14
29/10/2017	21	16	7	14	15	12

Date	24-hour PM_{10}					
	DC02	DC04	DC05	DC06	DC07	DC09
	Sheppard Avenue	South Muswellbrook	Roxburgh Road	Edderton Road	Antiene	Wellbrook
30/10/2017	34	22	11	18	19	18
31/10/2017	30	21	13	8	17	10
1/11/2017	27	24	20	15	18	17
2/11/2017	25	29	25	11	23	24
3/11/2017	32	39	15	9	25	16
4/11/2017	18	20	16	7	16	14
5/11/2017	5	9	6	3	6	5
6/11/2017	16	16	10	6	13	11
7/11/2017	14	18	14	5	12	10
8/11/2017	8	13	12	5	9	9
9/11/2017	13	16	18	5	14	13
10/11/2017	15	16	18	15	14	12
11/11/2017	14	15	16	6	12	14
12/11/2017	16	18	20	8	16	17
13/11/2017	20	20	23	8	18	17
14/11/2017	17	17	20	8	15	17
15/11/2017	23	20	24	7	17	24
16/11/2017	23	20	17	7	15	25
17/11/2017	17	16	23	8	13	22
18/11/2017	14	15	13	5	13	11
19/11/2017	11	14	16	5	11	12
20/11/2017	15	16	20	7	13	17
21/11/2017	17	18	20	7	16	16
22/11/2017	16	15	20	8	14	18
23/11/2017	17	17	14	13	13	17
24/11/2017	21	20	36	13	16	28
25/11/2017	25	26	18	10	20	16
26/11/2017	15	18	20	8	19	19
27/11/2017	22	18	18	9	12	16
28/11/2017	23	22	24	8	15	18
29/11/2017	17	14	16	7	9	15
30/11/2017	22	15	14	9	10	14
1/12/2017	29	17	18	16	13	17
2/12/2017	12	11	7	8	7	8
3/12/2017	12	12	1	3	5	2
4/12/2017	19	21	15	7	15	14
5/12/2017	13	15	9	6	10	8
6/12/2017	20	16	4	3	10	4
7/12/2017	23	17	5	5	12	7
8/12/2017	63	31	22	13	21	24
9/12/2017	18	19	19	8	13	16

Date	24-hour PM_{10}					
	DC02	DC04	DC05	DC06	DC07	DC09
	Sheppard Avenue	South Muswellbrook	Roxburgh Road	Edderton Road	Antiene	Wellbrook
10/12/2017	17	19	20	8	13	16
11/12/2017	23	23	24	10	16	18
12/12/2017	26	24	32	12	18	25
13/12/2017	33	27	35	13	19	78
14/12/2017	52	29	20	15	23	30
15/12/2017	62	46	54	20	37	56
16/12/2017	34	31	25	17	23	18
17/12/2017	42	38	47	17	30	41
18/12/2017	35	31	25	19	25	16
19/12/2017	23	16	12	16	11	19
20/12/2017	58	34	27	20	27	34
21/12/2017	19	19	19	12	14	19
22/12/2017	15	15	15	10	10	17
23/12/2017	26	23	19	14	17	21
24/12/2017	44	26	22	12	21	28
25/12/2017	14	17	13	8	12	12
26/12/2017	12	13	10	5	8	11
27/12/2017	14	15	21	8	9	15
28/12/2017	25	18	29	11	13	31
29/12/2017	37	23	22	12	18	20
30/12/2017	29	21	9	9	12	15
31/12/2017	23	22	25	11	16	21
1/01/2018	31	25	26	12	19	22
2/01/2018	32	24	29	12	18	24
3/01/2018	32	23	22	10	14	19
4/01/2018	25	25	24	13	18	23
5/01/2018	27	31	33	10	20	35
6/01/2018	35	23	25	16	18	28
7/01/2018	48	19	18	17	16	28
8/01/2018	54	43	38	19	37	52
9/01/2018	31	31	18	14	22	20
10/01/2018	37	27	22	9	20	20
11/01/2018	35	32	31	14	25	29
12/01/2018	41	28	33	16	23	36
13/01/2018	66	31	17	14	25	40
14/01/2018	46	31	7	5	17	10
15/01/2018	30	20	15	6	15	17
16/01/2018	53	34	26	9	24	28
17/01/2018	50	33	35	13	25	36
18/01/2018	53	34	44	13	29	50
19/01/2018	66	36	51	19	29	50

Date	24-hour PM_{10}					
	DC02	DC04	DC05	DC06	DC07	DC09
	Sheppard Avenue	South Muswellbrook	Roxburgh Road	Edderton Road	Antiene	Wellbrook
20/01/2018	56	38	45	11	29	39
21/01/2018	37	28	32	9	21	30
22/01/2018	61	40	40	16	31	30
23/01/2018	79	52	62	17	47	63
24/01/2018	60		53	20	40	49
25/01/2018	45		34	14	31	32
26/01/2018	48		32	18	31	28
27/01/2018	39		23	15	26	33
28/01/2018	21		16	10	14	17
29/01/2018	37		23	11	22	21
30/01/2018	52		26	14	27	27
31/01/2018	39		15	8	19	12
1/02/2018	38		22	8	17	22
2/02/2018	33		17	4	12	15
3/02/2018	79		16	5	16	19
4/02/2018	42		15	4	16	13
5/02/2018	41		21	7	17	21
6/02/2018				6	17	25
7/02/2018						
8/02/2018	45	27	43			
9/02/2018	92	47	68	36	41	62
10/02/2018	43	36	47	29	33	33
11/02/2018	60	39	36	25	31	53
12/02/2018	42	13	28	27	33	39
13/02/2018	36	25	35	23	25	31
14/02/2018	55	34	26	21	28	45
15/02/2018	78	61		46	55	61
16/02/2018	83	45	43	39	37	39
17/02/2018	49	37	35	31	31	37
18/02/2018	45	33	42	34	29	40
19/02/2018	85	34	44	29		39
20/02/2018	14	13	13	11		13
21/02/2018	20	14	15	11		15
22/02/2018	27	22	24	14	17	25
23/02/2018	32	24	30	16	19	28
24/02/2018	45	23	24	21	22	26
25/02/2018	15	10	4	7	5	10
26/02/2018	2	6	1	2	2	2
27/02/2018	14	16	16	13	13	14
28/02/2018	22	17	13	14	14	14
1/03/2018	42	35	38	28	29	40

Date	24-hour PM_{10}					
	DC02	DC04	DC05	DC06	DC07	DC09
	Sheppard Avenue	South Muswellbrook	Roxburgh Road	Edderton Road	Antiene	Wellbrook
2/03/2018	24	22	24	19	18	23
3/03/2018	28	26	29	22	21	28
4/03/2018	21	19	14	16	15	18
5/03/2018	18	19	15	16	15	16
6/03/2018	9	12	8	8	8	9
7/03/2018	14	16	15	12		14
8/03/2018	15	15	17	10		13
9/03/2018	13	12	12	8	10	12
10/03/2018	15	16	18	12	14	17
11/03/2018	16	16	19	13	14	15
12/03/2018	20	20	25	22	16	23
13/03/2018	30	21	25	15	18	30
14/03/2018	22	20	24	18	19	25
15/03/2018	28	23	25	21	22	27
16/03/2018	45	38	41	32	36	41
17/03/2018	40	32	32	28	31	34
18/03/2018	42	33	29	32	29	33
19/03/2018	75	59	56	44	58	58
20/03/2018	75	54	56	37	55	54
21/03/2018	11	12	8	8	11	10
22/03/2018	7	10	6	6	7	6
23/03/2018	9	12	9	8	9	8
24/03/2018	11	12	25	13	11	17
25/03/2018	21	15	20	13	13	14
26/03/2018	12	15	4	9	13	7
27/03/2018	19	19	22	15	18	16
28/03/2018	21	22	24	15	19	20
29/03/2018	24	23	28	17	20	23
30/03/2018	25	16	26	17	14	21
31/03/2018	34	34	37	27	33	33
1/04/2018	40	23	24	22	19	20
2/04/2018	31	26	19	22	21	27
3/04/2018	22	25	26	19	21	21
4/04/2018	21	18	20	14	17	18
5/04/2018	20	15	19	13	12	21
6/04/2018	25	20	29	22	16	31
7/04/2018	30	23	34	26	18	31
8/04/2018	34	26	29	29	22	32
9/04/2018	58	35	29	24	31	34
10/04/2018	33	28	28	22	29	27
11/04/2018	42	36	38	26	30	32

Date	24-hour PM_{10}					
	DC02	DC04	DC05	DC06	DC07	DC09
	Sheppard Avenue	South Muswellbrook	Roxburgh Road	Edderton Road	Antiene	Wellbrook
12/04/2018	46	33	31	23	30	27
13/04/2018	37	25	18	20	21	27
14/04/2018	31	24	14	14	21	30
15/04/2018	73	65	53	41	67	63
16/04/2018	23	17	10	10	17	13
17/04/2018	25	20	25	15	20	27
18/04/2018	22	21	22	24	20	25
19/04/2018	29	18	28	15	15	27
20/04/2018	28	18	18	13	16	16
21/04/2018	32	28	27	24	28	26
22/04/2018	20	20	22	19	21	18
23/04/2018	19	16	17	12	15	23
24/04/2018	30	24	16	14	21	18
25/04/2018	30	22	20	16	19	17
26/04/2018	34	24	20	17	23	19
27/04/2018	29	23	15	16	23	16
28/04/2018	21	18	14	11	17	62
29/04/2018	25	25	18	12	17	55
30/04/2018	21	15	18	9	13	24
1/05/2018	15	13	20	16	13	17
2/05/2018	30	22	27	20	20	24
3/05/2018	34	24	17	19	17	31
4/05/2018	61	48	33	32	46	38
5/05/2018	38	31	18	17	28	23
6/05/2018	28	22	43	25	22	35
7/05/2018	32	24	21	20	15	26
8/05/2018	49	34	25	23	28	33
9/05/2018	42	27	24	20	24	33
10/05/2018	65	44	23	30	36	39
11/05/2018	66	34	13	11	31	18
12/05/2018	36	23	8	7	20	9
13/05/2018	26	18	6	7	11	9
14/05/2018	33	26	17	14	21	24
15/05/2018	37	26	29	23	18	29
16/05/2018	32	23	35	19	19	29
17/05/2018	46	27	20	17	18	23
18/05/2018	35	26	20	22	22	27
19/05/2018	36	28	14	21	19	23
20/05/2018	29	21	8	13	17	25
21/05/2018	42	25	10	14	18	31
22/05/2018	25	17	10	8	12	17

Date	24-hour PM_{10}					
	DC02	DC04	DC05	DC06	DC07	DC09
	Sheppard Avenue	South Muswellbrook	Roxburgh Road	Edderton Road	Antiene	Wellbrook
23/05/2018	32	20	23	20	12	34
24/05/2018	34	24	26	20	20	29
25/05/2018	35	29	31	26	26	22
26/05/2018	30	27	28	24	20	27
27/05/2018	31	23	21	18	16	20
28/05/2018	56	29	31	21	18	32
29/05/2018	37	27	17	24	17	31
30/05/2018	17	15	4	11	8	6
31/05/2018	13	12	4		8	5
1/06/2018	16	17	6	7	8	9
2/06/2018	12	15	8	13	9	17
3/06/2018	10	15	8	11	11	10
4/06/2018	14	16	10	8	22	16
5/06/2018	12	14	14	8	10	13
6/06/2018	9	11	11	9	11	9
7/06/2018	13	17	18	13	18	16
8/06/2018	20	29	11	7	31	11
9/06/2018	13	15	4	8	8	6
10/06/2018	7		5	6	6	5
11/06/2018	7		14	12	7	8
12/06/2018	13		4	6	8	4
13/06/2018	21	15	6	8	13	8
14/06/2018	16	16	7	9	13	15
15/06/2018	21	14	9	6	11	10
16/06/2018	16	13	5	7	9	8
17/06/2018	26	11	3	3	12	8
18/06/2018	15	12	4	3	10	5
19/06/2018	11	13	3	4	6	3
20/06/2018	13	15	10	11	10	7
21/06/2018	14	19	13	10	13	11
22/06/2018	11	14	11	9	6	10
23/06/2018	14	17	6	13	10	8
24/06/2018	16	18	17	15	14	18
25/06/2018	19	25	20	16	17	17
26/06/2018	12	17	18	16	13	15
27/06/2018	13	15	29	13	13	17
28/06/2018	10	13	7	8	8	10
29/06/2018	6	8	1	7	4	3
30/06/2018	17	17	5	5	10	5

Date	24-hour PM_{10}					
	DC02	DC04	DC05	DC06	DC07	DC09
	Sheppard Avenue	South Muswellbrook	Roxburgh Road	Edderton Road	Antiene	Wellbrook
Annual Average Regulatory Criteria	30 µg/m³					
Annual Average	29	22	19	14	18	21
Maximum	92	65	68	46	67	78
Data Recovery %	93%	95%	99%	99%	98%	99%
Annual Average TSP Regulatory Criteria	90 µg/m³					
Annual Average TSP	71	55	47	35	44	51

24-hour result exceeding regulatory criteria,
all investigations deemed MAC contribution below criteria

Results unavailable

*Validated data is different to that used for reporting as per Table 15

Appendix 2 - Surface Water Quality Monitoring Results

Surface Water Quality Results

Site	Month	Date sampled	Flow (description)	Field pH	Field EC (uS/cm)	TDS (mg/L)	TSS (mg/L)	Turbidity (NTU)	Sulfate (mg/L)	Dissolved Fe (mg/L)	Total Fe (mg/L)	Nitrate (mg/L)	O&G (mg/L)
SW02	Jul-17	17 & 18/7/2017											
	Aug-17	15 & 16/8/2017											
	Sep-17	12 & 13/9/2017											
	Oct-17	17 & 18/10/2017											
	Nov-17	14 & 15/11/2017											
	Dec-17	12 & 13/12/2017											
	Jan-18	9 & 10/1/2018											
	Feb-18	12/02/2018											
	Mar-18	13 & 14/3/2018											
	Apr-18	10 & 11/04/2018											
	May-18	15 & 16/5/2018											
	Jun-18	19, 25 & 26/6/2018											
	Impact Assessment Criteria Trigger Values		**Stage 1 Trigger**	**6.5< >9.0**	**12365**		**219**						
			Stage 2 Trigger		**13900**		**277**						
SW03	Jul-17	17 & 18/7/2017	Still	7.9	4820	3240	14	0.6	654	<0.05	0.08	0.02	<5
	Aug-17	15 & 16/8/2017	Still	7.8	5110	3220	6	1.2	424	<0.05	0.14	0.02	<5
	Sep-17	12 & 13/9/2017	Still	7.9	5120	3340	8	1	449	<0.05	0.07	0.02	<5
	Oct-17	17 & 18/10/2017	Still	7.8	5470	3450	5	1.9	452	<0.05	0.26	<0.01	<5
	Nov-17	14 & 15/11/2017	Still	7.9	9820	7000	<5	3.6	810	<0.05	0.22	<0.01	<5
	Dec-17	12 & 13/12/2017	Still	7.8	6140	3880	<5	0.9	490	<0.05	0.19	0.04	<5
	Jan-18	9 & 10/1/2018	Still	7.9	6900	4500	<5	1.4	539	<0.05	0.1	<0.01	<5
	Feb-18	12/02/2018	Still	8.0	7960	5020	7	1.3	560	<0.05	0.11	<0.01	<5
	Mar-18	13 & 14/3/2018	Still	7.7	8420	5330	22	4.6	669	0.06	0.68	<0.01	<5
	Apr-18	10 & 11/04/2018	Low	8.0	8640	5400	80	19.9	789	0.08	1.08	0.01	<5
	May-18	15 & 16/5/2018	Still	7.8	8710	5870	18	4.2	840	<0.05	0.35	<0.01	
	Jun-18	19, 25 & 26/6/2018	Still	7.7	8240	5860	66	4.7	686	<0.05	1.56	0.03	<5
	Impact Assessment Criteria Trigger Values		**Stage 1 Trigger**	**6.5< >9.0**	**10133**		**37**						
			Stage 2 Trigger		**11402**		**46**						
SW04	Jul-17	17 & 18/7/2017	Still	7.8	10900	7150	<5	1.1	981	<0.05	<0.05	<0.01	<5
	Aug-17	15 & 16/8/2017	Still	8.4	10620	6880	<5	1.4	774	<0.05	0.06	<0.01	<5
	Sep-17	12 & 13/9/2017	Still	8.4	10660	6760	<5	1.7	801	<0.05	<0.05	0.03	<5
	Oct-17	17 & 18/10/2017	Still	8.6	11620	7530	<5	3.6	744	<0.05	0.08	<0.01	<5

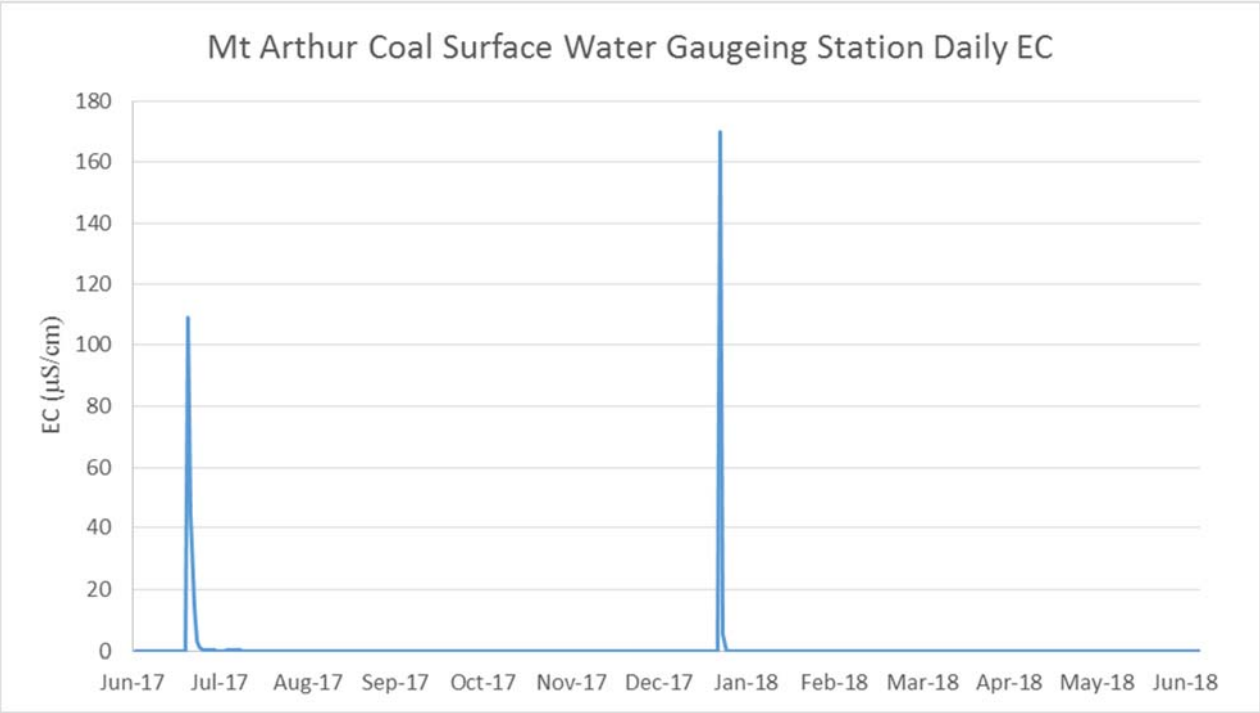
Site	Month	Date sampled	Flow (description)	Field pH	Field EC (uS/cm)	TDS (mg/L)	TSS (mg/L)	Turbidity (NTU)	Sulfate (mg/L)	Dissolved Fe (mg/L)	Total Fe (mg/L)	Nitrate (mg/L)	O&G (mg/L)
	Nov-17	14 & 15/11/2017	Still	8.6	11610	7730	<5	5	890	0.06	0.15	<0.01	<5
	Dec-17	12 & 13/12/2017	Still	8.9	12020	7920	11	2.5	642	<0.05	0.15	<0.01	<5
	Jan-18	9 & 10/1/2018	Still	9.3	15460	10000	6	2.2	693	<0.05	<0.05	<0.01	<5
	Feb-18	12/02/2018											
	Mar-18	13 & 14/3/2018											
	Apr-18	10 & 11/04/2018											
	May-18	15 & 16/5/2018											
	Jun-18	19, 25 & 26/6/2018											
	Impact Assessment Criteria Trigger Values		**Stage 1 Trigger**	**6.5< >9.0**	**13959**		**82**						
			Stage 2 Trigger		**15509**		**104**						
SW12	Jul-17	17 & 18/7/2017	Still	7.6	5430	3680	5	4.6	1070	<0.05	<0.05	<0.01	<5
	Aug-17	15 & 16/8/2017	Still	7.7	5920	4130	8	0.8	932	<0.05	0.07	<0.01	<5
	Sep-17	12 & 13/9/2017	Still	7.9	6320	4320	10	1	1100	<0.05	0.08	<0.01	<5
	Oct-17	17 & 18/10/2017	Still	7.8	7040	4250	<5	2.3	992	<0.05	0.12	0.02	<5
	Nov-17	14 & 15/11/2017	Still	7.9	7460	4980	7	3	1120	<0.05	0.19	<0.01	<5
	Dec-17	12 & 13/12/2017	Still	8.0	8640	6010	18	30.4	1560	0.06	0.15	<0.01	<5
	Jan-18	9 & 10/1/2018	Still	8.0	10830	7440	120	33.2	876	<0.05	0.13	<0.01	<5
	Feb-18	12/02/2018											
	Mar-18	13 & 14/3/2018	Still	7.9	2840	2370	27	11.9	1240	0.1	0.24	1.8	<5
	Apr-18	10 & 11/04/2018	Still	6.9	4280	3220	<5	3.6	1420	0.08	0.66	0.19	<5
	May-18	15 & 16/5/2018	Still	7.2	5440	4320	<5	2.9	1710	0.1	0.47	<0.01	<5
	Jun-18	19, 25 & 26/6/2018	Still	7.5	5700	4400	<5	4.5	1750	0.06	0.78	<0.01	<5
	Impact Assessment Criteria Trigger Values		**Stage 1 Trigger**	**6.5< >9.0**	**6659**		**555**						
			Stage 2 Trigger		**7153**		**708**						
SW15	Jul-17	17 & 18/7/2017	Dam	7.7	1122	646	14	3.2	30	0.18	0.48	0.03	<5
	Aug-17	15 & 16/8/2017	Dam	7.8	1244	716	<5	2.3	35	0.15	0.42	<0.01	<5
	Sep-17	12 & 13/9/2017											
	Oct-17	17 & 18/10/2017											
	Nov-17	14 & 15/11/2017											
	Dec-17	12 & 13/12/2017											
	Jan-18	9 & 10/1/2018											
	Feb-18	12/02/2018											
	Mar-18	13 & 14/3/2018											
	Apr-18	10 & 11/04/2018											

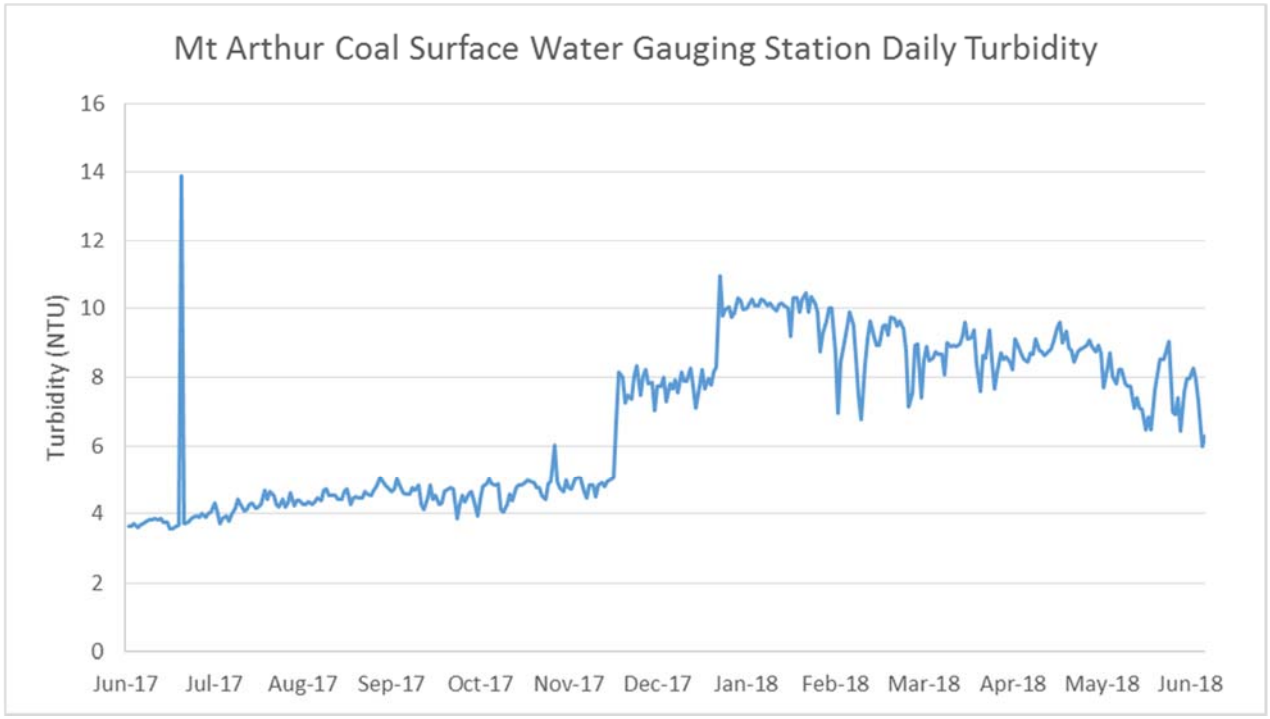
Site	Month	Date sampled	Flow (description)	Field pH	Field EC (uS/cm)	TDS (mg/L)	TSS (mg/L)	Turbidity (NTU)	Sulfate (mg/L)	Dissolved Fe (mg/L)	Total Fe (mg/L)	Nitrate (mg/L)	O&G (mg/L)
	May-18	15 & 16/5/2018											
	Jun-18	19, 25 & 26/6/2018											
	Impact Assessment Criteria Trigger Values		**Stage 1 Trigger**	**6.5< >9.0**	**7128**		**103**						
			Stage 2 Trigger		**8262**		**130**						

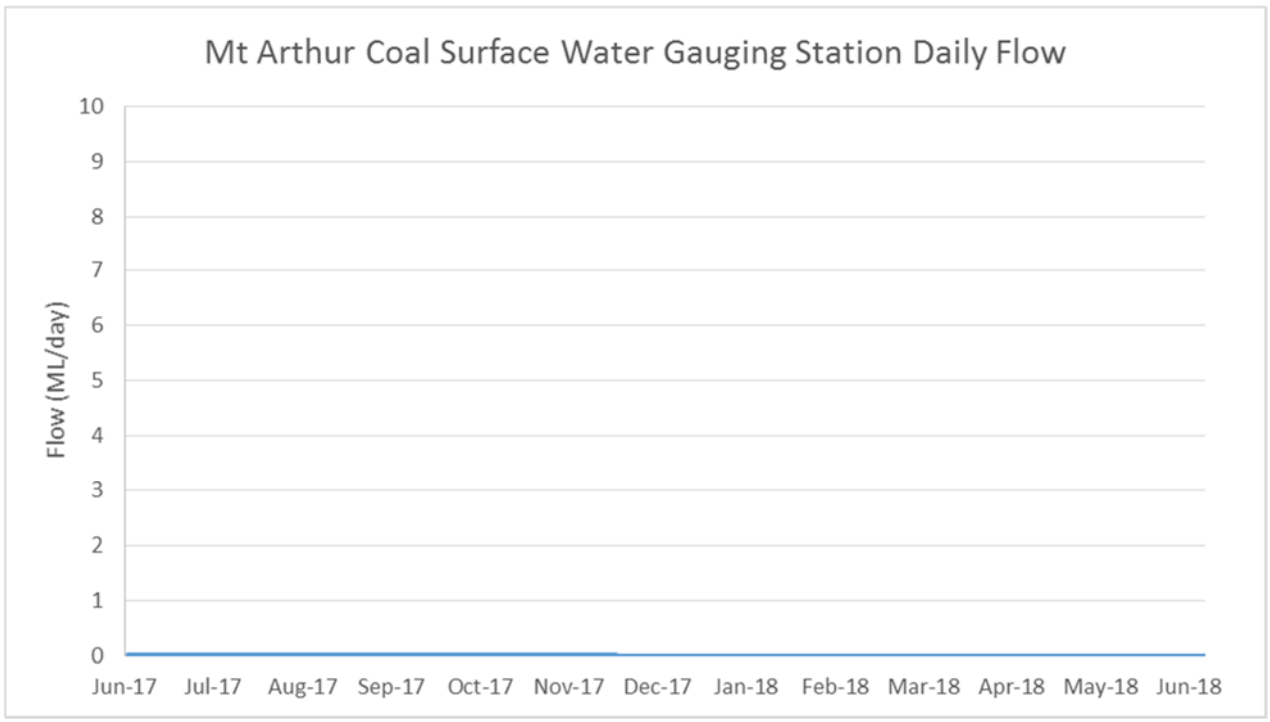
Unable to sample due to low water level

Sample bottle lost in transit

Saddlers Creek Surface Water Flow Plots




Mt Arthur Coal Surface Water Gauging Station Daily Turbidity
Turbidity (NTU)
16
14
12
10
8
6
4
2
0
Jun-17
Jul-17
Aug-17
Sep-17
Oct-17
Nov-17
Dec-17
Jan-18
Feb-18
Mar-18
Apr-18
May-18
Jun-18


Mt Arthur Coal Surface Water Gauging Station Daily Flow
Flow (ML/day)
10
9
8
7
6
5
4
3
2
1
0
Jun-17
Jul-17
Aug-17
Sep-17
Oct-17
Nov-17
Dec-17
Jan-18
Feb-18
Mar-18
Apr-18
May-18
Jun-18

Appendix 3 - Ground Water Monitoring Results and Groundwater Level Drawdown Analysis

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CC/TW:kc (G1936A.Mt Arthur drawdown review FY2018)
31 August 2018

Attention: Michael Gale

Hunter Valley Energy Coal Pty Ltd
Thomas Mitchell Drive
MUSWELLBROOK NSW 2333

via email

Dear Michael,

RE: Mt Arthur Coal
Groundwater Level Drawdown Analysis – 2017/2018

1 Introduction

This letter report has been drafted to assist in the preparation of the groundwater chapter in Mt Arthur Coal's (MAC) FY18 Annual Environmental Management Report (AEMR). Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) have prepared this letter at the request of MAC.

2 Scope

The objective of the project is to review groundwater monitoring data collected in the 2017/2018 financial year (FY18) to satisfy the conditions of approval. To achieve this objective, the scope of services includes:

- drawdown assessment:
    - review groundwater levels and prepare a groundwater drawdown plot for July 2017 to June 2018; and
    - compare monitoring data to groundwater drawdown predictions presented in the Mt Arthur Coal Consolidation Project Environmental Assessment.
- QA charge balance error:
    - undertake relative percent difference (RPD) calculations on duplicate/triplicate analytical samples to assess potential error in chemical analytical techniques; and
    - undertake high level statistical assessment (minimum, maximum, average, median and standard deviation) of field parameters and chemical analysis results to assess quality of field sampling and monitoring techniques.

- cut-off wall performance assessment:
    - review vibrating wire piezometer (VWP) data from PL1, PL2, PL3/227m and PL3/242m;
    - compare the VWP data to alluvium groundwater levels in adjacent monitoring bores; and
    - assess the potential impact to alluvial groundwater levels in relation to mining related depressurisation of coal seams.
- prepare a concise letter report summarising the findings of the tasks in line with reporting requirements as outlines in Department of Planning and Environment (DPE) "Annual Review Guidelines for Post-approval requirements for State significant mining developments" date October 2015;
- prepare a summary table of approved impacts compared to measured monitoring results; and
- prepare text for each task suitable for inclusion in the annual report.

3 Results and discussion

3.1 Consolidation project drawdowns

Groundwater level (or piezometric pressure head) drawdown for each statutory bore was calculated for both the total monitoring period and for the period between July 2017 and June 2018 (FY18). Table 3.1 Statutory bore, groundwater level and drawdown data documents data for 38 groundwater monitoring sites, including:

- survey data for bore position and elevation;
- predicted groundwater levels for FY18 from the Consolidation Project groundwater model;
- groundwater levels for each bore (initial measurement, July 2017 and June 2018); and
- calculated results:
    - compare FY18 modelled versus measured results;
    - total drawdown at the bores since records commenced; and
    - drawdown at the bores for the period July 2017 to June 2018.

Figure 3.1 shows the interpreted total drawdown contours in the Permian sequence. Drawdown for 2017/2018 is included as either a yellow label (alluvium) or a purple label (Permian). The drawdown in the Permian sequence around the main Mt Arthur Pit is evident and continues to extend southwest in the vicinity of the historical Bayswater mine area. Drawdown within the alluvium is limited and less than the trigger value of 1 m.

It should be noted that during 2013 and 2014, a bentonite wall was installed along Denman Road in the vicinity of the F4 fault. This was installed to minimise groundwater level drawdown in the alluvium due to seepage through the alluvium/regolith from the Hunter River alluvium toward the mine.

In this area, drawdown has been measured by the VWP installed to the west of the bentonite wall. Variable drawdown has been recorded since monitoring commenced in August 2011 ranging from 55.04 m in the Edinglassie Seam to 60.83 m in the deeper Ramrod Creek Seam. A 46.24 m drawdown response has been recorded within the F4 Fault.

3.2 Comparison of measured data to modelled FY18 data

The modelled FY18 pressure head was extracted for all model slices from the Consolidation project groundwater model and compared to measured June 2018 data. Figure 3.2 shows the result with negative values showing where the model over predicts mine impacts (red, orange and yellow markers).

This figure shows that the groundwater model predictions close to the mine and in the Hunter River alluvium are relatively good. Further to the southwest of main pit the modelled predictions are less accurate. The groundwater model is currently being rebuilt and these differences will be accounted for in the calibration of the new groundwater model.

Table 3.1 Statutory bore, groundwater level and drawdown data

Bore ID	Easting	Northing	Elv.[1] collar mAHD 2014 survey	Elv.[1] collar mAHD 2018 survey	Total depth bore (m)	Target formation	Model layer	WMP (2015) triggers (mBGL)	2005 Start Head (mAHD)	MAC con-solidation project June 2018 modelled head (mbgl)	MAC con-solidation project June 2018 modelled head (mAHD)	Date first GWL record	First record depth to GWL (mBC)	First record GWL (mAHD)	July 2017 depth to GWL (mBC)	July 2017 GWL (mAHD)	June 2018 depth to GWL (mBC)	June 2018 GWL (mAHD)	Diff. 2018 modelled head versus June 2018 measured (m)[2]	Measured drawdown (m) - first record versus July 2017	Expected drawdown (m) - first record versus modelled June 2018	2017-2018 measured draw-down[4]
BCGW05	291052.66	6410763.63	139.91	135.00	16.70	Glen Munro	3	-	137.87	4.10	135.81	Jan-08	13.50	126.40	NM	NM	NM	NM	NM	NM	NM	NM
BCGW10	293115.40	6414781.03	185.43	185.47	65.40	Woodlands Hill	4	-	182.01	46.02	139.41	Jan-08	7.10	178.30	NM	NM	NM	NM	NM	NM	NM	NM
BCGW11	293117.47	6414779.36	185.80	185.43	39.10	Glen Munro	3	-	182.01	46.13	139.67	Jan-08	7.30	178.50	NM	NM	NM	NM	NM	NM	NM	NM
BCGW12	293142.78	6414688.45	182.86	182.70	43.90	Glen Munro	3	-	180.03	55.70	127.16	Jan-08	8.30	174.50	NM	NM	NM	NM	NM	NM	NM	NM
BCGW15	290716.63	6412432.49	161.38	154.43	36.70	Glen Munro	3	-	176.61	-	-	Jan-08	14.10	147.20	NM	NM	NM	NM	NM	NM	NM	NM
BCGW18	294345.19	6419985.43	158.79	158.97	11.30	Arrowfield	4	142.7	156.68	1.03	157.76	Jan-08	3.90	154.90	10.37	148.60	8.38	150.59	7.17	4.31	-2.86	-1.99
BCGW19	292461.91	6419151.75	187.43	187.00	8.40	Glen Munro	3	174.4	191.41	77.49	109.94	Jan-08	5.60	181.80	7.49	179.51	6.63	180.37	-70.43	1.43	71.86	-0.86
BCGW22P	295304.16	6414210.88	143.91	144.02	37.90	Glen Munro	3	128.8	147.91	85.04	58.98	Jan-08	4.00	139.90	6.43	137.59	3.69	140.33	-81.35	-0.43	80.92	-2.74
BCGW22A	295313.60	6414209.80	143.45	144.04	15.00	alluvium	1		152.24	4.79	139.24	Feb-16	3.02	141.02	4.10	139.94	3.49	140.55	-1.30	0.47	1.77	-0.61
EWPC33	294252.70	6416847.05	230.34	230.04	57.40	Blakefield	2	176.2	222.90	140.12	90.22	Jan-08	34.30	196.00	33.08	196.96	32.85	197.19	-106.97	-1.19	105.78	-0.23
GW02	299044.92	6413510.71	153.92	153.87	113.00	Woodlands Hill	4	145.4	144.36	3.74	150.18	Jun-01	7.50	146.40	10.74	143.13	8.73	145.14	5.04	1.26	-3.78	-2.01
GW03	298855.80	6413389.36	151.56	151.79	120.40	Woodlands Hill	4	145.3	143.65	3.42	148.14	Aug-01	5.30	146.30	9.36	142.43	6.47	145.32	2.82	0.98	-1.84	-2.89
GW06	294227.05	6418579.22	198.49	198.59	27.10	Glen Munro	3	165.5	189.47	74.82	123.67	Feb-96	19.80	178.70	26.25	172.34	26.02	172.57	-48.90	6.13	55.03	-0.23
GW07	295635.41	6419594.54	214.65	214.82	48.80	Woodlands Hill	4	134.1	177.18	47.39	167.26	Jul-99	41.00	173.70	43.03	171.79	41.46	173.36	-6.10	0.34	6.44	-1.57
GW08	296991.44	6419491.13	207.63	mined out	-	NA	all	118.4	178.51	47.55	160.08	Feb-99	18.00	189.60	-	-	-	-	-	-	29.52	-
GW16	294197.18	6422759.34	132.22	131.89	13.30	Alluvium	1	121.8	123.45	9.55	122.67	Feb-99	9.20	123.00	9.34	122.55	9.38	122.51	0.16	0.49	0.33	0.04
GW21	296141.35	6424483.01	136.03	135.97	15.80	Alluvium	1	126.4	127.86	8.51	127.52	Feb-99	8.60	127.40	9.30	126.67	9.59	126.38	1.15	1.02	-0.12	0.29
GW22*	296929.99	6423998.39	154.36	mined out	91.20	Ramrod Creek	7	88.2	135.51	30.68	123.68	May-99	15.20	139.20	-	-	-	-	-	-	15.52	-
GW23	297919.37	6424514.92	181.70	181.17	54.60	Ramrod Creek	7	132.5	136.23	41.90	139.80	Feb-99	42.30	139.40	49.78	131.39	49.64	131.53	8.27	7.87	-0.40	-0.14
GW25	298375.73	6425230.84	140.43	140.09	13.70	Alluvium	1	120	134.49	-	-	Feb-99	9.60	130.80	10.25	129.84	9.85	130.24	-	0.56	-	-0.40
GW26	301841.28	6418791.94	234.80	234.76	93.10	West Cut Tails	-	-	-	-	-	Feb-04	69.00	165.80	52.82	181.94	51.33	183.43	Outside model	Outside model	Outside model	Outside model
GW27	301862.79	6418412.22	236.42	235.91	115.50	West Cut Tails	-	-	-	-	-	May-04	71.00	165.40	53.33	182.58	52.16	183.75	Outside model	Outside model	Outside model	Outside model
GW38A	293831.43	6422376.98	131.57	131.50	20.60	Alluvium	1	121.9	123.64	8.40	123.17	Jan-08	8.70	122.90	9.52	121.98	9.54	121.96	1.21	0.94	-0.27	0.02
GW38P	293831.70	6422384.09	131.58	131.68	32.60	Warkworth	4	121	123.62	8.40	123.18	Jan-08	9.50	122.00	10.18	121.50	10.23	121.45	1.73	0.55	-1.18	0.05
GW39A	293094.34	6422248.31	130.68	130.64	10.40	Alluvium	1	120.8	123.91	7.06	123.62	Jan-08	8.90	121.80	9.36	121.28	9.22	121.42	2.21	0.38	-1.82	-0.14
GW39P	293094.70	6422250.89	130.40	130.73	42.70	Warkworth	4	120.9	123.91	6.80	123.60	Jan-08	8.50	121.90	10.28	120.45	10.30	120.43	3.17	1.47	-1.70	0.02
GW40A	291815.48	6422119.30	129.35	129.28	13.80	Alluvium	1	118.7	122.41	7.01	122.34	Jan-08	9.60	119.70	10.32	118.96	10.25	119.03	3.32	0.67	-2.64	-0.07
GW41A	290354.29	6421788.54	126.48	126.42	11.60	Alluvium	1	118.7	119.70	6.70	119.78	Jan-08	6.80	119.70	7.30	119.12	7.23	119.19	0.59	0.51	-0.08	-0.07
GW42	295138.80	6423356.30	135.08	135.62	11.00	Alluvium	1	-	-	11.92	123.70	Feb-16	9.71	125.91	9.85	125.77	10.51	125.11	-1.41	0.80	2.21	0.66
GW43	294233.00	6418560.10	196.83	197.33	69.00	Woodlands Hill	4	-	193.65	84.24	113.09	Feb-16	27.49	169.84	28.73	168.60	27.86	169.47	-56.38	0.37	56.75	-0.87
GW44	297444.50	6414732.60	210.50	211.03	133.00	Woodlands Hill	4	-	181.17	121.76	89.27	Feb-16	85.14	125.89	83.39	127.64	83.40	127.63	-38.36	-1.74	36.62	0.01
GW45	298889.71	6413629.54	-	152.46	15.00	Alluvium	1	-	143.75	8.84	143.62	Feb-16	8.43	-	11.41	141.05	10.62	141.84	1.78	-	-	-0.79
GW46	298336.76	6413469.34	-	144.16	21.00	Alluvium	1	-	138.84	5.89	138.27	Feb-16	6.91	-	8.35	135.81	7.57	136.59	1.68	-	-	-0.78
GW47	297408.76	6412974.11	-	137.07	18.00	Alluvium	1	-	129.36	4.90	132.16	Feb-16	6.41	-	7.52	129.55	6.91	130.16	2.01	-	-	-0.61
GW48	291829.60	6422110.67	129.07	129.70	36.15	Bowfield	4	-	122.43	7.22	122.48	Feb-16	10.77	118.93	10.58	119.12	10.76	118.94	3.54	-0.01	-3.55	0.18
GW49	290345.74	6421797.57	126.02	126.55	36.00	Arrowfield	4	-	119.19	6.88	119.67	Feb-16	7.78	118.77	7.84	118.71	7.78	118.77	0.90	0.00	-0.90	-0.06
GW41A (IW4029)	290347.80	6421809.90	125.91	126.56	8.00	Alluvium	1	-	119.20	6.78	119.78	Feb-16	7.36	119.20	7.45	119.11	7.38	119.18	0.60	0.02	-0.58	-0.07
GW38A (IW4030)	293831.31	6422393.09	131.10	131.75	11.37	Alluvium	1	-	123.58	8.58	123.17	Feb-16	9.60	122.15	9.77	121.98	9.80	121.95	1.22	0.20	-1.02	0.03
OD1078*	294495.47	6419259.28	171.32	171.70	63.00	Arrowfield	4	-	166.24	2.01	169.31	Jan-08	7.30	164.10	29.77	141.93	23.05	148.65	20.66	15.45	-5.21	-6.72

Bore ID	Easting	Northing	Elv.[1] collar mAHD 2014 survey	Elv.[1] collar mAHD 2018 survey	Total depth bore (m)	Target formation	Model layer	WMP (2015) triggers (mBGL)	2005 Start Head (mAHD)	MAC con-solidation project June 2018 modelled head (mbgl)	MAC con-solidation project June 2018 modelled head (mAHD)	Date first GWL record	First record depth to GWL (mBC)	First record GWL (mAHD)	July 2017 depth to GWL (mBC)	July 2017 GWL (mAHD)	June 2018 depth to GWL (mBC)	June 2018 GWL (mAHD)	Diff. 2018 modelled head versus June 2018 measured (m)[2]	Measured drawdown (m) - first record versus July 2017	Expected drawdown (m) - first record versus modelled June 2018	2017-2018 measured draw-down[4]
OD1078-piezo	294495.47	6419259.28	171.38	171.41	82.80	Bowfield	4	142.3	166.24	2.07	169.31	Jan-08	18.50	152.90	41.45	129.96	29.43	141.98	27.32	10.92	-16.41	-12.02
OD1079*	295956.29	6416426.92	227.20	226.55	NA	NA		-	214.46	117.33	109.87	Oct-14	31.89	195.30	39.34	187.21	39.24	187.31	-77.43	7.99	85.43	-0.10
OD1079-piezo	295956.29	6416426.92	227.34	226.70	87.20	Glen Munro	3	158.7	214.46	117.61	109.73	Jan-08	51.70	175.70	56.51	170.19	55.90	170.80	-61.07	4.90	65.97	-0.61
VWP1 P1	295166.64	6423380.75	135.46	135.46	204.50	Edinglassie	7	96.1	129.01	28.08	107.38	Sep-11	23.60	111.90	-	-	-	-	-	-	4.52	-
VWP2 P1	295194.77	6423364.09	135.41	135.41	216.50	F4 Fault	-	70.4	-	-	-	Aug-11	47.70	87.70	93.90	41.51	112.88	22.53	-	65.17	-	18.98
VWP3 P1	295165.89	6423349.36	135.38	135.38	227.00	Edinglassie	7	88.5	129.01	27.65	107.73	Sep-11	29.80	105.60	88.56	46.82	103.05	32.33	75.40	73.27	-2.13	14.49
VWP3 P2	295165.89	6423349.36	135.38	135.38	241.00	Ramrod Creek	7	85	129.01	27.65	107.73	Sep-11	33.30	102.10	92.04	43.34	106.43	28.95	78.78	73.15	-5.63	14.39
VWP04	294719.20	6422131.70		140.84	-	Vaux (VU)	6	-	132.86	-	109.16	Sep-14	-	77.04	71.61	69.23	79.04	61.80	47.36	15.24	-32.12	7.43
VWP04					-	Bayswater (BU)						Oct-14	-	76.98	73.53	67.31	83.21	57.63	-57.63	19.35	76.98	9.68
VWP04					-	Edderton (ED)	7	-	133.90	-	128.90	Nov-14	-	75.24	77.73	63.11	90.32	50.52	78.38	24.72	-53.66	12.59
VWP04					-	Edinglassie (EG)						Dec-14	-	64.20	88.92	51.92	105.32	35.52	-35.52	28.68	64.20	16.40
VWP04					-	Ramrod Creek (RK)						Jan-15	-	61.17	97.33	43.51	111.12	29.72	-29.72	31.45	61.17	13.79
VWP05	293993.30	6421605.10		161.40	-	Vaux (VU)	6	-	131.99	-	129.20	Feb-15	-	68.95	82.29	79.11	88.23	73.17	56.03	-4.22	-60.25	5.94
VWP05					-	Bayswater (BU)						Mar-15	-	86.13	83.39	78.01	92.77	68.63	-68.63	17.50	86.13	9.38
VWP05					-	Edderton (ED)	7	-	133.97	-	133.43	Apr-15	-	85.47	84.15	77.25	91.64	69.76	63.67	15.71	-47.96	7.49
VWP05					-	Edinglassie (EG)						May-15	-	69.67	110.02	51.38	122.59	38.81	-38.81	30.86	69.67	12.57
VWP05					-	Ramrod Creek (RK)						Jun-15	-	63.04	112.14	49.26	115.65	45.75	-45.75	17.29	63.04	3.51
VWP06	293960.30	6420850.40		179.64	-	Vaux (VU)	6	-	142.69	-	144.16	Jul-15	-	92.30	89.93	89.71	90.63	89.01	55.15	3.29	-51.86	0.70
VWP06					-	Broonie (BR)						Aug-15	-	89.99	86.63	93.01	87.20	92.44	-92.44	-2.45	89.99	0.57
VWP06					-	Edderton (ED)	7	-	143.51	-	145.15	Sep-15	-	90.08	98.28	81.36	99.41	80.23	64.92	9.85	-55.07	1.13
VWP06					-	Edinglassie (EG)						Oct-15	-	86.33	101.60	78.04	102.86	76.78	-76.78	9.55	86.33	1.26
VWP06					-	Ramrod Creek (RK)						Mar-16	-	82.05	-	-	-	-	-	-	82.05	-
VWP07	295656.10	6419564.90		215.95	-	Piercefield	5	-	169.38	-	169.48	Dec-15	-	123.55	98.89	117.06	104.13	111.82	57.66	11.73	-45.93	5.24
VWP07					-	Vaux (VU)	6	-	169.38			Dec-15	-	116.15	101.45	114.50	105.97	109.98	-109.98	6.17	116.15	4.52
VWP07					-	Bayswater (BU)	7	-	170.37	-	171.37	Dec-15	-	104.89	120.67	95.28	124.06	91.89	79.48	13.00	-66.48	3.39
VWP07					-	Edderton (ED)						Dec-15	-	94.78	123.32	92.63	125.11	90.84	-90.84	3.95	94.78	1.79
VWP07					-	Ramrod Creek (RK)						Dec-15	-	154.32	61.34	154.61	68.96	146.99	-146.99	7.33	154.32	7.63

Notes: *[1] Elv. – elevation; mAHD metres Australian Height Datum; GWL – groundwater level; mBC – metres below collar elevation.*

[2] Negative values indicate the measured piezometric level is higher than modelled – this means the model is over-predicting effects at this site for FY17.

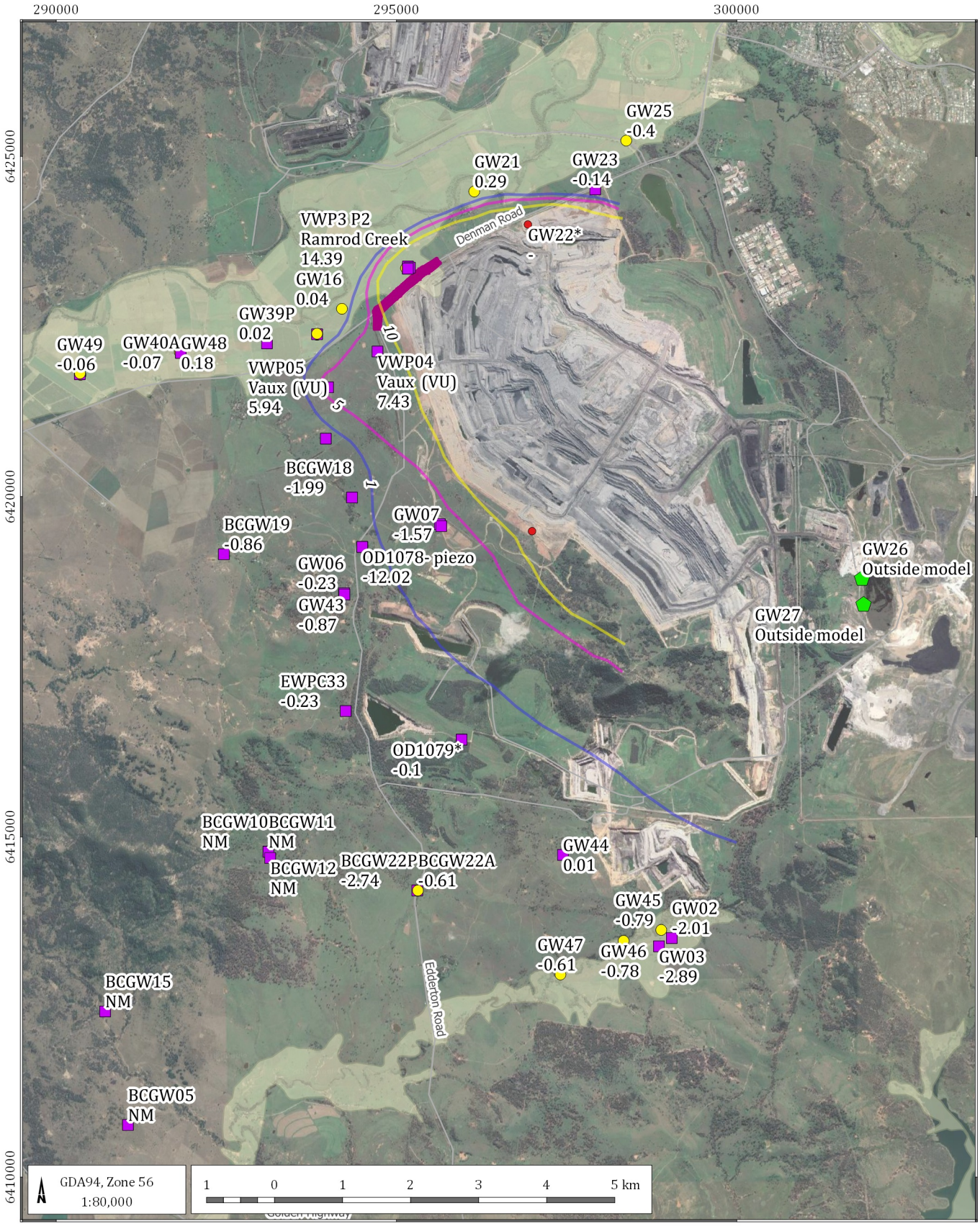
[3] Negative values indicate drawdown.

[4] Negative values indicate drawdown over the last year.

** Monitoring bores removed from monitoring program or decommissioned in FY16 – last recorded reading presented.*

NA – Data not available.

NM – Monitoring bore not measured in FY15 – access denied by landowner.



LEGEND

Permian aquifer drawdown to 2017 (m)

- 1
- 5
- 10
- 20
- 40
- 60
- 80

Monitoring locations and drawdown

- Alluvium
- Coal Measures
- Coal Measures/Highwall
- Mined out
- Roads
- Bentonite wall

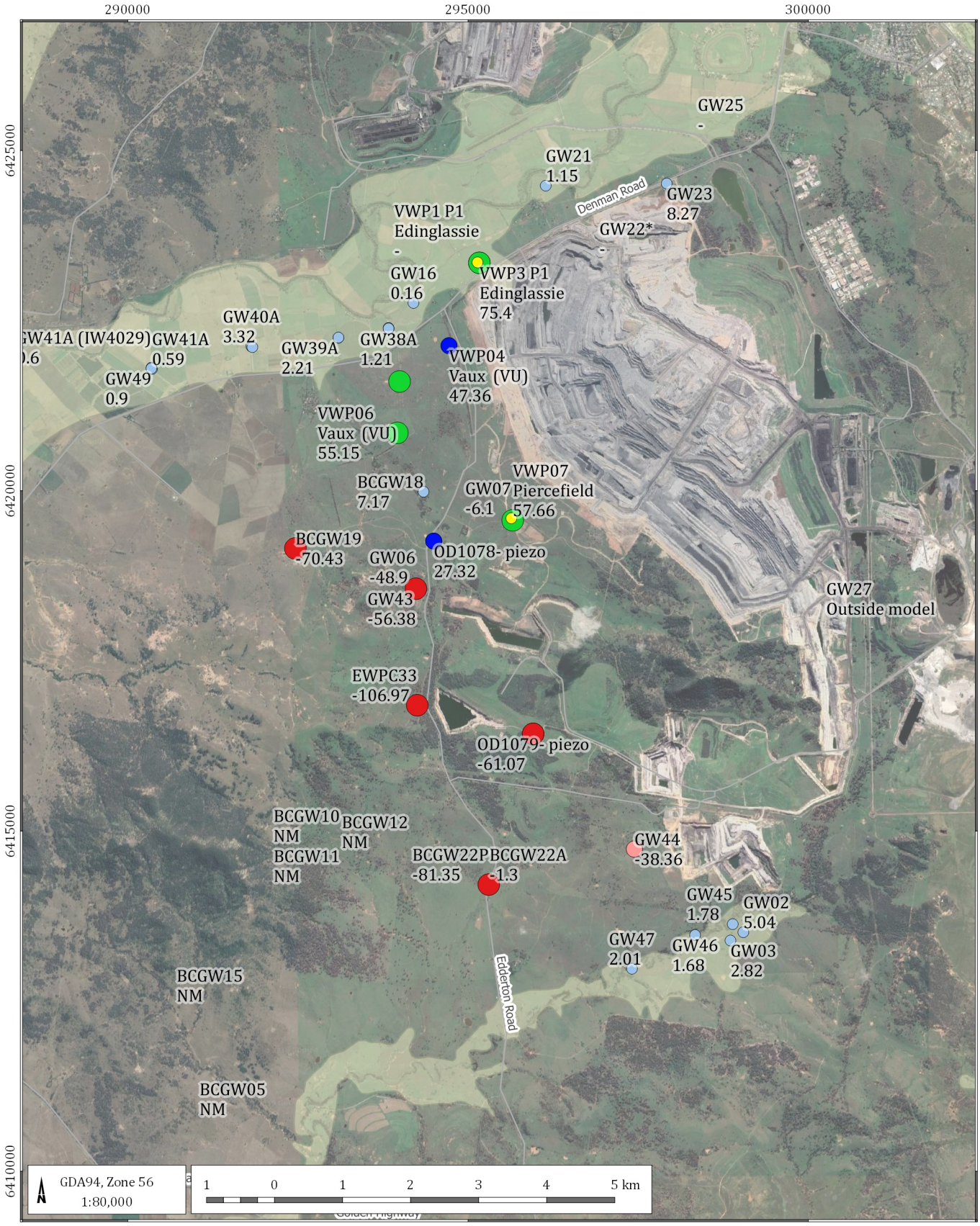
Mt Arthur Coal Drawdown Review FY18 (G1936A)

Groundwater level drawdown from July 2017 to June 2018

DATE 31/08/2018

FIGURE No: **3.1**

N:/Groundwater Jobs/G1936A.MAC Annual review 2017-2018/3_GIS/Workspaces/001_Deliverable1/fig 3.1 2017-2018 drawdown.qgs



LEGEND

2018 modelled versus measured heads (m)

- -150 - -50
- -50 - -25
- -25 - 0
- 0 - 25
- 25 - 50
- 50 - 80

Mt Arthur Coal Drawdown Review FY18 (G1936A)

Modelled FY18 heads versus measured heads

DATE 05/09/2018

FIGURE No: **3.2**

N:/Groundwater Jobs/G1936A.MAC Annual review 2017-2018/3_GIS/Workspaces/001_Deliverable1/fig 3.2 2018 modelled drawdown.qgs

3.3 Environmental performance

MAC provided a summary of the groundwater quality data for each key aquifer for the annual review for pH and electrical conductivity (EC) and depth to water level. This summary is presented in Table 3.2.

Table 3.2 Summary of groundwater monitoring results by aquifer

Aquifer	Sites	pH			EC (µS/cm)			Depth to water from top of casing (m)		
FY17	**Site references**	**Min.**	**Max**	**Avg.**	**Min.**	**Max.**	**Avg.**	**Min.**	**Max.**	**Avg.**
Saddlers Creek alluvium	GW45, GW46, GW47 &	6.9	7.6	7.1	734	8,220	3,987	6.91	11.41	8.77
Saddlers Creek tributary alluvium	BGGW22A (IW4029)	6.8	7.1	7.0	10,850	11,810	11,347	3.49	4.10	3.83
Hunter River alluvium	GW16, GW21, GW25, GW38A, GW38A(IW4030), GW39A, GW40A, GW41A, GW41A(IW4029) and GW42	6.2	8.0	7.2	764	7,700	4,362	7.23	11.02	9.35
Permian/ fractured rock	GW2, GW3, GW6, GW7, GW23, GW38P, GW39P, GW43, GW48, GW49, BCGW18, BCGW19, BCGW22 & EWPC33	6.0	11.9	7.6	2,230	10,680	4,796	3.69	83.72	26.35
West Cut highwall/TSF	GW26	6.6	6.9	6.7	5,610	6,070	5,852	51.33	52.82	52.20

In addition to above, MAC require an assessment of the quality assurance (QA) measures implemented by Carbon Based Environmental Pty Ltd (CBE) for the bi-monthly groundwater sampling to identify potential error with either the CBE sampling methodology or chemical analytical techniques. This review has been limited to:

- comparison of duplicate samples for each sampling event;
- review of the CBE groundwater sampling field sheets for assessment of field parameter stabilisation and purging volume for collection for a representative water sample;
- assessment of the Relative Percentage Difference (RPD) for the laboratory analysis results for each sampling event; and
- review of sample hold times prior to being dispatched to the Australian Laboratory Services Pty Ltd (ALS).

The results of this review are presented in the attachments and summarised below in Table 3.3.

Table 3.3 Summary of quality assurance review

Monitoring round	Field data	Field parameter stabilisation	Laboratory analyses	Analysis parameters	Holding time (days)	Duplicate sample	Relative percentage difference	Comments
Jul-17	WL, T(°C), pH, EC	All parameters within criteria prior to sampling	Bi-monthly	TSS/TDS, pH/EC, Cl, Total P, Ca, Mg, Na, K, SO4, Alkalinity. Dissolved metals: As, Cd, Cr, Cu, Ni, Pb, Zn, Hg, Fe, Al, Sb, Ba, B, Mo, Se	All samples arrived at lab within holding times, except for pH analysis	BCGW22	TSS - 97%	All bores purged >3 bore volumes, except GW7 (bailed dry), GW42 (hand bailed), GW44 (too deep to pump)
							Hydroxide Alkalinity - 41%	No water samples reached lab at specified temp of 4 degrees Celsius.
							Carbonate Alkalinity - 48%	Not clear in COC documentation whether W-2 metals analysis by ALS is for dissolved or total metals and if samples were field filtered or not.
							Chromium - 67%	No evidence of field calibration
							Copper - 67%	
Sep-17	WL, T(°C), pH, EC	All samples within parameters	Bi-monthly	TSS/TDS, pH/EC, Cl, Total P, Ca, Mg, Na, K, SO4, Alkalinity. Dissolved metals: As, Cd, Cr, Cu, Ni, Pb, Zn, Hg, Fe, Al, Sb, Ba, B, Mo, Se	All samples arrived at lab within holding times, except for pH analysis	IW4027	Nickel - 29%	All bores purged > 3 bore volumes, except GW6, GW7, BCGW22A, GW42 (hand bailed), GW44 (too deep to pump)
							Zinc - 20%	No water samples reached lab at specified temp of 4 degrees Celsius.
								Not clear in COC documentation whether W-2 metals analysis by ALS is for dissolved or total metals and if samples were field filtered or not.
								No evidence of field calibration

Monitoring round	Field data	Field parameter stabilisation	Laboratory analyses	Analysis parameters	Holding time (days)	Duplicate sample	Relative percentage difference	Comments
Nov-17	WL, T(°C), pH, EC	All samples within parameters	Bi-monthly	TSS/TDS, pH/EC, Cl, Total P, Ca, Mg, Na, K, SO4, Alkalinity. Dissolved metals: As, Cd, Cr, Cu, Ni, Pb, Zn, Hg, Fe, Al, Sb, Ba, B, Mo, Se	All samples arrived at lab within holding times, except for pH analysis	GW48	Zinc - 29%	Field calibration sheets provided.
								No water samples reached lab at specified temp of 4 degrees Celsius.
								Not clear in COC documentation whether W-2 metals analysis by ALS is for dissolved or total metals and if samples were field filtered or not.
								All bores purged > 3 bore volumes, except GW6, GW7, IW4029, BCGW22, GW39A/GW39P (hand bailed/low-flow), GW42, GW44 (too deep to pump)
Jan-18	WL, T(°C), pH, EC	All samples within parameters	Bi-monthly	TSS/TDS, pH/EC, Cl, Total P, Ca, Mg, Na, K, SO4, Alkalinity. Dissolved metals: As, Cd, Cr, Cu, Ni, Pb, Zn, Hg, Fe, Al, Sb, Ba, B, Mo, Se	All samples arrived at lab within holding times, except for pH analysis	GW26	TSS - 26%	Field calibration sheets provided.
								No water samples reached lab at specified temp of 4 degrees Celsius.
							Arsenic - 40%	Not clear in COC documentation whether W-2 metals analysis by ALS is for dissolved or total metals and if samples were field filtered or not.
								All bores purged > 3 bore volumes, except GW6, GW7, IW4029, IW4030, BCGW18, BCGW22, GW39A/GW39P (hand bailed/low-flow), GW42, GW44 (too deep to pump)

Monitoring round	Field data	Field parameter stabilisation	Laboratory analyses	Analysis parameters	Holding time (days)	Duplicate sample	Relative percentage difference	Comments
Mar-18	WL, T(°C), pH, EC	All samples within parameters	Bi-monthly	TSS/TDS, pH/EC, Cl, Total P, Ca, Mg, Na, K, SO4, Alkalinity. Dissolved metals: As, Cd, Cr, Cu, Ni, Pb, Zn, Hg, Fe, Al, Sb, Ba, B, Mo, Se	All samples arrived at lab within holding times, except for pH analysis	GW46	Potassium - 22%	Field calibration sheets provided.
							Copper - 40%	No water samples reached lab at specified temp of 4 degrees Celsius.
							Nickel - 120%	Not clear in sampling sheets whether W-2 metals analysis by ALS is for dissolved or total metals?? Were they field filtered?
								All bores purged > 3 bore volumes, except GW6, GW7, IW4029, IW4030, BCGW18, BCGW22, GW39A/GW39P (hand bailed/low-flow), GW42, GW44 (too deep to pump)
May-18	WL, T(°C), pH, EC	All samples within parameters	Bi-monthly	TSS/TDS, pH/EC, Cl, Total P, Ca, Mg, Na, K, SO4, Alkalinity. Dissolved metals: As, Cd, Cr, Cu, Ni, Pb, Zn, Hg, Fe, Al, Sb, Ba, B, Mo, Se	All samples arrived at lab within holding times, except for pH analysis	GW48	TSS - 120%	Field calibration sheets provided.
								No water samples reached lab at specified temp of 4 degrees Celsius.
							Total Phosphorous - 179%	Not clear in COC documentation whether W-2 metals analysis by ALS is for dissolved or total metals and if samples were field filtered or not.
								All bores purged > 3 bore volumes, except GW6, GW7, IW4029, IW4030, BCGW18, BCGW22, GW39A/GW39P (hand bailed/low-flow), GW42, GW44 (too deep to pump)

The summary of the QA measured utilised during the reporting period in Table 3.3 identifies:

- Duplicate sample – the borehole from which duplicate samples was consistently recorded.
- Field data – field parameters for pH, electrical conductivity (EC) and depth to groundwater level (WL) were recorded for each duplicate sample.
- Relative Percentage Difference – an exceedance of the RPD greater than 20% was determined for total suspended solids (TSS), alkalinity, total phosphorous, arsenic, chromium, copper, zinc, nickel and potassium. Assuming the duplicate samples were collected at the same time as the original sample, this would suggest the variation in parameter level may be related to the laboratory analysis. If the duplicate samples were collected sometime after the original sample, then the variation is likely to be due to sample heterogeneity resulting from continued purging. The RPD criteria exceedances for metals are attributed to the very low values for metals concentrations. That is, RPD calculations can show false positives when values are very low; for example, a RPD evaluation for samples with values of 0.002 and 0.003 (GW46/duplicate) present a RPD value of 40%. The exceedances of the physical parameters and major ions are considered acceptable because there are only seven exceedances on 59 individual analysis results. Generally, even with the RPD exceedances, we consider the duplicate analyses to be representative of one another.
- Holding Times – the holding times for all samples ranged from between one and five days, which is within the specified holding times for the parameters analysed. These range from seven days (calcium hardness, total suspended solids and total dissolved solids) to general 28 days for most of the remaining parameters, exception for general metals, which is six months. The exception to this is pH and no samples made the 6-hour holding time.
- Field Parameter Stabilisation – CBE provided sample stabilisation data for all sampling events and stabilisation criteria for the field determinations were suitable, with temperature being set at (±0.2°C), pH (±0.1 pH units) and EC (±5%).
- Bore purge Volume – Review of this data indicates that on average three bore volumes were purged for each bore. Those bores where less than this volume of water was purged were due in most cases to insufficient recharge after the bore was bailed or pumped dry. In each monitoring round the bore were monitored in a consistent manner and the samples are considered representative of the aquifer at each monitoring location.

3.4 Cut-off wall performance

The four VWPs installed into the underlying Permian geology beneath the Hunter River Alluvium (HRA), northwest of the Mt Arthur main pit and adjacent Denman Road, were installed in August 2011. Since installation, the most reliable data has been captured from the end of December 2013. A hydrograph of the VWP data and monitoring data from adjacent HRA monitoring bores is presented in Figure 3.4.

This shows groundwater levels within the Edinglassie and Ramrod Creek coal seams and the F4 Fault have declined between 65 m (F4 Fault) and 73 m (both the Edinglassie Seam – hanging block and the Ramrod Creek Seam) since installation. It should be noted that VWP data for the footwall block of the Edinglassie Seam only extends to January 2017. This issue is currently being addressed with the existing datalogger due to be replaced soon. In contrast, nearby Hunter River Alluvial aquifer monitoring bores GW16 and GW21, have remained relatively static. GW42 is located adjacent to the VWP installations and has also remained relatively static, displaying oscillations in the groundwater level that are consistent with the Hunter River level. The higher levels in GW42 coincide with periods of Hunter River water level above 1.5m stage height (Figure 3.5).

These relatively static groundwater levels within the alluvium indicates the depressurisation observed in the underlying Permian coal seam does not appear to have propagated into the HRA in the vicinity of GW16 and GW21. These bores are located approximately 1.2 km northwest and 1.4 km southeast from the aforementioned VWP monitoring bores. That is, the nominal decline observed in the three HRA bores is most likely a response to naturally occurring seasonal conditions.

Figure 3.3 Cut-off wall and HRA monitoring bore locations

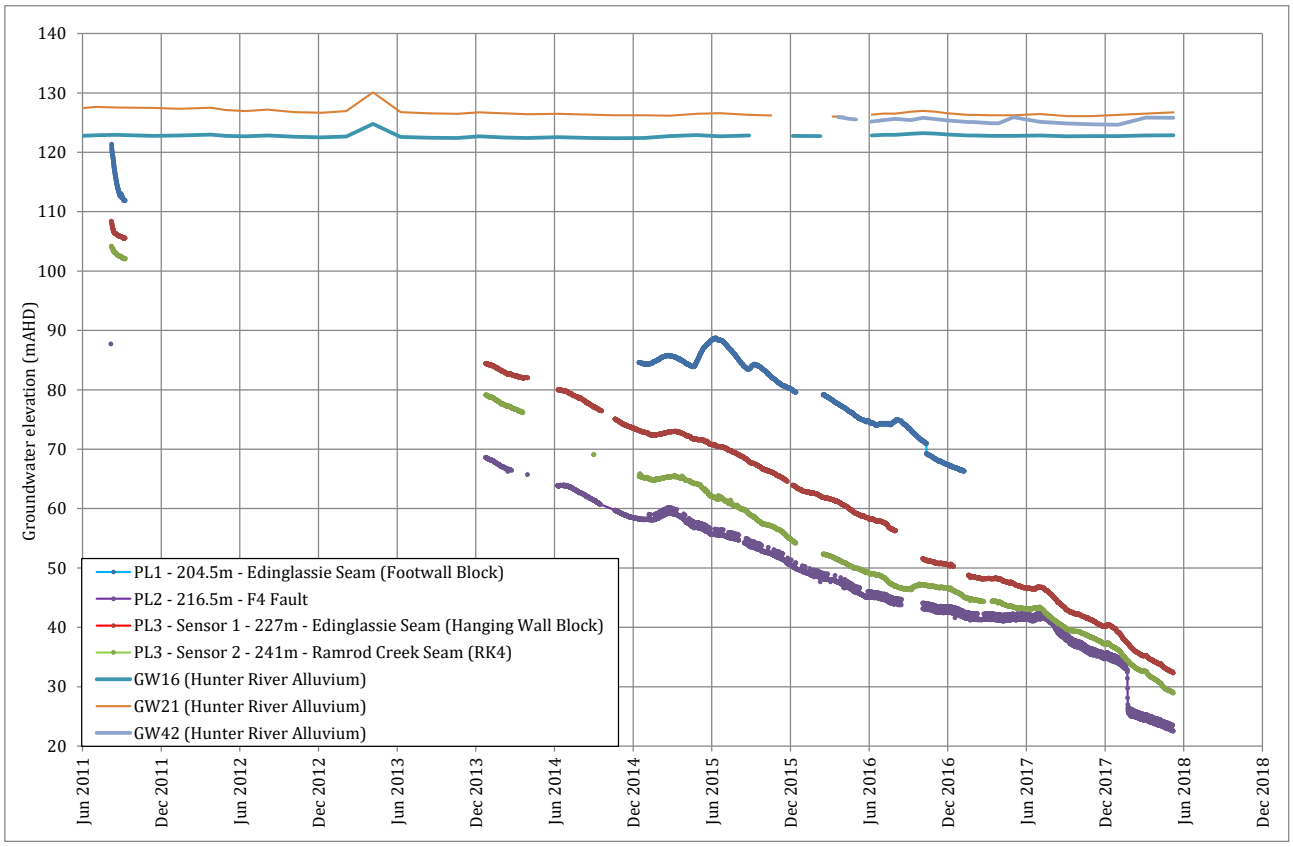


Figure 3.4 Groundwater Hydrograph - PL1, PL2 and PL3 and Hunter River Alluvium

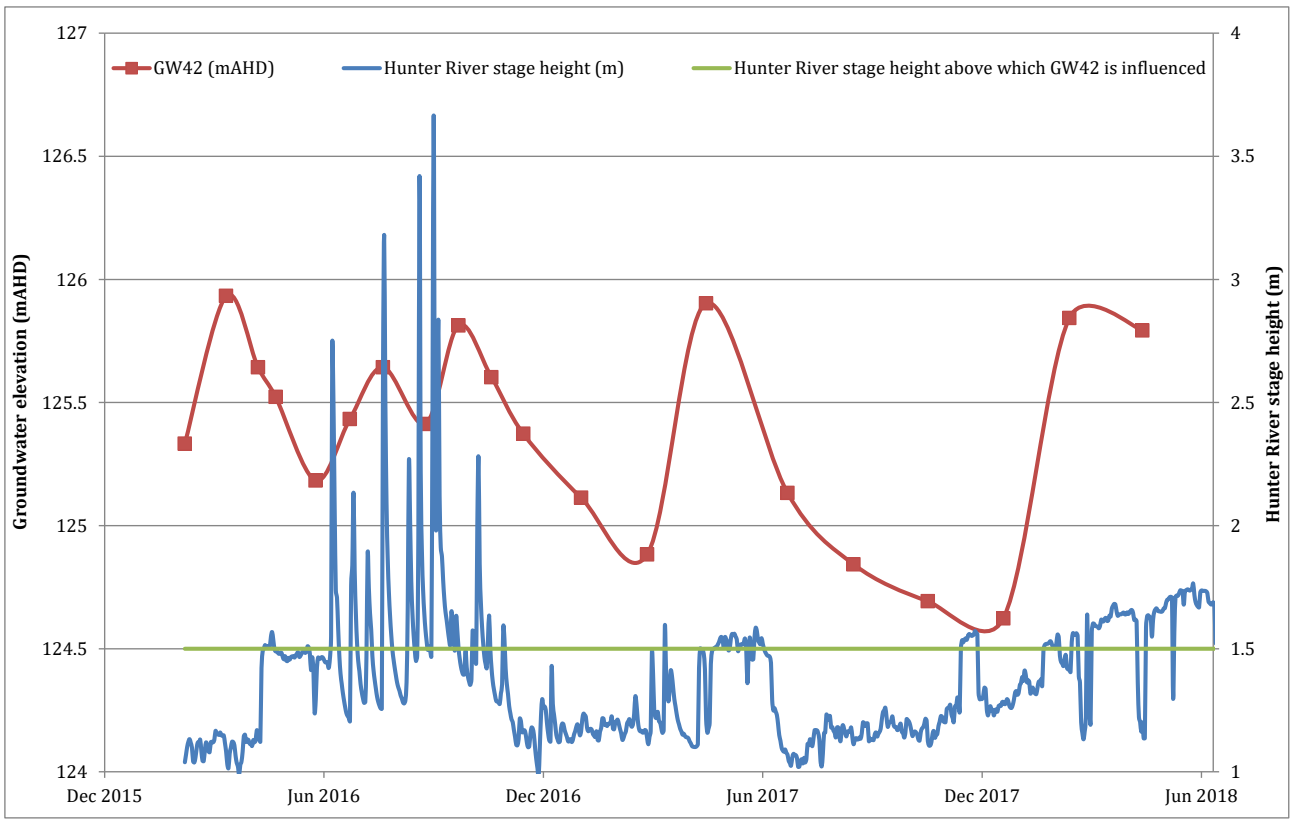


Figure 3.5 GW42 and Hunter River stage height

4 Recommendations

We suggest the following improvements to the MAC groundwater monitoring program:

- Barometrically corrected data – the monitoring contractor has improved the provision of pressure transducer data by providing the raw downloaded data that is necessary to correct the data to barometric pressure; however, the monitoring contractor should also provide the pressure transducer data as raw data and as baro-corrected files.
- Chilled groundwater lab samples – in the 2017/2018 FY monitoring campaign none of the groundwater samples accepted at ALS were at or below the recommended temperature. In future samples should be chilled with an ice/water slurry and not only an ice-brick.
- Metals analysis – the groundwater samples appear to have been tested by ALS Environmental for dissolved metals; however, it is unclear whether the W2 suite marked on the chain of custody (COC) documentation is for dissolved or total metals. Also, there is no mention of the samples being field filtered and preserved for metals analysis, other than on the COC. This should be more clearly highlighted on the field-sheets.
- Field calibration sheets – the monitoring contractor has provided evidence of field calibration of the water quality meter for three of the six monitoring campaigns (January, March and May 2018). This should continue and be provided for each monitoring campaign in future and the review of which should be undertaken in future annual groundwater monitoring reviews.
- Digital field monitoring sheets – currently, the monitoring data is recorded manually on paper for later transcription into the MAC database. The monitoring contractor should consider taking steps towards digital recording of field data. This step will reduce time and cost for the review of field data and reduce potential error being introduced during the transcription phase.

5 Closure

Thank you for the opportunity to assist MAC with this groundwater review for the FY17 AEMR. If you have any queries please do not hesitate to call.

Yours faithfully,

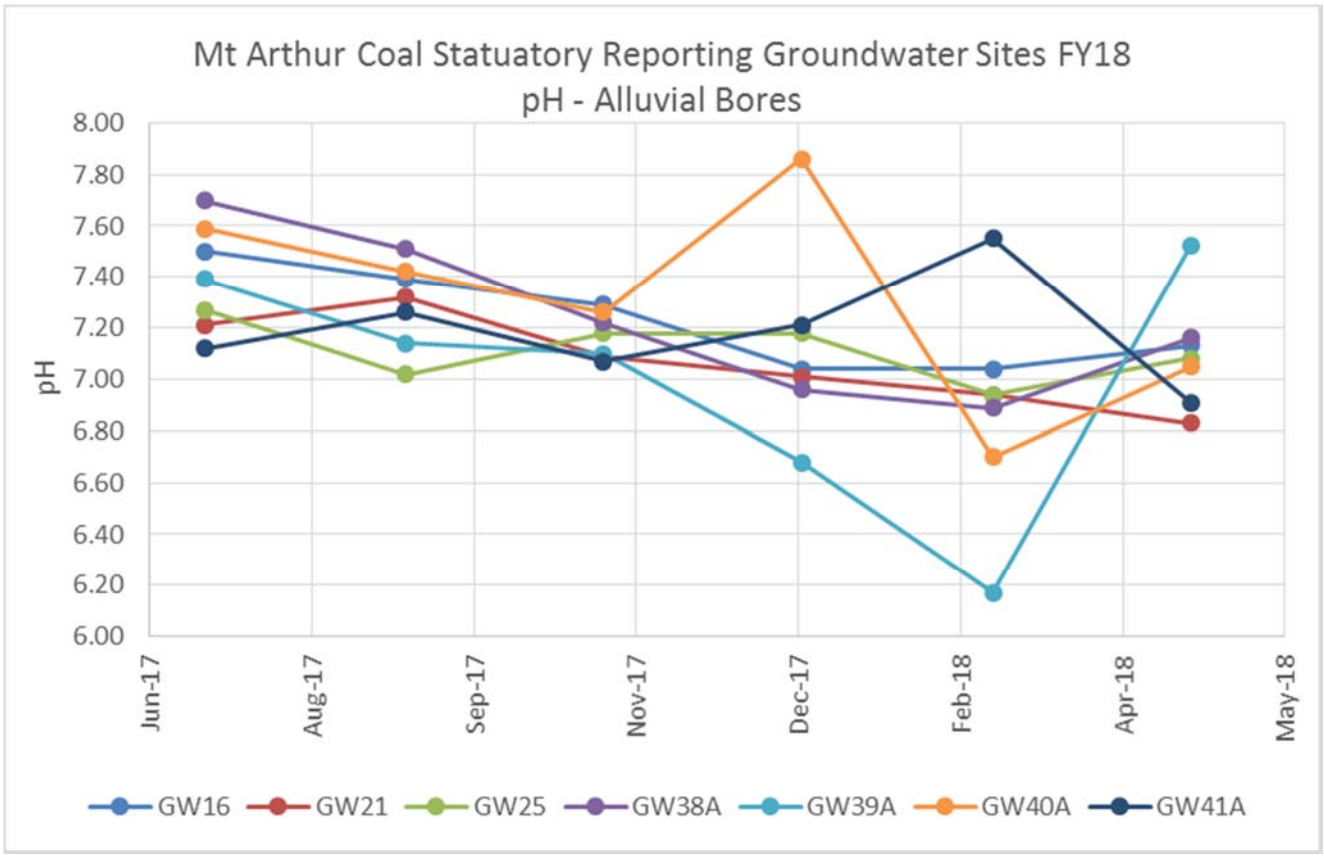
Costante Conte
Principal Hydrogeologist/NSW Manager
Australasian Groundwater and Environmental Consultants Pty Ltd

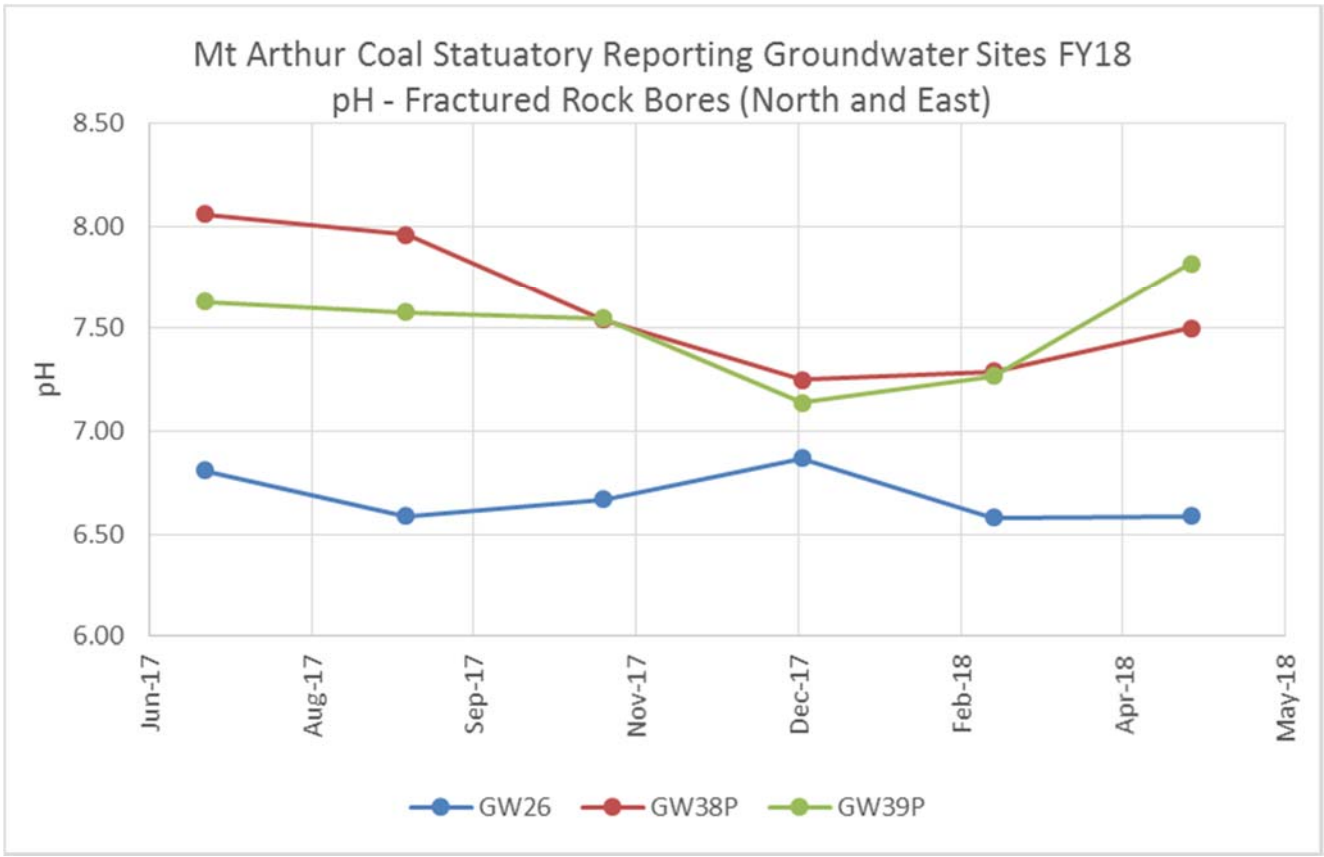
Attachment: Relative percentage difference of duplicated sample analyses for FY17

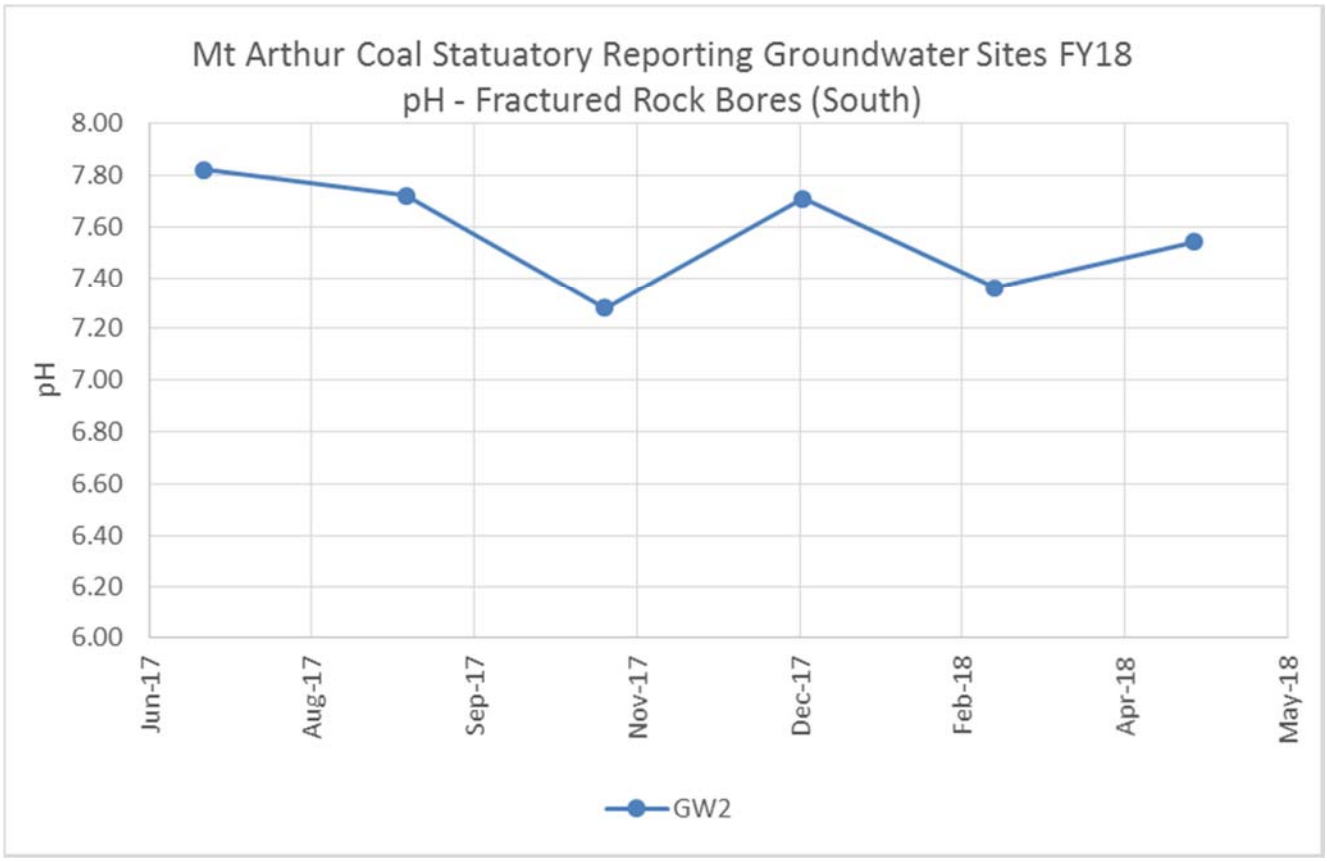
ALS Sample Number: Sample Date: Client sample ID (1st): Analyte grouping/Analyte	Unit	LOR	ES1803568002 29/01/2018 GW26	ES1803568005 29/01/2018 DUPLICATE	Relative Percentage Difference	ES1808793003 22/03/2018 GW46	ES1808793007 21/03/2018 DUPLICATE	Relative Percentage Difference	ES1814584004 18/05/2018 GW48	ES1814584003 18/05/2018 DUPLICATE	Relative Percentage Difference
Physical parameters											
pH Value	pH Unit	0.01	7.26	7.18	1%	7.55	7.57	0%	8	8.01	0%
Electrical Conductivity @ 25°C	µS/cm	1	5750	5740	0%	6480	6560	1%	3690	3640	1%
Total Dissolved Solids @180°C	mg/L	10	4370	4250	3%	4230	4340	3%	2200	2230	1%
Suspended Solids (SS) dried at 104 ± 2°C	mg/L	5	13	10	**26%**	<5	<5	0%	<5	10	**120%**
Major ions											
Hydroxide Alkalinity as CaCO3	mg/L	1	<1	<1	0%	<1	<1	0%	<1	<1	0%
Carbonate Alkalinity as CaCO3	mg/L	1	<1	<1	0%	<1	<1	0%	<1	<1	0%
Bicarbonate Alkalinity as CaCO3	mg/L	1	553	556	1%	691	677	2%	1920	1920	0%
Total Alkalinity as CaCO3	mg/L	1	553	556	1%	691	677	2%	1920	1920	0%
Sulfate as SO4 - Turbidimetric	mg/L	1	2260	2260	0%	540	589	9%	<1	<1	0%
Chloride by Discrete Analyser	mg/L	1	698	676	3%	1430	1460	2%	259	260	0%
Calcium	mg/L	1	335	323	4%	184	181	2%	13	13	0%
Magnesium	mg/L	1	274	268	2%	240	233	3%	15	15	0%
Sodium	mg/L	1	653	638	2%	825	841	2%	952	937	2%
Potassium	mg/L	1	19	18	5%	5	4	**22%**	8	9	12%
Total Phosphorus as P	mg/L	0.01	<0.01	<0.01	0%	<0.01	<0.01	0%	0.04	0.72	**179%**
Dissolved Metals											
Aluminium	mg/L	0.01	<0.01	<0.01	0%	<0.01	<0.01	0%	<0.01	<0.01	0%
Antimony	mg/L	0.001	<0.001	<0.001	0%	<0.001	<0.001	0%	<0.001	<0.001	0%
Arsenic	mg/L	0.001	0.002	0.003	**40%**	<0.001	<0.001	0%	<0.001	<0.001	0%
Barium	mg/L	0.001	0.012	0.012	0%	0.113	0.1	12%	0.03	0.027	11%
Cadmium	mg/L	0.0001	<0.0001	<0.0001	0%	<0.0001	<0.0001	0%	<0.0001	<0.0001	0%
Chromium	mg/L	0.001	<0.001	<0.001	0%	<0.001	<0.001	0%	<0.001	<0.001	0%
Copper	mg/L	0.001	<0.001	<0.001	0%	0.002	0.003	**40%**	<0.001	<0.001	0%
Lead	mg/L	0.001	<0.001	<0.001	0%	<0.001	<0.001	0%	<0.001	<0.001	0%
Molybdenum	mg/L	0.001	0.002	0.002	0%	<0.001	0.001	0%	0.001	0.001	0%
Nickel	mg/L	0.001	0.176	0.179	2%	0.002	<0.001	**120%**	<0.001	<0.001	0%
Selenium	mg/L	0.01	<0.01	<0.01	0%	<0.01	<0.01	0%	<0.01	<0.01	0%
Zinc	mg/L	0.005	0.04	0.042	5%	0.012	0.013	8%	<0.005	<0.005	0%
Boron	mg/L	0.05	0.22	0.21	5%	0.1	0.12	18%	0.12	0.11	9%
Iron	mg/L	0.05	3.34	3.17	5%	<0.05	<0.05	0%	0.32	0.27	17%
Mercury	mg/L	0.0001	<0.0001	<0.0001	0%	<0.0001	<0.0001	0%	<0.0001	<0.0001	0%

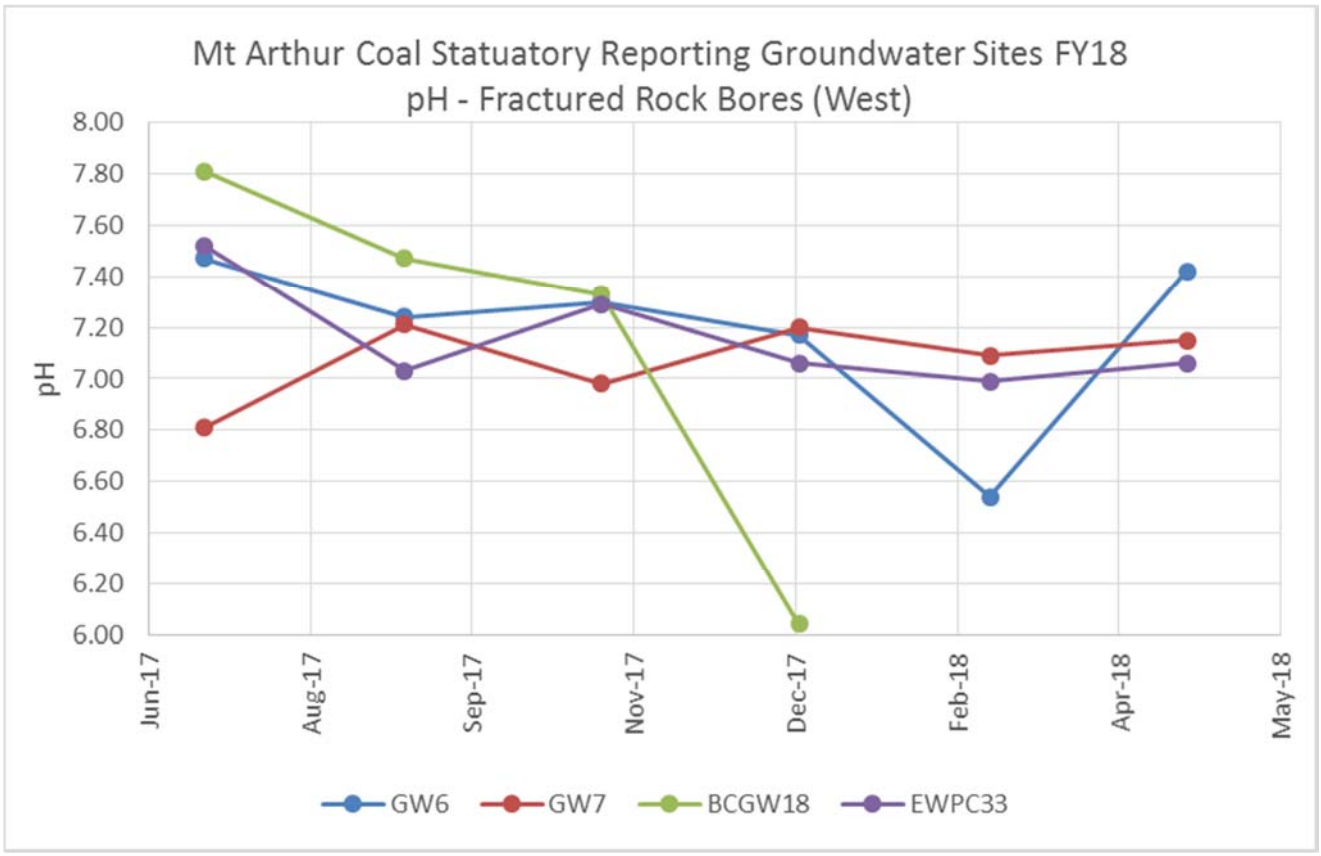
ALS Sample Number: Sample Date: Client sample ID (1st): Analyte grouping/Analyte	Unit	LOR	ES1718309003 24/07/2017 BCGW22	ES1718309004 24/07/2017 DUPLICATE	Relative Percentage Difference	ES1724006001 22/09/2017 IW4027	ES1724006002 22/09/2017 DUPLICATE	Relative Percentage Difference	ES1730408005 29/11/2017 GW48	ES1730408007 29/11/2017 DUPLICATE	Relative Percentage Difference
Physical parameters											
pH Value	pH Unit	0.01	11.1	10.8	3%	7.63	7.6	0%	7.91	7.95	1%
Electrical Conductivity @ 25°C	µS/cm	1	9590	9360	2%	12100	12000	1%	3750	3790	1%
Total Dissolved Solids @180°C	mg/L	10	4980	5000	0%	7190	7250	1%	1980	1950	2%
Suspended Solids (SS) dried at 104 ± 2°C	mg/L	5	58	20	**97%**	<5	<5	0%	<5	<5	0%
Major ions											
Hydroxide Alkalinity as CaCO3	mg/L	1	105	69	**41%**	<1	<1	0%	<1	<1	0%
Carbonate Alkalinity as CaCO3	mg/L	1	85	138	**48%**	<1	<1	0%	<1	<1	0%
Bicarbonate Alkalinity as CaCO3	mg/L	1	<1	<1	0%	839	788	6%	1930	1980	3%
Total Alkalinity as CaCO3	mg/L	1	190	207	9%	839	788	6%	1930	1980	3%
Sulfate as SO4 - Turbidimetric	mg/L	1	34	32	6%	206	205	0%	<1	<1	0%
Chloride by Discrete Analyser	mg/L	1	2600	2640	2%	3160	3220	2%	241	241	0%
Calcium	mg/L	1	16	16	0%	224	233	4%	14	14	0%
Magnesium	mg/L	1	<1	<1	0%	308	312	1%	16	15	6%
Sodium	mg/L	1	1720	1800	5%	1660	1680	1%	947	960	1%
Potassium	mg/L	1	133	136	2%	5	5	0%	8	9	12%
Total Phosphorus as P	mg/L	0.01	<0.01	<0.01	0%	<0.02	<0.02	0%	0.03	0.03	0%
Dissolved Metals											
Aluminium	mg/L	0.01	0.23	0.24	4%	<0.01	<0.01	0%	<0.01	<0.01	0%
Antimony	mg/L	0.001	<0.001	<0.001	0%	<0.001	<0.001	0%	<0.001	<0.001	0%
Arsenic	mg/L	0.001	0.002	0.002	0%	<0.001	<0.001	0%	<0.001	<0.001	0%
Barium	mg/L	0.001	0.107	0.111	4%	0.248	0.261	5%	0.036	0.037	3%
Cadmium	mg/L	0.0001	<0.0001	<0.0001	0%	<0.0001	<0.0001	0%	<0.0001	<0.0001	0%
Chromium	mg/L	0.001	0.002	0.001	**67%**	<0.001	<0.001	0%	<0.001	<0.001	0%
Copper	mg/L	0.001	<0.001	0.001	**67%**	0.003	0.003	0%	<0.001	<0.001	0%
Lead	mg/L	0.001	<0.001	<0.001	0%	<0.001	<0.001	0%	<0.001	<0.001	0%
Molybdenum	mg/L	0.001	0.011	0.012	9%	<0.001	<0.001	0%	<0.001	<0.001	0%
Nickel	mg/L	0.001	0.008	0.009	12%	0.004	0.003	**29%**	<0.001	<0.001	0%
Selenium	mg/L	0.01	<0.01	<0.01	0%	<0.01	<0.01	0%	<0.01	<0.01	0%
Zinc	mg/L	0.005	<0.005	<0.005	0%	0.022	0.027	**20%**	0.006	0.008	**29%**
Boron	mg/L	0.05	0.06	0.06	0%	0.14	0.16	13%	0.11	0.11	0%
Iron	mg/L	0.05	<0.05	<0.05	0%	<0.05	<0.05	0%	0.36	0.36	0%
Mercury	mg/L	0.0001	<0.0001	<0.0001	0%	<0.0001	<0.0001	0%	<0.0001	<0.0001	0%

Groundwater quality plots (pH)

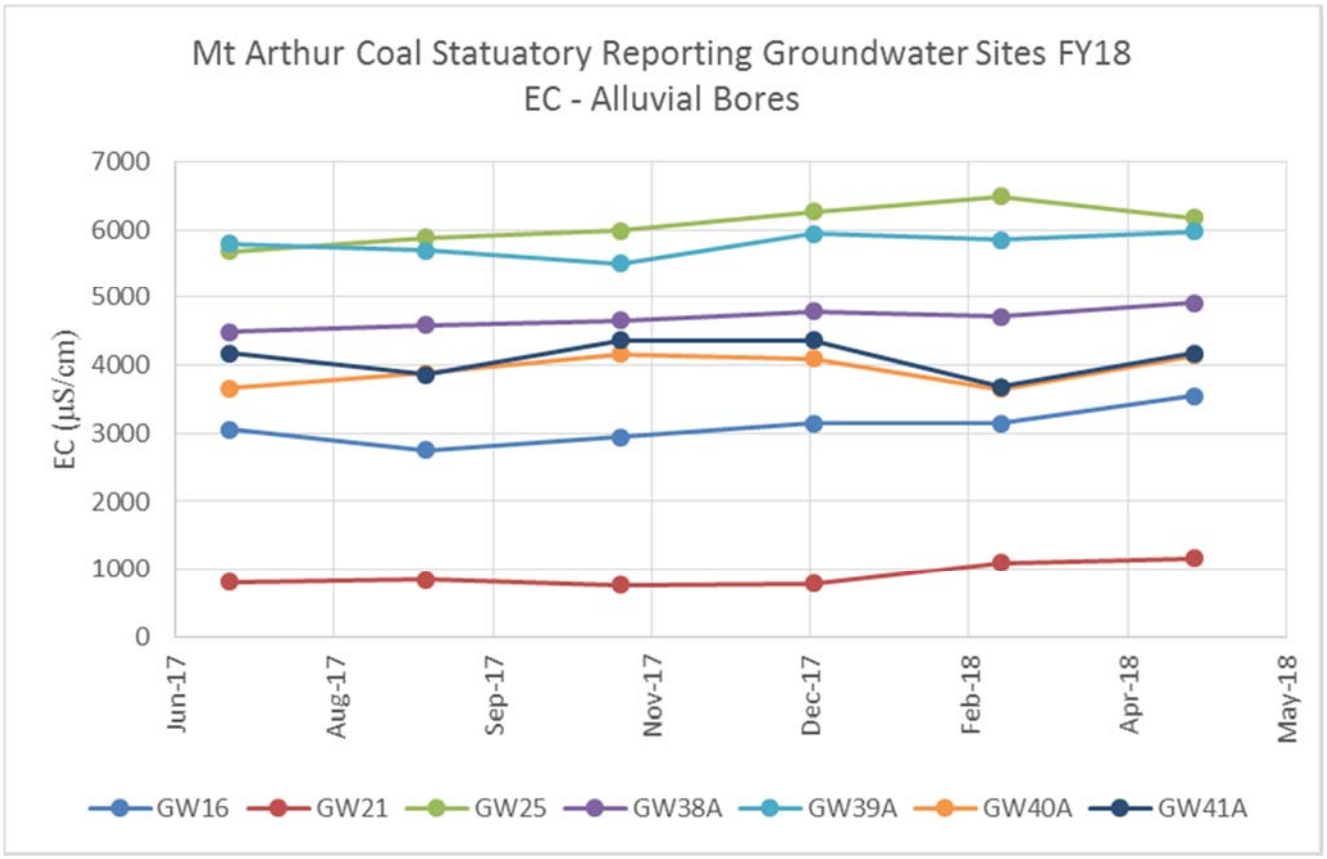


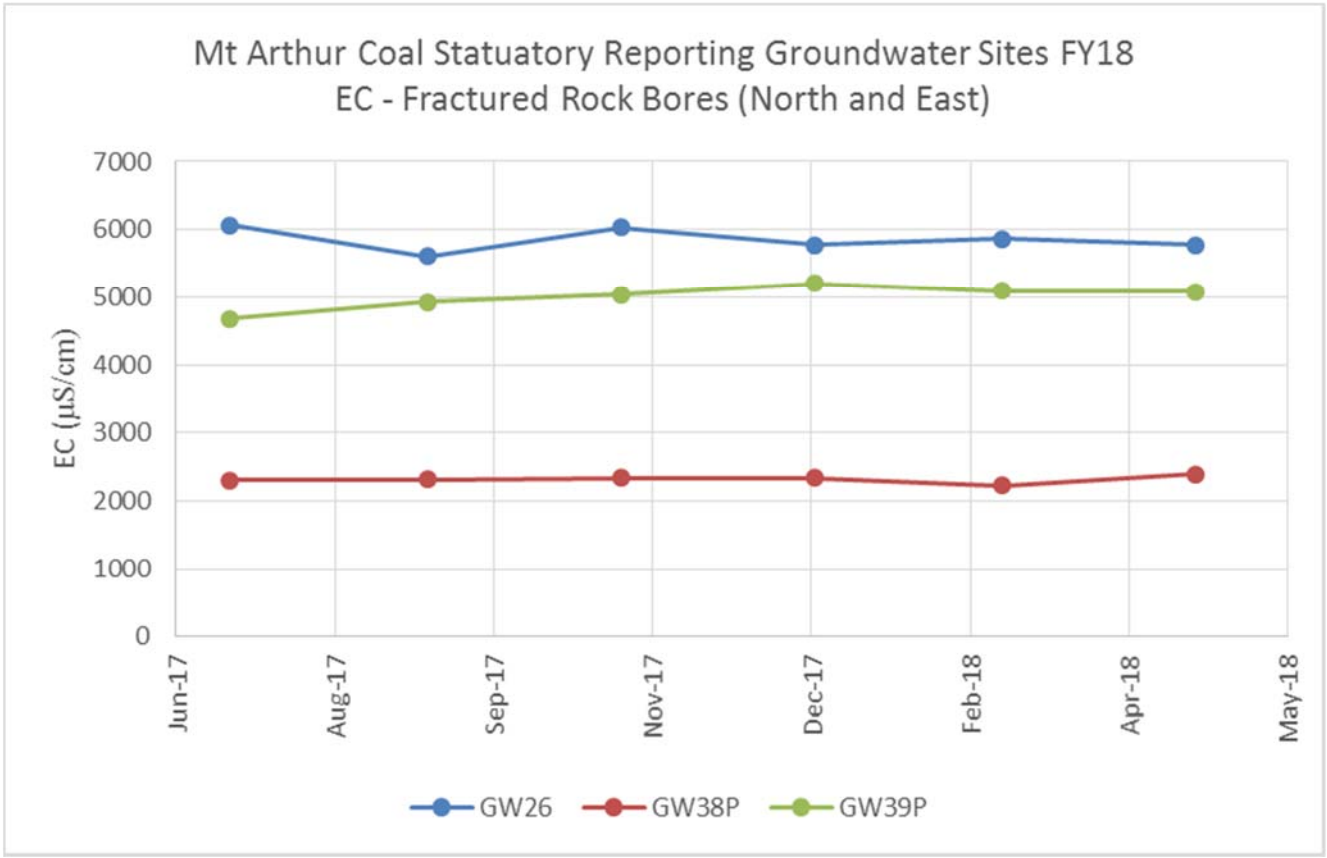


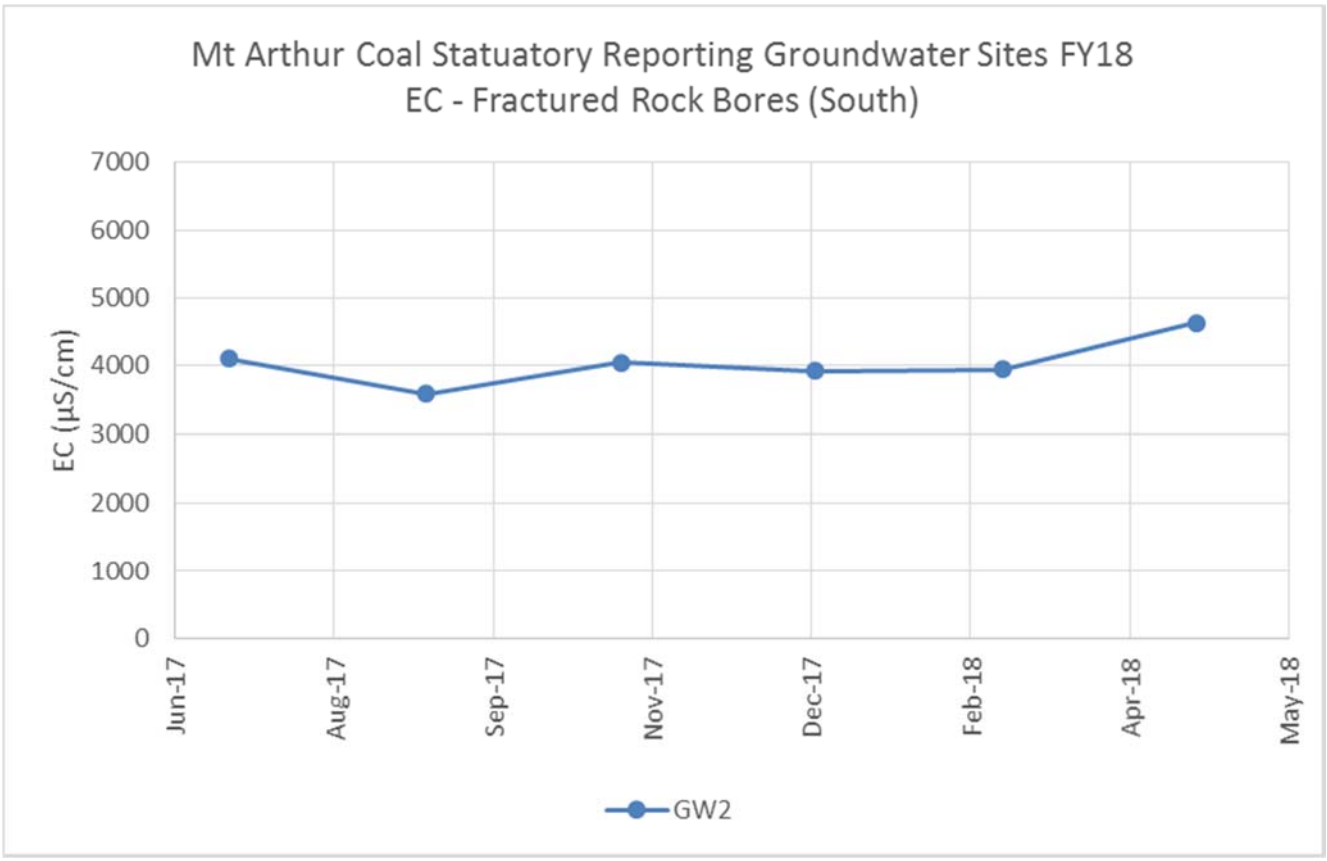

Mt Arthur Coal Statuatory Reporting Groundwater Sites FY18
pH - Fractured Rock Bores (South)
pH
8.00
7.80
7.60
7.40
7.20
7.00
6.80
6.60
6.40
6.20
6.00
Jun-17
Aug-17
Sep-17
Nov-17
Dec-17
Feb-18
Apr-18
May-18
GW2

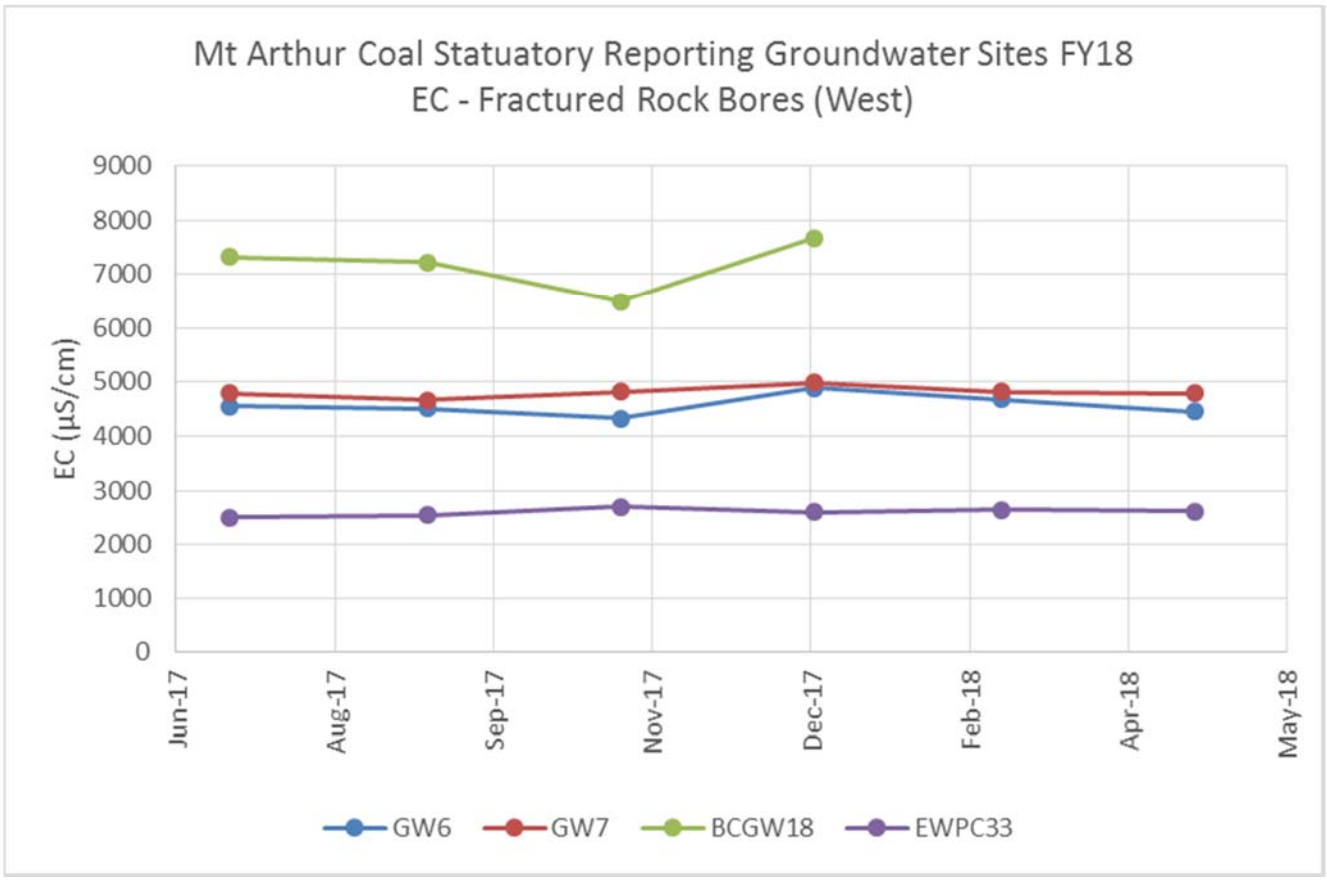

Mt Arthur Coal Statuatory Reporting Groundwater Sites FY18
pH - Fractured Rock Bores (West)
pH
8.00
7.80
7.60
7.40
7.20
7.00
6.80
6.60
6.40
6.20
6.00
Jun-17
Aug-17
Sep-17
Nov-17
Dec-17
Feb-18
Apr-18
May-18
GW6
GW7
BCGW18
EWPC33

Groundwater quality plots (EC)






Mt Arthur Coal Statuatory Reporting Groundwater Sites FY18
EC - Fractured Rock Bores (South)
EC (µS/cm)
7000
6000
5000
4000
3000
2000
1000
0
Jun-17
Aug-17
Sep-17
Nov-17
Dec-17
Feb-18
Apr-18
May-18
GW2


Mt Arthur Coal Statuatory Reporting Groundwater Sites FY18
EC - Fractured Rock Bores (West)
EC (µS/cm)
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Jun-17
Aug-17
Sep-17
Nov-17
Dec-17
Feb-18
Apr-18
May-18
GW6
GW7
BCGW18
EWPC33

Appendix 4 - Community Complaints

Month	Date and time	Time	From	Issue	Lodgement type	Investigation and response to caller
July	14/07/2017	1:44	Denman Rd	Blast	Community Response Line	Concern over dust. At that time MAC real time monitors were below the criteria specified in the project approval and no dust complaints were received by MAC on this day.
	22/07/2017	9:44	Roxburgh Rd	Lighting	Community	Caller advised they could see a bright light. Lights were adjusted accordingly.
August	05/08/2017	7:51	Roxburgh Rd	Lighting	Community Response Line	Caller advised they could see a bright light. Lights were adjusted accordingly.
	15/08/2017	14:33	Denman Road	Blast Dust	Community Response Line	Investigation revealed weather conditions were suitable for blasting at the time. Results at the nearest monitor indicated dust levels were not elevated at the time, and the 24 hour average remained within regulatory criteria. Caller was advised of investigation and monitoring results.
	29/08/2017	9:26	Roxburgh Rd	Lighting	Community	Caller advised they could see a bright stationary light. The offending light was adjusted accordingly.
September	05/09/2017	1:45	Roxburgh Rd	Dust	Community Response Line	Caller advised they could see dust on site. Monitoring showed no dust leaving site.
October	09/10/2017	11:46	Roxburgh Rd	Lighting	Community Response Line	Clear stationary light visible. Supervisor attended property to identify light source, corrective action taken to minimise impact.
	10/10/2017		Roxburgh Rd	Noise	Community Response Line	Investigation revealed no unusual mining operations were occurring at the time. Results at the nearest real-time monitor indicated noise levels were within regulatory criteria. Caller was advised of investigation and monitoring results.
	18/10/2017		Roxburgh Rd	Noise	Community Response Line	Investigation revealed no unusual mining operations were occurring at the time. Results at the nearest real-time monitor indicated noise levels

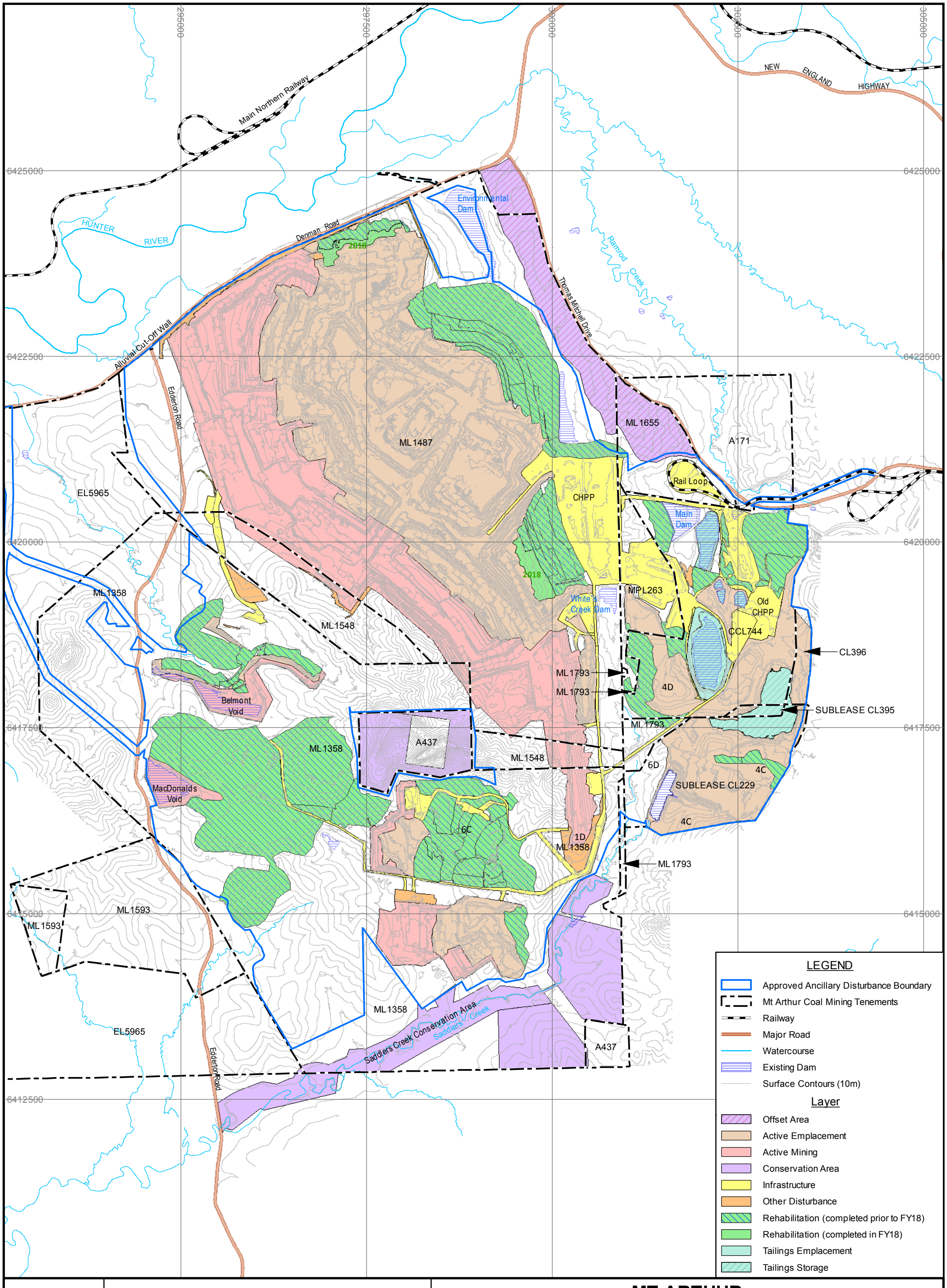
Month	Date and time	Time	From	Issue	Lodgement type	Investigation and response to caller
						were within regulatory criteria. Caller was advised of investigation and monitoring results.
	20/10/2017		Roxburgh Rd	Noise	Community Response Line	Investigation revealed no unusual mining operations were occurring at the time. Results at the nearest real-time monitor indicated noise levels were within regulatory criteria. Caller was advised of investigation and monitoring results.
November	05/11/2017	8:39	Roxburgh Rd	Lighting	Community Response Line	Offending flood light identified and positioning corrected. .
	22/11/2017	1:10	Denman Rd	Dust	Community Response Line	Dust observed at Mt Arthur site. Dust following Blast. No dust leaving site.
	27/11/2017	3:05	Denman Rd	Dust	Community Response Line	Observed dust at Mt Arthur. No reports of any dust leaving site.
December	15/12/2017	12:22	Muswellbrook	Dust	Community Response Line	No recorded dust levels over regulatory criteria.
	16/12/2017	6:31	Denman Rd	Dust	Community Response Line	No recorded dust levels over regulatory criteria.
January	02/01/2018	7:32	Muswellbrook	Noise	Community Response Line	Caller declined to leave any details. Advised they could hear dozers in the distance. No noise recorded over regulatory criteria.
	06/01/2018	12:17	Denman Rd	Blast	Community Response Line	Investigation revealed there were no exceedances for vibration or noise when blast was fired

Month	Date and time	Time	From	Issue	Lodgement type	Investigation and response to caller
	06/01/2018	12:15	Bengalla Rd	Noise	Community Response Line	Investigation revealed there were no exceedances for vibration or noise when blast was fired
	06/01/2018	6:43	Roxburgh Rd	Blast	Community Response Line	Investigation revealed there were no exceedances for vibration or noise when blast was fired
	09/01/2018	3:28	Muswellbrook	Noise	Community Response Line	Caller advised noise following a blast , There were no exceedances for vibration or noise
	09/01/2018	3:51	Old Bengalla Rd	Noise	Community Response Line	Caller advised noise following a blast , There were no exceedances for vibration or noise
	10/01/2018	10:17	Denman Rd	Dust	Community Response Line	Call came via Mt Arthur reception. Reported dust over Denman Rd. There were no exceedances for dust reported from site.
	16/01/2018	9:53	Roxburgh Rd	Lighting	Community Response Line	Caller advised they could see one stationary clear flood light from the site OCE attended property and light was adjusted
	21/01/2018		Roxburgh Rd	Noise	Community Response Line	Investigation revealed no unusual mining operations were occurring at the time. Results at the nearest real-time monitor indicated noise levels were within regulatory criteria. Caller was advised of investigation and monitoring results.
	29/01/2018	6:35	Roxburgh Rd	General Dust	Community Response Line	Caller advised they could see dust after strong wind gusts. No dust was recorded off site.
February	06/02/2018	20:48	Roxburgh Rd	Lighting	Community Response Line	Offending light identified and measure taken to correct.

Month	Date and time	Time	From	Issue	Lodgement type	Investigation and response to caller
	07/02/2018	11:29	Racecourse Rd	Noise	Community Response Line	No firing activity from site today. Mt Arthur not the source of any blast vibration or noise.
	22/02/2018	16:04	Denman Rd	Dust	Community Response Line	Resident advised seeing dust over road. Could not determine dust was leaving site at that time.
	24/02/2018	20:07	Roxburgh Rd	Lighting	Community Response Line	Offending light identified and measure taken to correct.
	25/02/2018	19:59	Roxburgh Rd	Lighting	Community Response Line	Offending light identified and measure taken to correct.
March	01/03/2018	1:03	Denman Rd	Dust	Community Response Line	Caller advised they could dust following a blast. There were no alerts advising any dust left site.
	08/03/2018	10:31	Roxburgh Rd	Lighting	Community Response Line	Caller advised they could see a clear light. Light was adjusted accordingly.
	10/03/2018	7:56	Roxburgh Rd	Lighting	Community Response Line	Caller advised they could see a clear light. Light was adjusted accordingly.
	13/03/2018	19:00	Roxburgh Rd	Lighting	Community Response Line	Caller advised they could see a clear light. Light was adjusted accordingly.
April	05/04/2018	12:23	Denman Rd	Blast Dust	Community Response Line	Investigation revealed weather conditions were suitable for blasting at the time. Results at the nearest monitor indicated dust levels were not elevated at the time, and the 24 hour average remained within regulatory criteria. Caller was advised of investigation and monitoring results.

Month	Date and time	Time	From	Issue	Lodgement type	Investigation and response to caller
May	13/05/2018	20:00	Roxburgh Road	Lighting	Community Response Line	Investigation revealed location of lights, which were redirected or turned off. Caller was advised of investigation results and action taken. Caller advised they were satisfied that the issue had been resolved
	16/05/2018	21:08	Roxburgh Road	Lighting	Community Response Line	Investigation revealed location of lights, which were redirected or turned off. Caller was advised of investigation results and action taken. Caller advised they were satisfied that the issue had been resolved
	29/05/2018	9:41	Muswellbrook	General Dust	Community Response Line	Investigation revealed mining operations had already ceased at the time. Results at the nearest monitor indicated dust levels were not elevated at the time, and the 24 hour average remained within regulatory criteria. Caller was advised of investigation and monitoring results.
	29/05/2018	10:45	Muswellbrook	General Dust	Community Response Line	Investigation revealed mining operations had already ceased at the time. Results at the nearest monitor indicated dust levels were not elevated at the time, and the 24 hour average remained within regulatory criteria. Caller was advised of investigation and monitoring results.
June	None to report					

Appendix 5 - Rehabilitation Plan


295000
297500
300000
302500
305000
6425000
6422500
6420000
6417500
6415000
6412500
Main Northern Railway
NEW ENGLAND HIGHWAY
HUNTER RIVER
Denman Road
Environmental Dam
Ramrod Creek
Thomas Mitchell Drive
Alluvial Cut-Off Wall
Edderton Road
2018
ML1655
A171
ML1487
Rail Loop
CHPP
Main Dam
EL5965
ML1358
ML1548
MPL263
White's Creek Dam
Old CHPP
CCL744
CL396
ML1793
4D
SUBLEASE CL395
Belmont Void
A437
6D
4C
SUBLEASE CL229
MacDonalds Void
6C
1D
ML1593
Saddlers Creek Conservation Area
Saddlers Creek
LEGEND
Approved Ancillary Disturbance Boundary
Mt Arthur Coal Mining Tenements
Railway
Major Road
Watercourse
Existing Dam
Surface Contours (10m)
Layer
Offset Area
Active Emplacement
Active Mining
Conservation Area
Infrastructure
Other Disturbance
Rehabilitation (completed prior to FY18)
Rehabilitation (completed in FY18)
Tailings Emplacement
Tailings Storage
BHP
Mapping Services Brisbane
0 500 1,000 1,500 2,000 m
Transverse Mercator Projection.
MGA Zone 56. GDA84 Datum.
MT ARTHUR
Rehabilitation Plan FY18
Drawn: B. Kleinschmidt
Checked: R. Quayle
Date: 23/07/2018
Revision: 1
Filename: Appen5_RehabPlan
Appendix 5

Appendix 6 – Annual Coal Transport Report FY18

This report has been prepared in accordance with Schedule 3 Condition 46 of Project Approval 09_0062 MOD 1:

Monitoring of Coal Transport

46. The Proponent shall keep records of the:
    (a) amount of coal transported from the site in each financial year;
    (b) number of coal haulage train movements generated by the Mt Arthur mine complex (on a daily basis); and
    (c) make these records available on its website at the end of each financial year.

For the 12 month period ending 30 June 2018:

- 16.18 million tonnes of export product coal was transported by rail to the Port of Newcastle. This is compliant with Schedule 2 Condition 7(a) of Project Approval 09_0062 MOD 1, which restricts Mt Arthur Coal's coal transport on the Antiene rail spur to a maximum of 27 million tonnes of product coal in a financial year;
- 1.38 million tonnes of domestic product coal was transported by conveyor to the Bayswater Power Station;
- The total number of train movements was 3,784; and
- The maximum number of train movements in a single day was 22, which occurred once only throughout the reporting period. This is compliant with Schedule 2 Condition 7(b) of Project Approval 09_0062 MOD 1, which restricts Mt Arthur Coal's coal transport on the Antiene rail spur to a maximum of 30 train movements a day.

Note: Each train entering and exiting the site is classified as two train movements and a day refers to the 24 hours from midnight to midnight the next day.

Table A6.1. Daily train movements FY18

Date	No. of train movements
1/07/2017	14
2/07/2017	8
3/07/2017	14
4/07/2017	16
5/07/2017	12
6/07/2017	12
7/07/2017	14
8/07/2017	18
9/07/2017	14
10/07/2017	20
11/07/2017	4
12/07/2017	14
13/07/2017	6
14/07/2017	12
15/07/2017	16
16/07/2017	12
17/07/2017	10
18/07/2017	8
19/07/2017	14
20/07/2017	2
21/07/2017	4
22/07/2017	14
23/07/2017	4
24/07/2017	6
25/07/2017	6
26/07/2017	8
27/07/2017	6
28/07/2017	10
29/07/2017	8
30/07/2017	10
31/07/2017	16

Date	No. of train movements
1/08/2017	8
2/08/2017	6
3/08/2017	10
4/08/2017	8
5/08/2017	14
6/08/2017	12
7/08/2017	10
8/08/2017	10
9/08/2017	12
10/08/2017	10
11/08/2017	2
12/08/2017	10
13/08/2017	18
14/08/2017	6
15/08/2017	0
16/08/2017	0
17/08/2017	2
18/08/2017	10
19/08/2017	6
20/08/2017	6
21/08/2017	4
22/08/2017	6
23/08/2017	8
24/08/2017	6
25/08/2017	8
26/08/2017	6
27/08/2017	6
28/08/2017	18
29/08/2017	10

Date	No. of train movements
30/08/2017	10
31/08/2017	12
1/09/2017	8
2/09/2017	8
3/09/2017	10
4/09/2017	12
5/09/2017	4
6/09/2017	10
7/09/2017	10
8/09/2017	16
9/09/2017	8
10/09/2017	8
11/09/2017	10
12/09/2017	18
13/09/2017	12
14/09/2017	14
16/09/2017	16
17/09/2017	16
18/09/2017	16
19/09/2017	16
20/09/2017	12
21/09/2017	12
22/09/2017	8
23/09/2017	6
24/09/2017	4
25/09/2017	14
26/09/2017	10
27/09/2017	10
28/09/2017	12

Date	No. of train movements
29/09/2017	16
30/09/2017	12
1/10/2017	12
2/10/2017	14
3/10/2017	10
4/10/2017	8
5/10/2017	8
6/10/2017	14
7/10/2017	14
8/10/2017	10
9/10/2017	6
10/10/2017	0
11/10/2017	0
12/10/2017	0
13/10/2017	8
14/10/2017	10
15/10/2017	14
16/10/2017	12
17/10/2017	8
18/10/2017	10
19/10/2017	6
20/10/2017	12
21/10/2017	8
22/10/2017	6
23/10/2017	6
24/10/2017	8
25/10/2017	6
26/10/2017	12
27/10/2017	12

Date	No. of train movements
28/10/2017	18
29/10/2017	12
30/10/2017	14
31/10/2017	2
1/11/2017	14
2/11/2017	12
3/11/2017	10
4/11/2017	6
5/11/2017	8
6/11/2017	12
7/11/2017	12
8/11/2017	16
9/11/2017	12
10/11/2017	14
11/11/2017	16
12/11/2017	18
13/11/2017	12
14/11/2017	10
15/11/2017	12
16/11/2017	10
17/11/2017	6
18/11/2017	6
19/11/2017	4
20/11/2017	0
21/11/2017	0
22/11/2017	0
23/11/2017	0
24/11/2017	6
25/11/2017	8

Date	No. of train movements
26/11/2017	10
27/11/2017	12
28/11/2017	16
29/11/2017	12
30/11/2017	8
1/12/2017	0
2/12/2017	4
3/12/2017	8
4/12/2017	14
5/12/2017	8
6/12/2017	16
7/12/2017	12
8/12/2017	8
9/12/2017	4
10/12/2017	14
11/12/2017	10
12/12/2017	18
13/12/2017	16
14/12/2017	8
15/12/2017	16
16/12/2017	16
17/12/2017	10
18/12/2017	6
19/12/2017	6
20/12/2017	6
21/12/2017	10
22/12/2017	10
23/12/2017	6
24/12/2017	12

Date	No. of train movements
25/12/2017	0
26/12/2017	0
27/12/2017	10
28/12/2017	14
29/12/2017	12
30/12/2017	4
31/12/2017	10
1/01/2018	12
2/01/2018	10
3/01/2018	20
4/01/2018	18
5/01/2018	18
6/01/2018	6
7/01/2018	6
8/01/2018	6
9/01/2018	8
10/01/2018	12
11/01/2018	14
12/01/2018	16
13/01/2018	12
14/01/2018	12
15/01/2018	12
16/01/2018	6
17/01/2018	0
18/01/2018	0
19/01/2018	6
20/01/2018	6
21/01/2018	6
22/01/2018	0

Date	No. of train movements
23/01/2018	0
24/01/2018	6
25/01/2018	4
26/01/2018	0
27/01/2018	8
28/01/2018	20
29/01/2018	0
30/01/2018	0
31/01/2018	0
1/02/2018	8
2/02/2018	10
3/02/2018	12
4/02/2018	12
5/02/2018	12
6/02/2018	8
7/02/2018	12
8/02/2018	6
9/02/2018	6
10/02/2018	6
11/02/2018	4
12/02/2018	6
13/02/2018	6
14/02/2018	8
15/02/2018	10
16/02/2018	10
17/02/2018	10
18/02/2018	12
19/02/2018	12
20/02/2018	0

Date	No. of train movements
21/02/2018	0
22/02/2018	0
23/02/2018	4
24/02/2018	10
25/02/2018	10
26/02/2018	6
27/02/2018	8
28/02/2018	8
1/03/2018	12
2/03/2018	18
3/03/2018	16
4/03/2018	16
5/03/2018	16
6/03/2018	14
7/03/2018	2
8/03/2018	2
9/03/2018	8
10/03/2018	14
11/03/2018	16
12/03/2018	14
13/03/2018	8
14/03/2018	10
15/03/2018	12
16/03/2018	8
17/03/2018	12
18/03/2018	14
19/03/2018	12
20/03/2018	12
21/03/2018	6

Date	No. of train movements
22/03/2018	2
23/03/2018	8
24/03/2018	16
25/03/2018	16
26/03/2018	14
27/03/2018	10
28/03/2018	14
29/03/2018	10
30/03/2018	10
31/03/2018	16
1/04/2018	14
2/04/2018	10
3/04/2018	14
4/04/2018	10
5/04/2018	12
6/04/2018	16
7/04/2018	16
8/04/2018	18
9/04/2018	18
10/04/2018	0
11/04/2018	0
12/04/2018	6
13/04/2018	8
14/04/2018	14
15/04/2018	6
16/04/2018	12
17/04/2018	14
18/04/2018	18
19/04/2018	16

Date	No. of train movements
20/04/2018	20
21/04/2018	14
22/04/2018	22
23/04/2018	12
24/04/2018	10
25/04/2018	20
26/04/2018	18
27/04/2018	20
28/04/2018	20
29/04/2018	4
30/04/2018	0
1/05/2018	12
2/05/2018	14
3/05/2018	16
4/05/2018	10
5/05/2018	12
6/05/2018	6
7/05/2018	8
8/05/2018	10
9/05/2018	16
10/05/2018	12
11/05/2018	8
12/05/2018	14
13/05/2018	16
14/05/2018	12
15/05/2018	14
16/05/2018	16
17/05/2018	14
18/05/2018	16

Date	No. of train movements
19/05/2018	18
20/05/2018	16
21/05/2018	2
22/05/2018	10
23/05/2018	12
24/05/2018	16
25/05/2018	12
26/05/2018	18
27/05/2018	14
28/05/2018	16
29/05/2018	16
30/05/2018	14
31/05/2018	18
1/06/2018	16
2/06/2018	16
3/06/2018	20
4/06/2018	18
5/06/2018	14
6/06/2018	16
7/06/2018	12
8/06/2018	8
9/06/2018	0
10/06/2018	0
11/06/2018	0
12/06/2018	0
13/06/2018	16
14/06/2018	20
15/06/2018	14
16/06/2018	16

Date	No. of train movements
17/06/2018	20
18/06/2018	10
19/06/2018	14
20/06/2018	20
21/06/2018	8
22/06/2018	12
23/06/2018	16
24/06/2018	18
25/06/2018	18
26/06/2018	18
27/06/2018	16
28/06/2018	18
29/06/2018	14
30/06/2018	14
Total	**3784**
Maximum daily train	**22**