



Annual Review

2018




DURALIE COAL MINE

ANNUAL REVIEW

Reporting Period: 1st July 2017 to 30th June 2018

Table 1 – Annual Review Title Block

Name of operation	<i>Duralie Coal Mine</i>
Name of operator	<i>Yancoal Australia Ltd</i>
Development consent/ project approval #	<i>PA (08_0203)</i>
Name of holder of Development consent/ project approval #	<i>Duralie Coal Pty Limited</i>
Mining lease #	<i>ML1427, ML 1646</i>
Name of holding of mining lease	<i>CIM Duralie Pty Ltd</i>
Water licence #	<i>20BL168404, 20WA202053, various monitoring bore licences.</i>
Name of holder of water licence	<i>CIM Duralie Pty Ltd & Duralie Coal Pty Ltd</i>
MOP/ RMP start date	<i>18th March 2015</i>
MOP/ RMP end date	<i>31st December 2019</i>
Annual Review start date	<i>1st July 2017</i>
Annual Review end date	<i>30th June 2018</i>
<p>I, John Cullen, certify this audit report is true and accurate record of the compliance status of Duralie Coal Mine for the period of 1st July 2017 to 30th June 2018 and that I am authorised to make this statement on behalf of Yancoal.</p> <p><i>Note.</i></p> <p>a) The Annual Review is an 'environmental audit' for the purpose 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 the corporation, \$1 million and for an individual \$250,000.</p> <p>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).</p>	
Name of authorised reporting officer	<i>Mr John Cullen</i>
Title of authorised reporting officer	<i>Operations Manager – Duralie Coal</i>
Signature of authorised reporting officer	
Date	<i>19 October 2018</i>

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1 **STATEMENT OF COMPLIANCE**

This Annual Review has been prepared in accordance with NSW Project Approval 08_0203 Schedule 5 Condition 3 for the Duralie Coal Mine for the period 1 July 2017 to 30 June 2018. This report is also prepared in accordance with the annual reporting requirements for ML 1427 Condition 3 and ML 1646 Condition 4

A summary of the incidents and non-compliances identified during the reporting period are included in Table 3 below.

An Independent Environmental Audit (IEA) of the Duralie Coal Mine was undertaken in December 2017. A summary of the non-compliances with the Development Consent identified during the IEA which are applicable to the current reporting period are included in Table 3 (IEA covers a period of three years). Further detail regarding the outcomes and recommendations from this IEA are reported separately in **Section 10** and **Appendix 9**.

Table 2- Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	
Project Approval No. 08_0203	NO
ML1427, ML1646	Yes

Table 3 – Summary of Non-compliances

Condition #	Non-Compliance	Compliance Status/Risk	Comment	Section addressed
Project Approval 08_0203				
Sch 3, Con 23 and AQMP	Broken dust deposition gauge D4 – No results for February 2018.	Low	The dust gauge was broken when struck by a tractor. No result was recorded for the month of February 2018. No adverse effects expected based on low results at other monitoring points.	Section 6.3.3
Project Approval 08_0203				
Sch 3, Con 43	The BMP was re-approved close to but after the commencement of clearing for MOD2. DCPL held an approved BMP for the Duralie Coal Mine which included management measures for vegetation clearance approved by DP&E. The revised BMP was submitted to DP&E in June 2015 to include the additional offset areas, and DCPL indicates the management measures remained unchanged. The revised BMP was approved by DP&E in January 2016 (7 months after submission with no issues raised from DP&E). The MOD2 areas were not cleared until end December 2015. Habitat trees cleared on 20 Jan 2016 (after BMP approved).	Low	IEA 2017	Section 10 & Appendix 9

ML 1646				
Condition 5	No incidents as discussed in IEA Section 5.14 were reported to DRG as required by this condition.	Administrative	IEA 2017	Section 10 & Appendix 9

Table 4 – Compliance Status Categories

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	Non-compliance which does not result in any risk of environmental harm

2. INTRODUCTION

The Duralie Coal Mine (DCM) is located approximately 80km north of Newcastle in New South Wales, between the villages of Stroud Road and Wards River. Refer **Figure 1 (Appendix 1)**.

Duralie Coal Pty Ltd (DCPL) is the owner and operator of the DCM. DCPL is a wholly owned subsidiary of Yancoal Australia Limited (YAL).

Development Consent for the mine was granted by the NSW Minister for Urban Affairs and Planning on 21 August 1997 and Mining Lease Number 1427 was issued by the NSW Minister for Mineral Resources on 6 April 1998.

In October 1998 a Statement of Environmental Effects (SEE) was produced to consider proposed alterations to the Duralie Mine. These proposed alterations were approved by the NSW Minister for Urban Affairs and Planning on 5 February 1999.

Construction commenced in June 2002 with mining production commencing in March 2003 and the first coal railed to the Stratford Mine for processing in the same month. Duralie Coal Pty Ltd (DCPL) received Project Approval for the Duralie Extension Project (PA 08_0203) in November 2010 for mining activities to extend until 31 December 2021 and Mining Lease 1646 was issued on 4 January 2011. The Project Approval has since been modified on two occasions on 1 November 2012 and 5 December 2014.

Duralie Coal Mine consists of an open-cut, truck and excavator mine producing run of mine (ROM) coal which is processed at the Stratford Coal Mine Coal Handling and Processing Plant (CHPP).

This Annual Review (AR) has been prepared in accordance with PA (08_0203) Schedule 5 Condition 3. This report is also prepared in accordance with the annual reporting requirements for ML 1427 Condition 3 and ML 1646 Condition 4. and in accordance with the Department of Planning and Environment (DPE) Annual Review Guidelines (October 2015).

The AR describes the environmental protection, pollution control and rehabilitation activities at the DCM for the period 1 July 2017 to 30 June 2018. As required by the Project Approval, comparisons of environmental monitoring results have been made against relevant statutory requirements, monitoring results of previous years and relevant predictions of Environmental Assessments. Environmental activities planned for the next 12 months are also discussed.

2.1 MINE CONTACTS

The DCM is an owner operated mine site by DCPL Site personnel responsible for mining, rehabilitation and environmental issues at the end of the reporting period were:

Position	Name	Contact
Operations Manager, Stratford & Duralie Operations	Mr John Cullen	02 4999 5108
Environment & Community Superintendent	Mr Michael Plain	02 4999 5117

3. APPROVALS

3.1.1 Status of Leases, Licences, Permits and Approvals

The DCM operates in accordance with the approvals provided in Table 5.

Table 5 – Duralie Coal Mine - Leases, Licences and Approvals

Description	Date of Grant	Duration of Approval	Comment
NSW Project Approvals			
Duralie Extension Project – Project Approval (08_0203)	5/12/2014 (As Modified)	The Applicant may carry out mining operations on site until the end of 2021.	<ul style="list-style-type: none"> Grant 26/10/2010. MOD 1 (Rail Hours) 1/11/2012. MOD 2 (Open Cut variations) 5/12/2014.
Mining Leases and Exploration Licences			
ML1427	6/4/1998	21 years. (6/4/2019)	
ML1646	4/1/2011	21 years. (4/1/2032)	
AUTH 315	14/10/2013	28 November 2017.	Renewal lodged 27/11/2017.
Environment Protection Licences			
Environment Protection Licence (EPL) 11701	4/9/2002	Until the licence is surrendered, or revoked.	As modified by subsequent variations (refer to EPA website).
Commonwealth Approvals			
Commonwealth Approval (EPBC 2010/5396)	22/10/2010	22/10/2020	
Water Licences			
Water Supply Works Approval 20WA202053	1/7/2004	1 October 2018.	Coal Shaft Creek diversion and various on-site water management structures.
WAL 41518 (previously 20BL168404)	22/09/2002	Perpetuity	Groundwater Licence for the Duralie Open Cut extraction. Converted to WAL 41518 under WM Act 2000 on 14/12/2017.
Groundwater licences – various monitoring bores.	Various	Various	Monitoring purposes only.

Various Environmental Management Plans (EMPs) are also approved for the DCM. The current versions approved by DP&E are available on the Duralie Coal website.

- Environmental Management Strategy (revised), DPE approved as of 24 October 2017.
- Air Quality and Greenhouse Gas Management Plan (revised), DP&E approved 23 June 2015.
- Biodiversity Management Plan (revised), DP&E approved 5 September 2017.
- Blast Management Plan (revised), DP&E approved 24 October 2017.
- Giant Barred Frog Study, DP&I approved 6 March 2012.
- Giant Barred Frog Management Plan (revised), DP&E approved 5 September 2017.

- Heritage Management Plan (revised), DP&E approved as of 23 June 2015.
- Noise Management Plan (revised), DP&E approved as of 9 May 2018.
- Waste Management Plan, DP&E approved 23 June 2015.
- Water Management Plan (revised), DP&E approved 5 September 2017.
- Mining Operations Plan & Rehabilitation Management Plan (revised), DRG approved 11 December 2017.
- Duralie Extension Project Study of Dust Emissions from Rail Transport under condition 21A of the Project Approval, approved 2012.
- Consultation Plan – Additional Rail Noise Mitigation Measures, approved December 2012.
- Pollution Incident Response Management Plan (revised), April 2017.

3.1.2 Amendments to Approvals/Licences during the Reporting Period

Table 6 lists approvals and amendments that were granted during the reporting period.

Table 6 – Amendments to Approvals/Licences

Licence/Approval	Amendment type	Date of amendment
EPL 11701	Licence variation issued by the EPA following a 5-year review of the licence.	Granted by EPA on 8 November 2017
EPL 11701	Licence variation issued to reduce the fee based activity scale.	Granted by EPA on 24 May 2018
WAL 41518	Groundwater licence 20BL168404 converted to WAL 41518 under WM Act 2000.	Issued by DPI Water on 14 December 2017
Mining Operations Plan & Rehabilitation Management Plan	An amendment was prepared for the Mining Operations Plan and now incorporates the Rehabilitation Management Plan. The MOP was also amended to include a mine closure planning schedule.	Approved by DRG on 11 December 2017.
Environmental Management Plans <ul style="list-style-type: none"> • Biodiversity Management Plan • Giant Barred Frog Management Plan • Water Management Plan • Environmental Management Strategy • Blast Management Plan • Noise Management Plan 	Revised and updated during the 2017-18 reporting period	<ul style="list-style-type: none"> • Approved 5-Sep-2017 • Approved 5-Sep-2017 • Approved 5-Sep-2017 • Approved 24-Oct-2017 • Approved 24-Oct-2017 • Approved 9-May-2018

4. OPERATIONS SUMMARY

A summary of operations (Production), during the preceding and current reporting period as well as a forward forecast for the next reporting period is provided below in **Table 7**.

Table 7 - Production Summary

Material	Approved limit (specify source)	Previous reporting period (tonnes)	This reporting period (tonnes)	Next reporting period (tonnes)
Waste Rock/ Overburden (BCM)	N/A	4,684,990	2,268,264	286,850*
ROM Coal	3 million tonnes per annum	871,448	715,073	162,416
Codisposal Reject (Includes Stratford Consent)	Approx. 12.3 million tonnes over life of project.	282,043	190,230	400,000
Saleable product (Includes Stratford Consent)	N/A (Process limit of 5.6 million tonnes per annum)	657,183	631,768	900,000

* An additional 1.3MBCM of overburden would be rehandled during the next reporting period.

Product coal utilising Duralie ROM coal is produced at the Stratford Mining Complex. Blending of Duralie ROM coal with other ROM coals and rewash reject material occurred during processing to produce a saleable product coal. Saleable coal production for the period July 2017 to June 2018 was 631,768 tonnes comprising 93,037 tonnes of coking coal and 538,731 tonnes of thermal coal.

ROM production for the reporting period is listed in **Table 8** below by month.

Table 8: Monthly ROM Coal Production

MONTH	ROM PRODUCTION (tonnes)
July 2017	202,980
August 2017	133,409
September 2017	88,328
October 2017	39,641
November 2017	12,717
December 2017	122
January 2018	24,542
February 2018	45,146
March 2018	29,459
April 2018	36,220
May 2018	63,104
June 2018	39,405
Total	715,073

Product coal production to date by month is shown in **Table 9**.

Table 9: Product Coal Produced by Month

MONTH	Coking Coal	Thermal Coal	Total Product Coal
July 2017	14,843	104,172	119,015
August 2017	1,861	108,603	110,464
September 2017	7,162	22,055	29,217
October 2017	22,562	41,603	64,165
November 2017	15,413	26,396	41,809
December 2017	14,318	37,079	51,397
January 2018	3,994	22,720	26,714
February 2018	5,129	28,177	33,306
March 2018	1,491	36,803	38,294
April 2018	906	32,122	33,028
May 2018	2,523	32,736	35,259
June 2018	2,835	46,265	49,100
Total Annual	93,037	538,731	631,768

4.1 EXPLORATION

No exploration activities were undertaken during the 2017-2018 reporting period. At the time of publication, only minor exploration activities are proposed for Authorisation 315 to the north of the existing Weismantel Pit during the 2018-2019 reporting period. Exploration activities will focus around the Stratford Mining Complex area.

4.2 ESTIMATE MINE LIFE

In accordance with PA 08_0203 (DoPI 2011), mining operations are permissible until 31 December 2021. This date remains the same under the Project Modification granted on 5 December 2014.

Mining operations including rehabilitation activities at the DCM are expected to continue during this period. ROM coal production is expected to be finalised by the end of 2018.

4.3 MINING

The DCM is an open cut truck and shovel operation located approximately 20km south of the Stratford Mine facilities. The workings extract coal from the Weismantel and Clareval seams at the base of the Gloucester Coal Measures. The deposit forms a synclinal structure with the open cut area located at the southernmost crop line within the main axis of the Gloucester Basin. The operation is now situated on the west limb of the syncline with seams dipping at about 50 degrees east. Mining is undertaken with ML1427 and of ML1646 and includes the extension of the Weismantel pit to the North West and the inclusion of the Clareval seam parallel and to the west of the Weismantel seam.

Dips within the deposit vary from a shallow 5 degrees to an almost vertical profile. Consequently, a method of horizontal 3m to 4m benches is used as the primary extraction method. An average of 5m of free dig material is generally experienced at Duralie after which all waste material generally requires blasting.

Mining continued concurrently in both the Weismantel and Clareval pits during the 2017/18 reporting period. Mining in the Clareval pit was completed during September 2017 and waste from the Weismantel pit will continued to be placed in the Clareval pit. Clearing in advance of mining has now been completed up to the proposed disturbance limit in both Weismantel and Clareval. Mining of coal within the Weismantel pit is expected to be completed in October 2018.

Mining operations are permitted 7 days per week, however mining is currently undertaken during Monday to Friday with no weekend work. Additionally, nightshift operations have ceased during 2018.

Surface facilities at the mine and current mine development as at 30 June 2018 are indicated within **Figure 3**, provided in **Appendix 1**.

4.3.1 Mining Equipment and Method

The mining equipment currently in use at DCM up until 30 June 2018 is listed in **Table 10** provided below.

Table 10: Current Mining Fleet*

Plant Item	Number
Excavators	3
Haul Trucks	8
Drills	2
Dozers	3
Water Carts	2
Graders	1
Loader (ROM feed)	1

*Total fleet not all used concurrently.

The mining sequence is summarised below and is conducted in accordance with the approved Mining Operations Plan and supporting approvals including relevant Environmental Management Plans and respective licences (refer Section 1.1) as required. The mining sequence generally occurs in the following manner:

- A vegetation clearance and ground disturbance plan is prepared. This included fauna/flora assessments and cultural heritage surveys.
- A sedimentation control plan is prepared for the area to be disturbed (or an existing plan utilised).
- Sedimentation controls are implemented (as required).
- Tree clearing is limited to the minimum required for ongoing operations and undertaken ahead of the advancing face or dump.
- Topsoil is removed in accordance with a topsoil stripping plan.
- Overburden removal is undertaken by a hydraulic excavator. Generally, the first one to five metres of subsoil/overburden is ripped and/or free-dug. Deeper overburden requires blasting prior to excavation.
- Overburden waste material is deposited within/above a void section of the mining excavation until at final approved height in readiness for shaping to the approved final landform profile.

The truck fleet currently comprises predominantly Cat 785XQ model trucks supported by a lesser number of attenuated Cat 789C trucks.

4.4 COAL HANDLING AND BENEFICATION

4.4.1 Duralie CHP Throughput & Rejects Management

Rock greater than 140 mm is removed from ROM coal using a rotary breaker at the DCM Coal Handling Plant (CHP). The separated rock is conveyed to a bin from which it is loaded out and trucked to be buried on site as potentially acid forming (PAF) waste. The ROM coal is then transferred to a train loadout bin and railed to the Stratford Mine via a shuttle train.

Reject fractions from the ROM coal are generated at the Stratford Mine and deposited along with processing waste fractions produced from the washing of Stratford Mining Complex coals. The Stratford Mine utilises a co-disposal method that combines the coarse rejects with the intermediate sized materials and tailings. The co-disposal area is managed in accordance with the Stratford Mining

Complex Life of Mine Reject Disposal Plan.

4.4.2 ROM Coal Processing On Site

ROM coal is processed through a rotary breaker to produce a coal fraction less than 140 mm. The essential elements of the coal processing plant on site and their design capacities are as follows:

ROM conveyor handling rate	1400 tph
Train load out rate	2400 tph

4.4.3 Coal Stockpile Capacity (ROM)

The ROM pad stockpile is utilised for temporary ROM coal storage which is transported by loader directly to the ROM hopper. Additionally, a temporary ROM coal stockpile (RL69), located within the approved surface development area, was utilised during the MOP term. ROM coal temporarily stored at this stockpile is transported by truck to the DCM coal handling area.

Stockpile	Capacity (tonnes)
Duralie ROM pad	20,000
Duralie RL69 ROM	150,000

4.4.4 Product Transport

All ROM coal is transported from site to Stratford Mining Complex by rail. The approved hours of operation of the Duralie shuttle train are between 6 am and midnight. In exceptional circumstances, the Duralie shuttle train may operate on the North Coast Railway between midnight and 1am in accordance with Condition 8, Schedule 2 of the NSW Project Approval. This condition was not utilised during the reporting period.

762,000 tonnes of ROM coal was transported from the DCM in the reporting period to the Stratford Mine Site. A total of 365 train movements (Duralie-Stratford-Duralie circuit) occurred during the July 2017 to June 2018 period. There was a maximum daily movement of 4 trains. A summary of the ROM coal transported from site and the shuttle train movements is available on the Duralie Coal website in accordance with Condition 48, Schedule 3 of PA 08_0202 and is also shown in **Appendix 6**.

A summary of Product Coal transported during the reporting period is included in the Stratford Mining Complex Annual Review as no product is transported directly from Duralie.

4.5 WASTE MANAGEMENT AND RECYCLING

A fully accredited waste contractor was engaged during the reporting period to manage all waste streams from the Duralie operations. This contract includes general waste and recycling, scrap metal, hydrocarbons including waste grease and oil and hazardous waste.

4.5.1 Sewerage Treatment and Disposal

Sewage treatment at the mine site involves multiple septic systems at the offices and crib rooms that manage all generated sewage. Sewage is processed using Garden Master 7100 Elite Aerated Waste Water Treatment Systems. The systems works on the combined principles of primary settlement and aerobic treatment. Treated effluent is discharged via a spray system into a grassed area located to the southwest of the Main Office.

The sewage treatment facility is registered with MidCoast Council and serviced on a quarterly basis by

an approved contractor.

4.5.2 Fuel, Oil and Grease Management and Disposal

Fuel (diesel) storage at the mine site consists of two 100,000 litre capacity above ground double-skinned storage tanks (Transtanks). An "Acknowledgement of Notification of Hazardous Chemicals on Premises" (Acknowledgement Number NDG 036328 was held for this facility during the reporting period. Potential hydrocarbon contaminated runoff from fuel fill points is captured on concrete pads and directed through an oil water separator. Dirty water runoff from the fuel pad is captured and directed to the main water dam.

Bulk oil is stored onsite within a bunded area and double-skinned tanks near the workshop. Used engine oils (lubricating oils), hydraulic oils and grease are recovered during plant and vehicle servicing in the workshop and in the field. Waste oil is stored in designated Transtanks and waste grease is stored in drums on bunded pallets.

Within the workshop area, separate bunded areas hold a 28,000 litre waste oil tank and bulk storage of oils, greases and lubricants (tanks and drums). A washpad is utilised to clean vehicles and plant either prior to leaving site or for general servicing/repair. Off the washpad is a concrete sump which serves to trap silt and from which oil is removed using an oil water separator. Waste oil collected is removed from site by a commercial contractor for subsequent recycling off-site.

4.5.3 Rubbish Disposal

All domestic rubbish (e.g. food scraps, paper etc.) are deposited in industrial rubbish bins which are periodically emptied by a waste contractor for subsequent disposal.

Scrap metal produced by the workshop is collected and transferred off site by a scrap metal merchant. The merchant collects the scrap metal following inspections by the waste contractor.

Paper, cardboard, aluminium drink cans and other recyclables are collected for recycling as part of site waste segregation. Waste is transported to licenced facilities and waste tracking sheets recorded.

All contractors are responsible for the collection and removal of their own rubbish.

4.6 HAZARDOUS AND EXPLOSIVE MATERIALS MANAGEMENT

Hazardous materials are stored and used in accordance with relevant safety data sheets (SDS). SDS's are kept in a file inside the First Aid Room and are available from an online database on the company intranet.

Bulk explosives are approved for storage within an explosives compound at site.

All hazardous waste is appropriately disposed of by a fully accredited waste contractor and waste tracking certificates are supplied to DCPL.

4.6.1 Status of Hazardous Chemicals Notification

An "Acknowledgement of Notification of Hazardous Chemicals on Premises" (Acknowledgement Number NDG 036328) issued by SafeWork NSW is held by Duralie Coal Pty Ltd. This Acknowledgement addresses:

- Above-ground tanks (diesel)
- External magazine (detonators and boosters)
- Above-ground tank (oxidising liquid)
- Roofless bulk storage (ammonium nitrate)

4.7 OTHER INFRASTRUCTURE MANAGEMENT

4.7.1 Prescribed Dams - Dams Safety Committee

The Main Water Dam, Auxiliary Dam 1 and Auxiliary Dam 2 are all prescribed under the Dams Safety Act 1978.

Management plans for the prescribed dams have now been combined into single documents. The DCM Prescribed Dams Operation and Maintenance Manual was updated and approved by the DSC during 2017. The Prescribed Dams Safety Emergency Plan (DSEP) was updated in consultation with the SES and approved by the DSC during 2017.

Routine visual inspections of the prescribed dams are undertaken three (3) times per week. Monthly monitoring of piezometers terminating beneath the dam's clay core and within the clay core is also undertaken and water levels interpreted. Monuments located along the crests of the dams were surveyed for any indication of movement during the reporting period. No significant movement has been identified in any of the dam walls during the reporting period. Routine maintenance of vegetation on the dam walls has been undertaken.

The 5 yearly prescribed dam surveillance reports were scheduled and completed during November 2017. The surveillance reports didn't identify any significant issues with the management and maintenance of the structures. The surveillance reports have been endorsed by the Dam Safety Committee in their letter dated 14 December 2017.

DCPL is currently preparing plans for the decommissioning of the prescribed dams. AD1 was dewatered during the reporting period and AD2 is planned to be dewatered during the next reporting period. Further detail regarding the decommissioning of the prescribed dams is included in the mine closure planning program in Section 8.5.

5. ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

The Department of Planning & Environment (DPE) provided notification on 12 October 2017 that the Duralie Coal Annual Review 2016/2017 was generally in accordance with the project approval requirements. Actions to be addressed are listed in **Table 11**.

Table 11: DPE Action Items from 2016/2017 AR Review

Action	Due Date	Comments/status
The Department notes the sound power level monitoring was not undertaken during the reporting period as per PA08_0203 Schedule 3 Condition 7C and the Noise Management Plan. Provide action plan detailing measures to be implemented to comply with the approved Noise Management Plan regarding mobile plant noise monitoring.	9 December 2017	SCPL provided email advice to DPE dated 8 December 2018 stating: <i>"Mobile plant sound power level monitoring was completed during 6-7 December 2017 in accordance with the DCM Noise Management Plan. The results of the monitoring will be included in the next Duralie Annual Review."</i>

The Department of Resources & Geoscience (DRG) provided "Notice of Satisfactory Annual Review" on 27 February 2018 with no actions required.

6. ENVIRONMENTAL PERFORMANCE

6.1 REVIEW OF ENVIRONMENTAL PERFORMANCE

A brief review of environmental performance in relation to the Environment Protection Licence (EPL) 11701, together with NSW Project Approval conditions, is provided below. This performance is further discussed in the sections on environmental management activities and environmental monitoring.

6.1.1 EPA Environment Protection Licence 11701

- All monitoring has generally been carried out in accordance with licence conditions.
- Records of environmental monitoring activities have been kept.
- A record of pollution complaints has been maintained.
- Dust suppression measures are in place. Dust monitoring to date (dust deposition gauges, high volume (PM10) air samplers and a TEOM monitor) shows that current dust suppression systems have been effective and dust levels were below limits set by EPA (upon exclusion of non-dust contamination of dust deposition gauges).
- Quarterly noise compliance monitoring was undertaken in July 2017, October 2017, January 2018 and April 2018. The surveys determined that monitored mine operational noise at the time of the surveys complied with EPA noise level criteria at all monitored locations.
- No sediment dam spills occurred during the reporting period.
- A Pollution Incident Response Management Plan (PIRMP) was maintained and is available on the DCPL website
- An Annual Return for EPL 11701 was prepared
- No reportable environmental incidents occurred at the DCM during the reporting period.

6.1.2 Development Consent or Approval Conditions

Duralie Coal continues to operate in accordance with the existing PA 08_0203.

Development Consent conditions which were met during this reporting period are described in the following sections. These include administrative and reporting conditions, monitoring conditions, community engagement and rehabilitation. Environmental monitoring data was regularly reported as required by the development consent and associated environmental management plans (EMPs).

An Independent Environmental Audit of the Duralie Coal Mine was conducted during December 2017. Further detail is included on Section 10.

6.2 METEOROLOGICAL MONITORING

A meteorological station (i.e. weather station) is operated at the mine site as required by the Project Approval Conditions. The location of the meteorological station and the two inversion monitoring towers is shown on **Figure 2 (Appendix 1)**.

6.2.1 Rainfall

Table 12 provided below summarises the rainfall record obtained from the site Weather Station rain gauge. Graphical representation of the historical average and monthly recorded rainfall during the reporting period is provided in **Appendix 2**.

Table 12: Duralie Mine - Monthly Rainfall Records

MONTH	YEAR				STROUD DISTRICT
	2018 (to end reporting period)		2017		AVERAGE ²
	Monthly Total (mm)	No. of Rain Days/Month ¹	Monthly Total (mm)	No. of Rain Days/Month ¹	1889-2010
January	26.4	5	50.8	8	115.3
February	130.4	9	63.0	13	125.0
March	246.6	10	267.6	21	147.3
April	50.0	11	74.8	13	100.9
May	28.6	6	14.2	8	91.5
June	114.0	17	99.0	15	101.1
July			9.4	2	75.1
August			13.0	3	65.3
September			3.6	2	63.1
October			108.6	10	78.3
November			29.0	10	83.3
December			50.8	10	100.8
TOTAL	596.0	58	783.8	115	1147.0

- Notes:
1. No. of Rain Days/Month - the number of days in the month on which rain fell.
(When tipping bucket rain gauge data used, a "rain day" by definition requires a minimum recording of >0.25mm comprising dew, heavy fog or light rain (or a combination thereof).
 2. Average based on Stroud Post Office records until mine site weather station commissioned in 2002.

The 2017 calendar year rainfall total was significantly lower than the long-term district average with two of the twelve months in this period exceeding their respective long term average.

The rainfall total for the reporting period (July 2017 to June 2018) was 810.4 mm, significantly lower than the historical average.

6.2.2 Evaporation

Table 13 shows minimum, average and maximum evaporation rates for the reporting period. The graphical representation of the daily minimum, average and maximum evaporation rates recorded for each month during this review period is provided in **Appendix 2**.

Table 13: Monthly Minimum, Average and Maximum Evaporation Rates

MONTH	MINIMUM EVAPORATION RATE (mm/day)	AVERAGE EVAPORATION RATE (mm/day)	MAXIMUM EVAPORATION RATE (mm/day)
July 2017	0.3	3.7	1.7
August 2017	0.7	3.7	2.5
September 2017	1.7	7.7	4.1
October 2017	0.9	7.1	3.2
November 2017	0.7	5.1	3.3
December 2017	0.9	7.7	4.3
January 2018	1.3	7.5	4.9
February 2018	0.6	6.5	3.8
March 2018	0.8	4.6	3.0
April 2018	0.8	5.0	3.2
May 2018	0.9	3.5	1.8
June 2018	0.2	3.1	1.1

6.2.3 Wind Speed and Direction

Table 14 below indicates the monthly average and maximum wind speeds and dominant wind directions for the period July 2017 to June 2018, inclusive. The graphical representation of the daily average and maximum wind speeds recorded and monthly wind roses for each month during this period are provided in **Appendix 2**.

Table 14: Monthly Average and Maximum Wind Speeds and Dominant Wind Directions by Month

MONTH	AVERAGE WIND SPEED (k/hr)	MAXIMUM WIND SPEED RECORDED (k/hr)	DOMINANT WIND DIRECTIONS
July 2017	6.4	53.3	W
August 2017	9.0	52.3	W-WSW
September 2017	9.8	56.1	W
October 2017	8.7	51.8	ENE
November 2017	8.1	57.0	SE
December 2017	9.3	69.5	NE
January 2018	10.6	67.1	SSW & NE
February 2018	8.9	50.7	S-SSW & ENE
March 2018	7.3	34.1	SW-SE
April 2018	6.5	69.8	S-SW
May 2018	7.1	50.4	WSW
June 2018	7.2	48.1	SW-WSW

6.2.4 Temperature

Table 15 summarises monthly air temperatures. The graphical representation of the daily minimum, average and maximum atmospheric temperatures recorded for each month is provided in **Appendix 2**.

Table 15: Monthly Minimum, Average and Maximum Air Temperatures

MONTH	MINIMUM AIR TEMP RECORDED (deg C)	AVERAGE AIR TEMP (deg C)	MAXIMUM AIR TEMP RECORDED (deg C)
July 2017	0.2	11.1	22.7
August 2017	2.8	12.8	28.1
September 2017	2.0	17.2	36.0
October 2017	7.6	19.2	35.5
November 2017	8.9	18.8	31.1
December 2017	13.3	23.8	42.3
January 2018	10.3	24.6	42.4
February 2018	13.1	22.7	38.7
March 2018	12.9	22.0	36.6
April 2018	10.8	19.9	31.5
May 2018	4.3	14.3	26.1
June 2018	3.0	11.6	19.5

6.3 AIR QUALITY

6.3.1 Dust Control Procedures

DCM has an approved Air Quality and Greenhouse Gas Management Plan (AQMP) that establishes a dust management strategy which:

- Identifies air quality criteria;
- Outlines proactive and responsive dust management and control measures;
- Establishes dust management protocols;
- Formulates an air quality monitoring programme;
- Establishes stakeholder consultation protocols; and
- Details reporting and review requirements.

The following dust control procedures are used during mining operations to control dust emissions from wind erosion on exposed areas and dust generated from mining, handling and processing activities:

- Minimising topsoil stripping operations ahead of the pre-strip to minimise the area of exposed ground;
- Progressive rehabilitation including prompt reshaping, topsoiling and revegetation;
- Watering of haul roads and other trafficked areas;
- Watering dig faces prior to and during digging;
- Fitting drills with dust suppression equipment including aprons and sprays;
- Water sprays on the ROM dump hopper and transfer point between the ROM and train loading bins;
- Water sprays during train coal loading; and
- Modifying operations during adverse weather conditions.

A number of Pollution Reduction Programs (PRP) required under EPL11701 have previously been completed. These PRP's were removed from EPL 11701 by the EPA in the variation dated 8 November 2017.

6.3.2 Dust Monitoring and Criteria

DCPL monitors air quality (dust) surrounding the mine site by means of a network of nine (9) static dust fallout gauges, four (4) high volume PM₁₀ air samplers, one real time dust monitor (TEOM) and a meteorological monitoring station (i.e. weather station). The locations of these monitoring sites are shown on **Figure 2 (Appendix 1)**.

Monthly dust fallout levels are measured so that dust deposition rates in g/m²/month can be determined at each monitoring site. The EPA annual average limit for dust deposition is 4.0g/m²/month.

The high volume air samplers (HVAS) (PM₁₀) are located near company owned rural dwellings along Johnsons Creek Road ("Hattam" – located to the northeast of the mine, "Twin Houses" – located to the east of the mine and "High Noon" – located to the south of the mine). A HVAS unit is also located on private land along the Bucketts Way ("Edwards" – located west of the mine). Sampling occurs for a 24 hour period every 6 days in accordance with AS 2724.3. The EPA goal for air quality is an annual average limit of 30ug/m³/day and a National Environmental Protection Measure (NEPM) 24-hour average limit of 50ug/m³/day.

A Tapered Element Oscillating Microbalance (TEOM) analyser measuring PM₁₀ and PM_{2.5} is used to continuously measure particulate matter. Trigger levels are in place under the approved AQMP which also includes a dust management protocol to respond to elevated results. The real-time dust system provides a management tool to notify operations when particulate emissions have potential to exceed licence criteria triggering a hierarchy of management actions to mitigate potential impacts.

6.3.3 Review of Dust Monitoring Results

6.3.3.1 Dust Deposition Gauges

Table 16 shows the dust deposition results for nine (9) dust deposition gauges. Gauge D7 is located within the Village of Wards River. **Table 17** shows the annual average dust deposition results at the end of the reporting period (June 2018).

Table 16: Dust Deposition Gauge Results

	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18
D3	6.4 ^S	2.7	2.6 ^B	11.0 ^S	4.1 ^{V,I,S}	0.7	2.8 ^{I,B}	4.0	6.4 ^{V,I,S}	2.8	4.3 ^S	9.5 ^S
D4	1.7	0.7	3.4 ^{I,V}	1.3	2.7	0.6	1.6	**	0.5	0.6	10.6 ^S	0.5
D5	10.8	8.8 ^S	1.3	0.9	3.3 ^{I,B}	0.4	1.2	1.9	3.2	3.1	3.7	2.1
D7	1.4	1.1	0.8	0.8	0.2	0.3	0.3	1.5	1.2	1.0	0.5	1.0
D8	1.0	1.0	1.3	0.8	1.7	2.9	2.1	1.0	1.2	1.0	0.3	0.3
D9	1.5	1.2	1.4	0.9	1.1	1.2	0.8	0.5	0.8	0.7	1.0	1.1
D10	0.8	0.4	0.7	0.5	1.1	0.8	1.1	1.1	0.4	0.3	0.6	0.6
D12	0.7	0.6	1.4	1.0	1.2	0.9	1.4	0.7	1.0	1.2	1.0	0.4
D13	3.0 ^{I,B}	3.7 ^{I,B}	0.8	0.7	1.3	2.2 ^{I,B}	0.2	2.0	5.2 ^S	4.9 ^S	2.9	4.4 ^S

Notes/excluded results, Visual Description Guide:

D=Dirt: Subhedral to euhedral crystalline grains including fine sand, clay and other fine mineral particulates.

C=Coal: Black sharp angled grains with glossy conchoidal fractures or dull with cellular feature.

I=Insects: Whole insects e.g. spiders, ants, moths or outer parts of insects including wings, legs and exoskeletons.

S=Polysaccharide Slime: Slimy gelatinous material including decomposed soft body parts of insects and vegetation.

V=Vegetation: Plant debris and algae including trichomes, decomposed organic matter and particulates showing characteristic cellular structures.

B=Bird droppings: The most common contamination.

O=Other contaminants not included above.

** D4-broken bottle Feb18,

Dust levels recorded had an average value of 1.2 g/m²/month (contaminated results not counted). Elevated values were at times affected by various degrees of contamination from insects, bird droppings, vegetation (seeds/grasses) and algae. An elevated result at Gauge D5 in July 2017 was observed and was found not to be contaminated by bird droppings or vegetation. Consistently low HVAS results at the nearby Twin Houses site during the month and low results at all other dust gauges would support an outlying result conclusion. In addition, winds predominantly from the W-WSW for the

duration of the month and the location of the gauge would also support an outlying result. The results from D5 will continue to be analysed.

One sample at monitoring point D4 was not recorded during the month of February 2018 as the dust gauge was damaged when struck by a tractor undertaking slashing. No adverse effects could be expected based on low results from other dust deposition monitoring locations.

Table 17: Annual Average Dust Deposition Gauge Results

D3	D4	D5	D7	D8	D9	D10	D12	D13	EPA Limit
2.6	1.1	2.8	1.2	0.8	1.2	1.0	0.7	1.0	1.3

Results compared with the EPA annual average upper limit of 4 g/m²/month indicate no exceedances against criteria at the end of the reporting period. Graphical representation of dust gauge results and annual rolling averages are provided in **Appendix 3**.

Results of depositional dust monitoring were generally similar to previous reporting periods and are in concurrence with the Duralie Environmental Assessment (EA) (2010) which predicts the annual average criteria of 4 g/m²/month will not be exceeded at any receiver and that project only incremental increases in annual average dust deposition will not exceed the applicable 2 g/m²/month EPA criterion at any receiver.

6.3.3.2 High Volume Dust Samplers

Table 18 shows the PM₁₀ high volume air sampler (HVAS) monitoring results for the four HVAS in ug/m³/day (24 hours) for the monitoring sites during the reporting period.

Results show that all monitoring locations (in terms of monitored days) did not exceed the National Environmental Protection Measure (NEPM) of 50 ug/m³/day during the reporting period listed under Condition 19, Schedule 3 of the DEP Approval. Two exceptions were the mine owned "Hattam" property that exceeded the criteria on 20 December 2017 and the mine owned "Twin Houses" that exceeded the criteria on 20 March 2018. Bush fire smoke haze was observed in the vicinity of the "Hattam" HVAS in the week prior to the 20 December 2017 run date. Also, around the time of the 20 March 2018 run it was noted there were very hazy conditions in the valley following a southerly change and elevated results were not related to mining activities. Elevated results recorded across all HVAS on 20 March 2018.

Table 18: High Volume Air Sampler (PM₁₀) Results

Date	High Noon	Twin Houses	Hattam	Edwards
5-Jul-17	2	5	5	7
11-Jul-17	5	7	13	6
17-Jul-17	2	6	2	3
23-Jul-17	0	10	2	2
29-Jul-17	2	10	4	3
4-Aug-17	2	7	3	1
10-Aug-17	5	8	4	1
16-Aug-17	8	13	15	8
22-Aug-17	11	16	15	17
28-Aug-17	4	7	4	7
3-Sep-17	9	12	10	9
9-Sep-17	6	9	13	7
15-Sep-17	7	2	7	5
21-Sep-17	6	14	11	10
27-Sep-17	23	31	32	8
3-Oct-17	8	9	10	15
9-Oct-17	6	6	8	4
15-Oct-17	4	5	6	7

Date	High Noon	Twin Houses	Hattam	Edwards
21-Oct-17	6	9	6	8
27-Oct-17	3	4	5	5
2-Nov-17	11	15	16	11
8-Nov-17	6	6	6	7
14-Nov-17	5	8	15	7
20-Nov-17	7	8	14	8
26-Nov-17	3	4	4	4
2-Dec-17	3	4	6	3
8-Dec-17	23	31	40	26
14-Dec-17	13	15	15	14
20-Dec-17	19	21	59	22
26-Dec-17	4	5	2	3
1-Jan-18	12	14	12	13
7-Jan-18	11	13	14	12
13-Jan-18	1	15	17	15
19-Jan-18	20	12	10	11
25-Jan-18	43	10	9	7
31-Jan-18	4	11	10	11
6-Feb-18	9	5	5	5
12-Feb-18	7	23	23	24
18-Feb-18	15	17	15	16
24-Feb-18	6	4	3	5
2-Mar-18	13	21	15	16
8-Mar-18	4	11	5	4
14-Mar-18	5	7	3	6
20-Mar-18	41	51	45	45
26-Mar-18	16	31	15	14
1-Apr-18	10	12	13	23
7-Apr-18	8	10	6	8
13-Apr-18	7	18	14	4
19-Apr-18	6	11	11	10
25-Apr-18	4	3	4	5
1-May-18	3	3	4	4
7-May-18	2	3	1	4
13-May-18	1	3	3	3
19-May-18	3	7	4	7
25-May-18	8	20	11	14
31-May-18	4	7	7	5
6-Jun-18	2	2	3	2
12-Jun-18	1	4	2	1
18-Jun-18	1	1	1	1
24-Jun-18	1	3	3	2
30-Jun-18	4	6	5	7
Annual Rolling Average	8.0	10.9	10.6	8.9

Graphical representation of the annual rolling average for the four HVAS including PM₁₀ and TSP during the reporting period is provided in **Appendix 3**. The HVAS rolling averages remained generally steady throughout the reporting period. The rolling average at the end of the reporting period for “High Noon” was 8.0, “Twin Houses” was 10.9, “Hattam” was 10.6 and Edwards was 8.9 ug/m³/day. Thus, annual averages for all sampling locations were below the 30 ug/m³/day EPA limit.

Results of HVAS monitoring are in concurrence with the Duralie Environmental Assessment (EA) (2010) which predicts the annual average PM₁₀ criteria of 30 µg/m³ will not be exceeded at any receiver and that project only 24 hour PM₁₀ concentrations will not be above the 50 µg/m³ EPA

assessment criteria at any privately owned receiver with the exception of “Hattam” which is mine owned and in close proximity to the mining operations. “Hattam” exceeded the $50 \mu\text{g}/\text{m}^3$ 24 hour limit on one occasion during the reporting period (20 December 2017). Bush fire smoke haze was observed in the vicinity of the “Hattam” HVAS in the week prior to the 20 December 2017 run date. “Twin Houses” exceeded the $50 \mu\text{g}/\text{m}^3$ 24 hour limit on one occasion during the reporting period (20 March 2018). Twin Houses is mine owned and the results was due to ambient weather conditions. The HVAS annual rolling averages remained low and fluctuations generally reflect changes in meteorological conditions throughout the year, i.e. rainfall and wind.

Concentrations of TSP are calculated, based on the results of the PM_{10} HVAS and the assumption that 40% of TSP is PM_{10} , as per the relationship obtained from co-located TSP and PM_{10} monitors operated in the Hunter Valley (NSW Minerals Council, 2000) as per the approved AGMP. The TSP annual rolling average for the four HVAS are shown in **Appendix 3**. The TSP rolling average at the end of the reporting period for “High Noon” was 19.9, “Twin Houses” was 27.3, “Hattam” was 26.4 and Edwards was $22.2 \mu\text{g}/\text{m}^3/\text{day}$. Thus, annual averages for all sampling locations were below the $90 \mu\text{g}/\text{m}^3/\text{day}$ EPA limit.

6.3.3.3 TEOM (PM_{10})

A Tapered Element Oscillating Microbalance analyser (TEOM) which measures PM_{10} on a real-time continuous basis is utilised as a management tool for operations to guide proactive and reactive mitigation measures.

24 hour average results for the reporting period and graphical representation of the running/cumulative average of PM_{10} results are provided in **Appendix 3**. The annual average from 1 July 2017 to 30 June 2018 is $10.9 \mu\text{g}/\text{m}^3$ for PM_{10} . The TEOM results are generally consistent with those measured by the HVAS units.

A register was maintained recording any trigger alarms from the TEOM system and the response implemented. All alarms during the reporting period resulted from either external events such as bushfires and strong winds or system calibration and maintenance. A real-time dust monitoring response register for the reporting period is provided in **Appendix 3**.

6.3.4 Complaints

One (1) air quality related complaint was received during the reporting period. The air quality complaint received was related to odour. A detailed complaints list is provided in **Appendix 7**. All complaints are responded to promptly and details of the complaint responses and outcomes are provided in **Appendix 7**.

6.4 BIOREMEDIATION

DCM operates an onsite bioremediation area for hydrocarbon contaminated soil where biological degradation of hydrocarbons is used to reduce the hydrocarbon concentration in the soil to an acceptable level. The management of hydrocarbon contaminated soils is detailed in the Duralie Coal Pollution Incident Response Management Plan. A logbook is kept which covers deposition, maintenance and disposal of materials from the bioremediation area. Following testing of the soils placed in the bioremediation facility soils with suitably low hydrocarbon levels are removed and disposed in the pit.

No upgrade of the bioremediation facility was undertaken during the reporting period and only minor volumes of contaminated material have been deposited at the current facility or removed directly from site by a licenced waste contractor.

6.5 BIODIVERSITY

The Duralie Coal Mine Annual Biodiversity Report 2018 provides a review of the effectiveness of measures in the Biodiversity Management Plan (BMP) for the annual year ending 30 June 2018 in accordance with Section 7.2 of the BMP. This report covers biodiversity management activities across both the Mining Lease areas and the Offset area. In accordance with Condition 33, Schedule 3 of the NSW Project Approval, DCM is required to implement the Offset strategy and achieve the broad completion criteria to the satisfaction of the Secretary of the DP&E.

In accordance with the BMP, the Duralie Coal Mine Annual Biodiversity Report 2018 is included in **Appendix 8**. A brief summary of main findings and conclusions are provided in the subsections below.

6.5.1 Vegetation Clearance Report

Vegetation clearance is undertaken in accordance with the BMP (Section 5.4 Vegetation Clearance Plan). Prior to any clearance operations a Clearing Plan Checklist is completed, and vegetation pre-clearance surveys are undertaken. During 2017/2018 reporting period, no vegetation clearance was undertaken. Vegetation clearance for the Duralie Extension Project has now been completed.

Information obtained during vegetation clearance (habitat features cleared and any fauna observed) is used to determine the requirements for nest box replacement in the biodiversity offset areas (refer Section 8).

6.5.2 Nest Box Program

AMBS Ecology & Heritage (AMBS) was commissioned to implement the nest box programme as described in the BMP Section 5.4.2 and Section 6.4.

The nest box program currently involves:

- 18 nest boxes targeting the Squirrel Glider (*Petaurus norfolcensis*), installed between 4 February 2013 and 8 February 2013;
- 106 nest boxes targeting a variety of hollow-dependent species, installed between 21 August 2013 and 30 August 2013;
- 45 nest boxes targeting a variety of hollow-dependent species, installed between 9 September 2014 and 12 September 2014; and
- 42 nest boxes targeting a variety of hollow-dependent species, installed between 19 September 2016 and 23 September 2016.

Results of 2016 - 2017 Nest Box Programme for the Duralie Offset Area Report (AMBS, June 2018) are summarised below;

Squirrel Glider nest boxes installed during February 2013:

*During the monitoring of the Squirrel Glider nest boxes, the target species was recorded within one nest box (one dead juvenile). Other vertebrate species recorded included the Sugar Glider (*Petaurus breviceps*) and signs of the Brush-tailed Phascogale (*Phascogale tapoatafa*). All 18 Squirrel Glider nest boxes have been occupied or showed signs of previous occupancy at some stage since their installation.*

Nest boxes installed during August 2013:

Eighty of the 106 nest boxes installed during August 2013 were occupied or shown signs of occupation at some stage since their installation. This is an occupancy rate of approximately 76%, 48 months after installation. Five species were recorded in the nest boxes or shown signs of previous occupation, during the period relevant to this report. Signs of the Brush-tailed Phascogale were higher than any previous surveys for the Nest Box Programme.

Nest boxes installed during September 2014:

Forty-one of the 45 additional nest boxes installed in September 2014 were occupied or shown signs of occupation at some stage since their installation. This is an occupancy rate of approximately 91%, 36 months after installation. Four species were recorded in the nest boxes or shown signs of previous occupation, during the period relevant to this report. One threatened species, the Masked Owl (*Tyto novaehollandiae*), has not previously been recorded within the nest boxes during the Nest Box Programme.

Nest boxes installed during September 2016:

Thirty-one of the 41 additional nest boxes installed in September 2016 were occupied or shown signs of occupation at some stage since their installation. This is an occupancy rate of approximately 61%, 12 months after installation. Thirteen species were recorded in the nest boxes or shown signs of previous occupation, during the period relevant to this report. Four different microbat species were recorded in a new nest box design, the highest since the commencement of the Nest Box Programme. One microbat species, the Free-tailed Bat (*Mormopterus* sp.) has not previously been recorded in a nest box.

Twenty-two vertebrate species have now been recorded within nest boxes during the Nest Box Programme. This includes eleven species of mammal (Brown Antechinus, Bush Rat [probable], Brush-tailed Phascogale, Common Brushtail Possum, Common Ringtail Possum, Feathertail Glider, Gould's Wattled Bat, Lesser Long-eared Bat, Gould's Long-eared Bat, a Free-tailed Bat, Sugar Glider and Squirrel Glider), five species of bird (Australian King-Parrot, Eastern Rosella, Australian Owllet-nightjar, Australian Wood Duck, White-throated Treecreeper, Masked Owl), one frog species (Peron's Tree Frog) and three species of reptile (Lace Monitor, Common Tree Snake and Diamond/Carpet Python).

The majority of nest boxes were in good condition and no maintenance was required. Two nest boxes are in poor condition and will require repair or replacement during the next monitoring survey. Signs of the European Honey Bee (*Apis mellifera*) were recorded at nine nest boxes and for eight of these, no bees were present at the time of the survey. The entrance hole of the nest box with bees present was blocked with tape. Management of this nest box was successful with no live bees observed 3 months later.

6.5.3 Weed Control

Follow-up weed treatment of all remnant enhancement and regrowth management VMUs recommenced in October 2017 and continued through to April 2018. Additional weed management activities within the Mining Lease areas recommenced in September 2017. The key species targeted included blackberry, lantana, privet, wild tobacco and Giant Parramatta grass. This is the fifth round of weed control activities in the offset areas. Re-vegetation works continued during Spring 2017 with pre-cultivation spraying undertaken in preparation for the re-vegetation works.

During 2017/2018, the removal of privet and wild tobacco adjacent to Mammy Johnsons River in the Biodiversity Offset areas continued using mechanical removal (slashing), and chemical spraying in accordance with previous advice from the MidCoast Council (MCC) Weeds Officer.

Success of weed management has been monitored and documented in the Duralie Coal Mine Biodiversity Offsets Monitoring of Landscape Function and Vegetation Structure, October 2017 (Appendix E).

Monitoring of the VMUs including the effectiveness of weed control will continue to be undertaken in conjunction with the Landscape Function Analysis (LFA) and vegetation monitoring. The 2017 monitoring report indicates that:

The number and density of weed species was generally very low with only Lantana camara (Lantana) being wide spread within the VMUs themselves. Ligustrum sinense (Small-leaved Privet) was recorded in riparian areas. Other weeds observed along access tracks included Ageratina adenophora (Crofton Weed), Andropogon virginicus (Whisky Grass) and Sporobolus fertilis (Giant Parramatta Grass).

6.5.4 Feral Animal Control

In accordance with the BMP Section 5.10 a follow-up feral animal survey was undertaken by AMBS Ecology & Heritage (AMBS) during April 2017 to monitor the success of control programs and determine priorities for ongoing control measures. A summary of the survey results is included in the Annual Biodiversity Report 2018 (**Appendix 8**).

During the reporting period DCPL engaged MDP Vertebrate Pest Management to implement a wild dog and fox control program. The program was undertaken between September 2017 to October 2017 and covered the Biodiversity Offset area, the Duralie and Stratford Mining Leases and surrounding mine owned properties. The program involved a combination of trapping and shooting. A total of 11 dogs and foxes were caught during the program. This program continued the work undertaken during 2016 where 41 dogs and foxes were caught.

6.5.5 Controlling Access and Managing Grazing

During the reporting period contractors were engaged to undertake maintenance activities on access tracks, culverts, gates and fences. The works included slashing of tracks, firebreaks and repairs to damaged gates and culverts. Livestock continue to be excluded from the Biodiversity Offset areas with the exception of 'crash grazing' programs in preparation for revegetation activities following a field assessment by a qualified consultant. However, during inspections of the Biodiversity Offset area, cattle were identified to have entered through damaged fencing on the eastern and northern boundaries. The cattle were removed and maintenance work was undertaken to repair the fencing.

6.5.6 Bushfire Management

To assist with bushfire management, access tracks and firebreaks have been constructed and maintained as shown in the BMP Figure 9.

DCPL engaged the NSW Rural Fire Service (RFS) in August 2015 to assist in the development of a burn plan for hazard reduction burning in select areas of the Biodiversity Offset areas and surrounding mine owned properties. The burn plan considered areas where fire was to be excluded for bush regeneration in the Biodiversity Offset areas and areas where burning was required for hazard reduction prior to revegetation activities. Following delays in 2015 and 2016, a hazard reduction burn was undertaken by the RFS along Johnsons Creek Road on 13 August 2017.

Continued discussions have been held with the RFS to conduct fire management activities and any such activities will be assessed and implemented to ensure the most appropriate period for ecological burn activities whilst also giving due consideration to personnel and asset safety.

6.5.7 Seed Collection, Propagation and Habitat Enhancement

Where possible, seed required for revegetation activities has been collected from within the Biodiversity Offset area and surrounds. Specific tree and shrub species which have not been available for collection have been sourced through external third-party suppliers. Further seed collection may be undertaken if found necessary to meet the completion criteria of the BMP offset revegetation and mine site rehabilitation.

Kleinfelder and Cumberland Plain Seed have been engaged to assist in the propagation of native plant species with tube-stock grown under controlled nursery conditions and delivered to site as required for revegetation works.

6.5.8 Revegetation Management

Revegetation works in the Duralie biodiversity offset have been undertaken progressively since the implementation of the BMP.

Revegetation works in VMUs AF, AE, AA and Z were undertaken during December 2016 and included ground preparation and direct seeding of approximately 80 hectares. Due to the inability to undertake controlled burning, slashing was undertaken as an alternative option prior to direct and broadcast seeding.

Tubestock was propagated during Summer 2016/2017 in preparation for Autumn planting in 2017. VMUs Y, AD and S, (approximately 40 hectares), located on alluvial flats near Mammy Johnsons River were prepared for planting by slashing, spraying for weeds and ripping. This was followed by the planting of approximately 7,200 tube-stock in April 2017. The results of the re-vegetation activities are reported in the DCM Biodiversity Offsets Revegetation Program Report Spring 2016 - Autumn 2017.

Following the hazard reduction burning in August 2017, revegetation works in VMUs Z, AB and AC were undertaken. In September 2017, direct seeding of approximately 52 hectares was completed, followed by harrowing.

Tube-stock planting of VMUs F, V, W and X was proposed for Autumn 2018 including approximately 16,000 plants over 61 hectares. The native tree seed was propagated over the Summer of 2017/2018 by Cumberland Plain Seeds. However, due to the slower than expected establishment of the tubestock, planting has been postponed until September 2018.

6.5.9 Biodiversity Offset Monitoring

As described in the Section 7 of the BMP an annual report reviewing DCPL's environmental performance and progress against the requirements of the BMP including monitoring and reporting is prepared annually and appended to this Duralie Coal Mine Annual Review. The annual report, reports on monitoring for:

- Effectiveness of revegetation in the offset area VMU's;
- Usage of the offset by fauna;
- Effectiveness of weed control;
- Effectiveness of feral animal control;
- Nest box monitoring program.

Initial vegetation surveys were undertaken in 2013 and 2014. The annual vegetation and landscape function monitoring was repeated in January 2017 and the results are provided in the *DCM Biodiversity Offset Monitoring of Landscape Function and Vegetation Structure 2017*. A summary of the survey results is included in the Annual Biodiversity Report 2018 (**Appendix 8**). The next round of monitoring is scheduled for early 2019.

Monitoring of fauna usage within the Biodiversity Offset areas is conducted every three years to assess the performance of the Biodiversity Offsets in providing habitat for a range of vertebrate fauna. The surveys include an assessment of habitat complexity, species richness and abundance. AMBS was engaged to undertake fauna monitoring within the Biodiversity Offset areas and mine rehabilitation areas during February 2018. The results are provided in the DCM Fauna Surveys of the Offset and Mine Rehabilitation Areas, February 2018. A summary of the survey results is included in the Annual Biodiversity Report 2018 (**Appendix 8**).

6.5.10 Complaints

No complaints related to the management of biodiversity were received during the reporting period. A full detailed complaints list is provided in **Appendix 7**.

6.6 GIANT BARRED FROG MANAGEMENT

Management and monitoring of the Giant Barred Frog population is conducted in accordance with the approved Duralie Coal Mine Giant Barred Frog Management Plan (GBFMP). The GBF monitoring has been undertaken to establish baseline data of the frog population and monitor whether a greater than negligible impact on the Giant Barred Frog population has occurred as a result of rainfall runoff from the mine's irrigation areas. Monitoring results are used to assess the Project against performance measures detailed in the GBFMP.

Annual monitoring and reporting on the implementation of the Giant Barred Frog Management Plan was undertaken between 2011 and 2016.

During a previous reporting period (2015/2016), the GBFMP was revised with proposed changes to the GBF monitoring program. The GBFMP was approved by DP&E on 17 December 2015 and by the Commonwealth Department of the Environment (DotE), on 4 January 2016 and is available on the Duralie Coal website.

As stated in Section 7 of the GBFMP the timing and frequency of monitoring will be triggered upon commencement of irrigation within the Duralie Extension Project irrigation areas. To date, the DCM has yet to begin irrigation activities associated with the Duralie Extension Project and as such, the Project has not presented a potential impact on the Giant Barred Frog population.

No monitoring was required during 2017/18 in accordance with the GBFMP. An assessment of any future irrigation activities within the approved irrigation areas will be undertaken on an annual basis to inform ongoing survey effort.

6.7 BLASTING

6.7.1 Blast Criteria and Control Procedures

Blasting is conducted in accordance with conditions 8-15 of Schedule 3 of the Project Approval 08_0203 and respective EPL conditions and the approved Blast Management Plan (BLMP).

Blast monitors are located on the:

- Schultz Property (Bucketts Way, south west of mine);
- Moylan Property (West);
- Fisher-Webster Property (North); and
- Former Weismantels Inn (West).

The location of blast monitoring units are shown on **Figure 2 (Appendix 1)**.

EPL condition L5 state that overpressure caused by blasting at monitored locations may exceed 115 dB(L) for no more than 5% of blasts during the reporting period and must not exceed 120 dB(L) at any time. Similarly, ground vibration at monitored locations caused by blasting may exceed a peak particle velocity of 5 mm/s for no more than 5% of blasts during the reporting period and not exceed 10 mm/s.

In accordance with Condition 13(b) of the Project Approval, a dedicated blasting hotline is available to provide current scheduled blasting times for the DCM. Persons living within two (2) kilometres of an active or approved operational area may also request advice of scheduled blasting activities.

Blasting activities are designed and managed in accordance with the BLMP.

6.7.2 Review of Blast Monitoring Results

Airblast overpressure and ground vibration results for all blasts undertaken during the reporting period are provided in **Appendix 5** and summarised below.

- **Overpressure Results**

During the reporting period (period ending 30 June 2018) there were no blasts events which exceeded the overpressure criteria limit of 120 dBL. There were also no blasts where overpressure exceeded 115 dBL during the reporting period.

- **Vibration Results**

During the reporting period (period ending 30 June 2018) there were no blasts where ground vibration exceeded 5 mm/s.

The 2010 EA provides predictions on blast emissions for various residential receivers. The blasting predictions indicate that blasting emissions would generally comply with airblast criterion of 115 dBL and ground vibration of 5 mm/s at nearby private receivers. During the reporting period, predicted blast emissions were generally consistent with measured values.

- **Fume Results**

During the reporting period, low level fume was recorded from one blast with a fume rating of 2A as recorded in accordance with the Blast Fume Management Procedure. No fume was recorded to exit the Mining Lease boundary from any blasts.

6.7.3 Building Condition Inspections

Building condition surveys of several privately owned dwellings located in the vicinity (within 2kms) of the mine are routinely carried out by an independent structural engineer. In addition, surveys may be commissioned following a request by a landowner concerned about dwelling damage which they consider may be related to blasting activity (Condition 11, Schedule 3).

During the reporting period, no building inspections of private residences were undertaken. No requests were received from any landowners to undertake a building inspection or to update a previous inspection report.

Former Weismantel's Inn is a heritage listed building owned by DCPL. An inspection of the Former Weismantel's Inn was undertaken in October 2017 and reported there is no evidence that the former Weismantel Inn building has been affected by blast-induced ground vibrations.

6.7.4 Complaints

No blast related complaints were received during the reporting period. A full detailed complaints list is provided in **Appendix 7**.

6.8 NOISE

6.8.1 Noise Criteria and Control Procedures

Noise emissions from the DCM are managed in accordance with the criteria and procedures described in the Noise Management Plan (NMP). The noise criteria are specified in PA08_0203 and EPL 11701. The NMP was revised and updated during the reporting period to reflect the ongoing monitoring requirements at times when no operations are occurring at the Duralie mine.

DCPL implements measures to ensure noise from the DCM is managed to approved levels, through a combination of the following:

- ensuring best management practices are implemented and reviewed;
- implementing noise controls to reduce noise from the source and attenuate noise transmission; and
- if necessary, implementing measures to control noise at receivers following a review of monitoring data.

The noise monitoring program includes both attended noise surveys and real-time noise monitoring. DCPL undertakes quarterly attended noise monitoring surveys in accordance with the NMP in order to determine the status of compliance with noise limits. Four (4) attended noise surveys were conducted during the reporting period. These surveys were conducted during July 2017, October 2017, January 2018 and April 2018.

A Sentinex real-time noise (RTN) monitor provides a management tool for operations to measure mine contribution noise emissions and implement management controls as outlined under the approved NMP.

The noise monitoring program also includes rail noise monitoring and mobile plant monitoring. The location of noise monitoring sites are shown on **Figure 2 (Appendix 1)**.

6.8.2 Review of Noise Monitoring Results

The summary results of the attended noise surveys undertaken during the reporting period are provided in **Tables 19 to 26**. Noise monitoring locations are shown on **Figure 2 (Appendix 1)**. The full Noise Survey Reports are available at the Duralie Coal website (www.duraliecoal.com.au).

Note that the noise criteria do not apply on sites which are Yancoal owned or if there is a written agreement between Yancoal and the landowner (refer to footnotes).

• July 2017 Survey

Table 19: Noise Performance Assessment – Operations – July 2017 Survey

Location	Estimated DCM LAeq(15minute) Contribution dBA			Noise Criteria LAeq(15minute) dBA			Compliance		
	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night
NM1 Woodley	I/A	I/A	I/A	35	35	35	Yes	Yes	Yes
NM2 Zulumovski Nth ¹	28	<25	<25	35	35	35	Yes	Yes	Yes
NM4 Fisher-Webster	I/A	20	<20	35	35	37	Yes	Yes	Yes
NM5 Moylan	I/A	23	25	35	35	35	Yes	Yes	Yes
WR1 Ward Street- Wards River Village	I/A	<20	26	35	35	35	Yes	Yes	Yes

I/A = Inaudible

¹. Yancoal owned property

Table 20: Performance Assessment – Sleep Disturbance – July 2017 Survey

Location	DCM LA1(1minute) Contribution	Noise Criteria LA1(1minute)	Compliance
NM1 Woodley	I/A	45	Yes
NM2 Zulumovski Nth ¹	29	45	Yes
NM4 Fisher-Webster	23	45	Yes
NM5 Moylan	29	45	Yes
WR1 Ward Street-Wards River Village	34	45	N/A

I/A = Inaudible

¹.Yancoal owned property

Compliance with the relevant noise criteria was achieved at all noise monitoring locations during the day, evening and night periods during the July 2017 surveys.

Based on the measured DCM noise contribution, compliance with the relevant sleep disturbance noise criteria was achieved at all noise monitoring locations during the night-time noise monitoring period.

- October 2017 Survey**

Table 21: Noise Performance Assessment – Operations – October 2017 Survey

Location	Estimated DCM LAeq(15minute) Contribution dBA			Noise Criteria LAeq(15minute) dBA			Compliance		
	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night
NM1 Woodley	I/A	26	27	35	35	35	Yes	Yes	Yes
NM2 Zulumovski Nth ¹	I/A	<28	I/A	35	35	35	Yes	Yes	Yes
NM4 Fisher-Webster	I/A	I/A	I/A	35	35	37	Yes	Yes	Yes
NM5 Moylan	I/A	30	<20	35	35	35	Yes	Yes	Yes
WR1 Ward Street- Wards River Village	I/A	I/A	I/A	35	35	35	Yes	Yes	Yes

I/A = Inaudible

¹.Yancoal owned property**Table 22: Performance Assessment – Sleep Disturbance – October 2017 Survey**

Location	DCM LA1(1minute) Contribution	Noise Criteria LA1(1minute)	Compliance
NM1 Woodley	31	45	Yes
NM2 Zulumovski Nth ¹	I/A	45	Yes
NM4 Fisher-Webster	I/A	45	Yes
NM5 Moylan	23	45	Yes
WR1 Ward Street-Wards River Village	I/A	45	Yes

I/A = Inaudible

¹.Yancoal owned property

Compliance with the relevant noise criteria was achieved at all noise monitoring locations during the day, evening and night periods during the October 2017 surveys.

Based on the measured DCM noise contribution, compliance with the relevant sleep disturbance noise criteria was achieved at all noise monitoring locations during the night-time noise monitoring period.

- January 2018 Survey

Table 23: Noise Performance Assessment – Operations – January 2018 Survey

Location	Estimated DCM LAeq(15minute) Contribution dBA			Noise Criteria LAeq(15minute) dBA			Compliance		
	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night
NM1 Woodley	I/A	I/A	I/A	35	35	35	Yes	Yes	Yes
NM2 Zulumovski Nth ¹	I/A	I/A	I/A	35	35	35	Yes	Yes	Yes
NM4 Fisher-Webster	I/A	I/A	I/A	35	35	37	Yes	Yes	Yes
NM5 Moylan	I/A	26	<25	35	35	35	Yes	Yes	Yes
WR1 Ward Street- Wards River Village	I/A	I/A	I/A	35	35	35	Yes	Yes	Yes

I/A = Inaudible

¹.Yancoal owned property**Table 24: Performance Assessment – Sleep Disturbance – January 2018 Survey**

Location	DCM LA1(1minute) Contribution	Noise Criteria LA1(1minute)	Compliance
NM1 Woodley	I/A	45	Yes
NM2 Zulumovski Nth ¹	I/A	45	Yes
NM4 Fisher-Webster	I/A	45	Yes
NM5 Moylan	30	45	Yes
WR1 Ward Street-Wards River Village	I/A	45	Yes

I/A = Inaudible

¹.Yancoal owned property

Compliance with the relevant noise criteria was achieved at all noise monitoring locations during the day, evening and night periods during the January 2018 surveys.

Based on the measured DCM noise contribution, compliance with the relevant sleep disturbance noise criteria was achieved at all noise monitoring locations during the night-time noise monitoring period.

- April 2018 Survey

Table 25: Noise Performance Assessment – Operations – April 2018 Survey

Location	Estimated DCM LAeq(15minute) Contribution dBA			Noise Criteria LAeq(15minute) dBA			Compliance		
	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night
NM1 Woodley	<20	23	22	35	35	35	Yes	Yes	Yes
NM2 Zulumovski Nth ¹	I/A	28	<20	35	35	35	Yes	Yes	Yes
NM4 Fisher-Webster	I/A	-	<20	35	35	37	Yes	Yes	Yes
NM5 Moylan	I/A	-	25	35	35	35	Yes	Yes	Yes
WR1 Ward Street- Wards River Village	I/A	I/A	I/A	35	35	35	Yes	Yes	Yes

I/A = Inaudible

¹.Yancoal owned property

- No evening measurements conducted at NM4 & NM5 due to lightning storm

Table 26: Performance Assessment – Sleep Disturbance - April 2018 Survey

Location	DCM LA1(1minute) Contribution	Noise Criteria LA1(1minute)	Compliance
NM1 Woodley	33	45	Yes
NM2 Zulumovski Nth ¹	<20	45	Yes
NM4 Fisher-Webster	<20	45	Yes
NM5 Moylan	28	45	Yes
WR1 Ward Street-Wards River Village	I/A	45	Yes

I/A = Inaudible

¹.Yancoal owned property

Compliance with the relevant noise criteria was achieved at all noise monitoring locations during the day, evening and night periods during the April 2018 surveys.

Based on the measured DCM noise contribution, compliance with the relevant sleep disturbance noise criteria was achieved at all noise monitoring locations during the night-time noise monitoring period.

The 2010 EA and 2014 EA provide predictions on mine contributed noise emissions for various operational years. Year 5 (2015) was predicted as the maximum operational noise levels for the Modification Project with reduced operational noise from 2016 to 2019. In terms of the four monitoring locations (“Woodley”, “Zulumovski”, “Moylan” and “Fisher-Webster”) predicted mine contributed noise emissions were consistent with measured values for all locations factoring in the current fleet operating at the DCM.

6.8.3 Rail Noise Monitoring

The NMP requires that rail noise monitoring is undertaken on a quarterly basis at existing Wards River and Craven locations. Rail noise monitoring is reported against rail noise criteria described in Section 4 of the NMP and is undertaken for general information purposes only (i.e. they are not DCM compliance requirements). Rail operations aim to progressively reduce noise levels to the goals of 65dB(A)Leq, (daytime from 7am – 10pm), 60dB(A)Leq (night-time from 10pm – 7am) and 85dB(A) (24hr) max pass-by noise, at one metre from the façade of affected residential properties. Additionally, Schedule 3 Condition 4(e) of PA 08_0203 includes a notification requirement for affected residents where the maximum rail pass-by noise exceeds 85dB(A).

Rail noise monitoring was conducted during the July 2017, October 2017, January 2018 and April 2018 Noise Surveys when shuttle trains were operating. Rail Noise Survey results are included in the Noise Survey reports which are available at the Duralie Coal website (www.duraliecoal.com.au). Attended noise measurements were conducted at all three locations, TN1 (Craven), TN2 (Wards River Village North) and TN3 (Wards River Village South).

During the July 2017, October 2017, January 2018 and April 2018 surveys, maximum Duralie Shuttle rail pass-by noise levels were below 85dBA at all receiver locations, excluding the sounding of horns on approach to level crossings. Notifications requirements in accordance with the NMP relate to the L_{Amax} levels and were deemed to be compliant for the annual reporting period.

6.8.4 Real Time Noise Monitoring Results

A real-time noise monitoring response protocol is described in the NMP Section 7.3.5. Real-time monitoring is used as a management tool to assist DCPL to take proactive management actions and implement additional noise mitigation measures to avoid potential non-compliances. Noise investigation triggers have been established which send alarms when noise emissions are approaching levels which may exceed the noise criteria at privately-owned receivers. Details of any RTN alarms and the operational responses implemented by DCPL are recorded in the RTN Response Register.

In general, alarms during the reporting period related to abnormal meteorological conditions such as wind and rain or other ambient noise sources such as vehicle traffic, birds and insects. Additionally, several of the alarms were received at times when no operations were occurring, i.e. weekends.

To address any noise alarms regardless of inversion presence, DCM continue to implement the management measures described in the NMP Section 6. Additionally, DCM implement operational management measures in accordance with the real-time noise monitoring response protocol described in the NMP Section 7.3.5.

During the reporting period weekend operations were ceased at the DCM. Additionally, in October 2017 DCM changed to a two-shift roster with no work between the hours of 12:30 am and 6:30am. During the next reporting period there is no planned evening or night-time operations at the DCM.

6.8.5 Mobile Plant Noise Assessments

The DCM fleet of mobile plant including haul trucks, excavators, dozers, graders and other items are assessed annually for sound power levels (SWL). SWL's are compared to the target SWL's referred to in the 2010 EA and 2014 EA and are also compared to historical results to track performance over time. Availability of mobile plant for noise testing is subject to production requirements and servicing/maintenance/breakdowns.

Noise assessments of mobile plant and equipment occurred in December 2017. In general the mobile fleet SWL's were comparable to the levels reported in the 2010 and 2014 EA's. The following conclusion has been made based on the results of the on-site SWL survey conducted at Duralie Coal Mine:

- The measured Liebherr R994B excavator (ID: EX02) comply with the A-weighted and Z-weighted static and dynamic target SWLs.
- All measured CAT D10T and CAT D11T dozers have achieved the A-weighted static target SWLs. Three CAT D10T (ID: 201, 202 and 206) and one CAT D11T (ID: 208) failed to comply with the Z-weighted static target SWLs.
- All measured CAT D10T and CAT D11T dozers have achieved the A-weighted and Z-weighted dynamic target SWLs when operating in 1st gear forward and reverse. Four CAT D10T dozers (ID: 201, 202, 206 and 207) exceeded the A-weighted and Z-weighted dynamic target SWL by up to 5 dB and 3 dB for their 2nd gear forward and reverse operations. The CAT D11T dozer (ID: 208) exceeded the Z-weighted dynamic target SWL by 1 dB for the 2nd gear reverse operation. These exceedances have been identified from the on-site SWL surveys as being caused by engine noise and track slap noise when travelling.
- Four CAT 789C (ID: 101, 102, 103 and 104) haul trucks exceeded the A-weighted static target SWLs by 1 dB, all the measured CAT 785C and CAT 789C haul trucks comply with the dynamic A-weighted and Z-weighted target SWLs.
- The Komatsu WA900 front-end-loader (ID: 401) exceeded the A-weighted static and dynamic target SWLs by 7 dB and 5 dB, respectively, and exceeded the Z-weighted static and dynamic target SWLs by 4 dB and 2 dB, respectively. It has been noted that the target SWL for the smaller class of front-end-loader (i.e. CAT 988H) has been applied to this equipment. A reasonable new target SWL for this Komatsu WA900 front-end-loader may need to be considered.
- The CAT 773F water cart (ID: 502) exceeded the A-weighted static target SWL by 4 dB. This equipment is hired from Matilda Equipment and does not have noise attenuation kit installed.

Since completing the mobile plant sound testing all mobile plant has undergone routine service and maintenance.

Mining operations are permitted 7 days per week, however mining is currently undertaken during Monday to Friday with no weekend work. Additionally, during the next reporting period there is no planned evening or night-time operations. Much of the mobile plant fleet will be relocated to the nearby Stratford Mining Complex and the DCM will maintain a single excavator and truck fleet on dayshift only.

These changes are expected to significantly reduced the overall sound power level from the mobile plant operations.

6.8.6 Complaints

No noise related complaints were received during the reporting period. The complaints list is provided in **Appendix 7**.

6.9 LANDSCAPING AND VISUAL SCREENING

The overall visual impacts of the Duralie Mine are described in the EA 2010 are generally considered low. However, some local impacts will occur and undertakings such as the following have been, and will continue to be, adopted to lessen these impacts:

- Minimising (where possible) disturbance to native vegetation, especially where such vegetation is providing visual screening;
- Retention specifically of ridge Open Forest and regrowth forest (where possible);
- Retention of all riparian vegetation along Mammy Johnsons River and those out of pit sections of Coal Shaft Creek;
- Ensuring out of pit emplacement design produces a landform which integrates with the adjoining natural landform;
- Painting of substantial fabricated infrastructure with a colour ("Rivergum") that assists it to blend in with the adjoining landscape;
- Maintenance of infrastructure to retain the ability of such infrastructure to blend into the surrounding landscape over the life of the project; and
- Placement, configuration and direction of lighting to reduce offsite nuisance effects of stray light;
- Prioritising rehabilitation of exposed and outer batters of waste emplacements;
- Vegetation would be established around the perimeter of the open pit voids to provide visual screening.

In accordance with project approval condition a visual screen has been constructed and maintained along a section of the Bucketts Way to the north-west of the mine in consultation with DPE, RMS, Great Lakes Council and DCM CCC. As predicted some additional vantage points of the mine have been exposed through the clearing of the northern extent of the Weismantel pit and landscaping works and progressive rehabilitation will continue to reduce the visual impact.

The rehabilitation principles and objectives at the DCM are included in the Project Approval and described in the DCM Mining Operations & Rehabilitation Management Plan. This includes requirements for landscaping and visual screening to ensure the final landforms are visually consistent with the surrounding environment and meet community and regulatory expectations The rehabilitation will be generally consistent with the proposed rehabilitation strategy described in the EA.

6.9.1 Complaints

No visual amenity related complaints were received during the reporting period. The complaints list is included in **Appendix 7**.

6.10 CULTURAL AND NATURAL HERITAGE CONSERVATION

Cultural and natural heritage at the DCM are managed in accordance with the approved Heritage Management Plan (HMP). The purpose of the HMP is to address the requirements of Project Approval Schedule 3, Condition 46.

Archaeological surveys conducted at the Duralie Mine site in the 1980's and 1990's did not identify any Aboriginal sites or items with the exception of one site. A tree, to be subsequently referred to as the "honey tree" was the subject of a site inspection involving various parties including representatives of NPWS in November 1998. The consensus at the time of inspection was that the "honey tree", an old ironbark, had had timber pieces inserted into the trunk in a spiral pattern to allow someone to scale the tree and access the crown – possibly to collect honey. It was not clear whether such timber insertion would have been performed by an Aboriginal person or early European settler. The "honey tree" was subsequently listed on the NPWS Aboriginal Heritage Information Management System (AHIMS) database.

The Duralie Extension Project Environmental Assessment identified 9 sites of Aboriginal heritage significance (DM2, DM3, DM4, DM5, DM6, DM9, DM10, DM11 and the "Honey Tree") on the Mining Lease. These sites have been protected by way of signpost and fencing where required. In addition, 4 sites (DM1, DM7, DM8 and Mammy Johnson's Grave) were identified outside of the Mining Lease. These 9 sites are tabulated below:

In accordance with the HMP topsoil disturbance during earthworks, construction and operation of the mine has been monitored utilising officers of the Karuah Local Aboriginal Land Council (KLALC). During the reporting period no topsoil disturbance was undertaken.

In accordance with the HMP, monitoring of the Aboriginal heritage sites at the Duralie mine was conducted each quarter during 2017/18.

Table 27: Aboriginal Heritage Sites within EA Study Area

Site Code (refer EA documentation)	Site Type	Status
DM2	Isolated Artefact	Salvaged by KLALC
DM3	Scarred Tree	Existing, no disturbance.
DM4	Scarred Tree	Existing, no disturbance
DM5	Scarred Tree	Salvaged by KLALC
DM6	Isolated Artefact	Existing, not located by KLALC
DM9	Open Artefact Scatter	Existing, no disturbance
DM10	Scarred Tree	Existing, no disturbance
DM11	Isolated Artefact	Disturbed, not located by KLALC.
38-1-0033	Scarred Tree – Honey Tree	Existing. No disturbance

Former Weismantels Inn is a heritage listed building owned by DCPL. A building inspection of the Weismantels Inn is conducted every two years.

An inspection of the Former Weismantels Inn was undertaken in October 2017 and reported there is no evidence that the former Weismantel Inn building has been affected by blast-induced ground vibrations.

The next building inspection is scheduled for 2019.

6.11 SPONTANEOUS COMBUSTION

Any incidences of spontaneous combustion at the DCM are managed in accordance with a Spontaneous Combustion Management Procedure. Management and mitigation practices generally involve reducing the interaction of potentially reactive materials with water and oxygen by appropriate dumping practices, profiling and capping any materials likely to heat and reducing the time coal faces are exposed prior to mining.

During the reporting period isolated incidences of spontaneous combustion were identified in the open cut pits and waste emplacements. Actions were taken to address the spontaneous combustion which included removing the affected material and extinguishing followed by dozing or capping of the area with inert material to restrict air flow and further heating.

DCPL had previously identified areas of self-heating on the Potentially Acid Forming (PAF) waste emplacements and continue to undertake remedial works to these areas.

One (1) air quality complaint related to odour was received during the reporting period. A detailed complaints list is provided in **Appendix 7**. DCPL responded to the complaint promptly and provided information on the specific issues.

6.12 AGRICULTURAL REPORT

An assessment of the Agricultural and Rural Suitability of the land surrounding the DCM was undertaken the EA 2010. The Project is located in a rural area characterised by cattle grazing on native and improved pastures. Areas managed for forestry, conservation, poultry farming and other types of agricultural production also occur in the wider area.

The Agricultural Land Use Rehabilitation Objective for the DCM is to establish the land capability classification for the relevant nominated agricultural pursuit.

Rural Land Capability

The Rural Land Capability classification system is used to determine the various classes of rural land on the basis of the capability of the land to remain stable under particular uses. Land is allocated to one of eight classes, with emphasis on the erosion hazards in the use of the land. The majority of land within the existing DCM and Project area is classified as Class IV using the rural land capability classification with the major factors in determining the classes being slope and soil stability in water.

Agricultural Suitability

The Agricultural Suitability system is used to classify land in terms of its suitability for general agricultural use. Agricultural land is classified by evaluating biophysical, social and economic factors that may constrain the use of land for agriculture. The agricultural land classification mapping classifies the majority of lower slopes of the DCM area as Class 3 land, and the upper slopes as Class 4. The land in the far south of ML is classified as Class 5 agricultural suitability.

The rehabilitated areas on the Duralie Waste Emplacement are proposed for Class 4 agricultural suitability. Class 4 Agricultural Suitability is defined as (NSW Agriculture, 2002):

Land suitable for grazing but not for cultivation. Agriculture is based on native pastures and improved pastures established using minimum tillage techniques. Production may be seasonally high but the overall production level is low as a result of major environmental constraints.

Agricultural lands on and surrounding the DCM including DCPL owned land continues to be managed for agricultural production. DCPL implements a property management strategy which includes grazing & pasture management and weed and pest control measures. The majority of agricultural lands are grazed under agistment/lease contracts.

There have been no changes to the agricultural land suitability during the reporting period. Further information on agricultural rehabilitation areas is included in Section 8.

7. WATER MANAGEMENT

Water management is undertaken in accordance with the approved Water Management Plan (WMP) and sub-components of the plan including surface water, ground water and site water balance required under Condition 29, Schedule 3 the DEP Project Approval.

The main principles of the water management system on-site are to:

- Minimise the generation of dirty water and divert clean water around disturbed areas;
- Minimise storage requirements by maximising re-use of dirty water;
- Remove potential impacts on downstream water resources by provision of secure containment on site and disposal by irrigation re-use;
- Implement a fail-safe system, whereby under extreme events in excess of design capacity, dirty waters would spill to the mine pit and not to the clean water catchments; and
- Not allow sediment laden water having an elevated suspended solids concentration to be discharged off site.

7.1.1 Water Supply and Demand

The main water supply storage on-site for use in irrigation and dust suppression is the Main Water Dam (MWD) (monitoring point SW3) located to the northwest of the Industrial Area. The MWD, Auxiliary Dam 1 (AD1) and Auxiliary Dam 2 (AD2) are the principal permanent mine water storages on-site. Water from these dams comprises pit produced water (runoff to/rainfall/seepage to), water from specific sediment dams and surface water runoff from the Industrial area.

The principal water losses in the water system are:

- Water applied to land by means of irrigation.
- Water used for dust suppression.
- Evaporation from the Main Water Dam, Auxiliary Dam 1 and Auxiliary Dam 2.
- Water retained in ROM coal and railed to Stratford.

The Mine Water Dam's current storage capacity is approximately 1405 ML whilst Auxiliary Dam 1 can contain approximately 460 ML and Auxiliary Dam 2 has an estimated storage capacity of approximately 2720 ML.

At the completion of the reporting period (30-Jun-2018) the Mine Water Dam contained 996 ML (77.0%), Auxiliary Dam 1 contained 0 ML (0%) and Auxiliary Dam 2 contained 2025 ML (78.1%).

7.1.2 Site Water Balance Review

A water balance model of the Duralie Extension Project mine operations was developed by HEC based on an operational model of the DCM water management system. A site water balance review is undertaken annually and captures all inflows and outflows from the water management system. The water which accumulates in the open pits through rainfall or groundwater seepage is measured at the point of dewatering. Prior to the water balance review servicing and verification of all flow meters at DCM was undertaken in November 2017. The results of the flow meter verifications were used to calibrate the site water balance in regard to water transfers.

Contained Water Storages

A review of the Main Water Dam, AD1 and AD2 water balance 2017 is as follows: Figures are based on Duralie Mine Site Water Balance Review for the 2017 calendar year. The full report is available on request.

Inflows (mL/pa)

Rainfall runoff	581
Pump from open cut pits	165
Pump from other storages	0
MWD diversion seepage	108
First flush capture	23*
Total Inflow	877

Outflows (mL/pa)

Evaporation	677
Haul Road dust suppression	146
Irrigation and Evaporator Fan Loss	256
Total Outflow	1,080
INFLOW - OUTFLOW	-202

Start of 2017 year total storage volume	3,184
End of 2017 year total storage volume	2,986
Change in Storage	-198

*Excluding 34 days' missing data

The above values indicate small reduction in stored water volume in the storage dams during 2017. Note that this does not include any increase in stored water volume in the Weismantel pit (estimated volume stored approximately 350 ML) and the adjacent waste rock emplacement (estimated volume stored possibly up to approximately 5,000 ML). The estimated volume of water contained in the Weismantel pit itself (based on recorded water levels) appears to have increased by between 90 and 123 ML during 2017. Long term RL trend charts for Main Water Dam, AD1 and AD2 are provided in **Appendix 4**.

Open Cut Pits

A mine pit water balance analysis was undertaken for the open cut pits using data recorded during 2017. The volume of groundwater estimated reporting to Weismantel and Clareval pits in 2017 was negligible. If groundwater inflow had occurred, the "predicted" volume would increase above the "measured" volume. This contrasts with a volume of 138 ML volume predicted from the groundwater model developed as part of the Duralie Extension Project (GCL, 2010).

DCPL holds an existing Bore Licence (20BL168404) issued by the NSW Department of Primary Industries, that allows for up to 300 ML of groundwater to be extracted from "works" in any 12 month period.

Table 28: Water Take

Water Licence #	Water sharing plan, source and management zone (as applicable)	Entitlement	Passive take / inflows	Active pumping	Total
WAL 41518 (NOW ref: 20AL213502) - Duralie Pit (Weismantel and Clareval)	Gloucester Basin Groundwater Source - North Coast Fractured and Porous Rock Groundwater Source 2016	300ML extraction.	0ML	0	0ML

7.2 SURFACE WATER

7.2.1 Surface Water Management

Surface water management is managed in accordance with WMP: Appendix 2 Surface Water Management Plan (SWMP) under Condition 29, Schedule 3 of the DEP Approval and is divided into the management of clean water and mine water as outlined below. Dirty water comprises both mine water and sediment laden/turbid water.

7.2.1.1 Erosion and Sediment Control

The primary objectives of the erosion and sediment control at the DCM are to:

- minimise and control soil erosion and sediment generation in areas disturbed by ongoing mining and associated activities at the DCM; and
- minimise the potential for sediment generated from site activities to adversely affect the water quality of the Mammy Johnsons River or the Karuah River.

Sediment generation and erosion is primarily controlled by:

- Maximum separation of runoff from disturbed and undisturbed areas;
- Timely progressive rehabilitation and vegetation establishment on disturbed areas (e.g. completed sections of the overburden dump) to minimise the area exposed to erosion;
- Construction of surface drains to facilitate the efficient transport of surface runoff;
- The direction of runoff from disturbed areas into sediment dams for settlement of suspended solids; and
- The placement of silt fences down slope of other disturbed areas (e.g. down slope of topsoil stockpiles before a grass cover has been established).

DCM had the following dedicated erosion and sediment control structures in use during the reporting period:

- Two (2) rail siding sediment dams – designated as RS1 and RS6
- One (1) waste emplacement (rehabilitation) sediment dam – designated as VC1
- Temporary Sediment Dams in advance of mining operations (none active at the end of the reporting period).

Sediment dam sizing is described in the Erosion and Sediment Control Plan. Runoff in excess of the design capacity will result in a dam spilling in accordance with the design criteria. It should be noted that at all times pumping (where possible) of sediment dams in order to prevent or limit the amount of spilling water was undertaken. Prioritisation of pumping operations also took into account the likely quality of spilling water when a dam was considered vulnerable to spilling. The quality of water collecting within sediment dam is managed (where practicable) to minimise suspended sediment load.

Sediment dams are inspected following receipt of sufficient rain whereby such dams have the potential to spill. Diversion structures and drains are also maintained, including vegetation management, to ensure integrity of the structures and capacity for flow.

During the reporting period there were no spills from sediment dams at the DCM.

In addition to dedicated sediment dams, clean water is directed around disturbed areas (where practicable) using diversion drains/bunds or in the case of Coal Shaft Creek, a creek diversion (refer discussion under *Water Management*) in order to minimise sediment laden water.

All elements of sediment control are regularly monitored and maintained. Sediment dams are cleaned out when the storage volume is substantially reduced by sediment deposition (i.e. when 30% of storage volume is lost to sediment build up) and inspected after major rainfall events.

Sloping areas under rehabilitation are stabilised by structural controls such as bench drains and contour banks (if required) to break up the effective slope length exposed to erosion. Final slopes will

generally not exceed 14 degrees which will aid in the control of erosion and sediment generation.

Inspection of diversion structures and sediment control dams occurred during and following heavy rainfall events. The site contained all mine water on site within its water management system and control structures remained effective.

A photographic surveillance record of key structures along the existing Coal Shaft Creek diversion is undertaken annually and was conducted during January 2018. Regular inspections of the CSC Diversion are also undertaken and in general the diversion is stable and no signs of erosion or sedimentation have been identified. Maintenance activities including weed spraying and vegetation control was undertaken on the clean water diversion drains and around the prescribed dams during the reporting period.

7.2.1.2 Clean Water Management

The main objective of clean water management is the segregation of clean water from mine water by the construction of diversion drains around disturbed areas, thereby minimising the quantity of 'dirty' water generated.

Surface water controls aim to prevent clean runoff water from entering the open mining pit and overburden dumping areas where practical. The main structures are:

- Diversion of Coal Shaft Creek. The diversion channel (built in stages) is required until the creek can be re-established at the conclusion of mining;
- Main Water Dam (MWD) diversion drain. This drain intercepts runoff from the catchment above the MWD and delivers that water to Coal Shaft Creek;
- Auxiliary Dam 1 (AD1) and Auxiliary Dam 2 (AD2) diversion drains;
- Clareval western diversion drain;
- Flood control embankments to prevent inundation of mining areas;
- A culvert under the Main Coal Haul Road which allows Coal Shaft Creek to flow through the site; and
- Various runoff control drains/bunds about disturbed areas, designed to divert clean water runoff around those areas.

The main elements of the clean water diversion system are shown in **Figure 3 (Appendix 1)**.

Inspections of diversion structures were undertaken during and after rainfall. Remedial and maintenance works were completed as required within the diversion drains and dams during the reporting period.

7.2.1.3 Mine Related Water Management

Mine related water management refers to the control, collection and re-use of water which may have become contaminated by mining operations and associated activities. This water comprises mine water and sediment laden/turbid water. Mine water is water that has come into contact with mining activities. Sediment laden/turbid water has come into contact with disturbed areas but predominantly not core mining areas.

Mine waters are typically characterised by higher salinity and on occasion lower pH. Sediment laden waters are characterised by elevated suspended solids and elevated turbidity.

During the reporting period all mine water was contained on site and no spills occurred from mine water storage dams.

The main objectives of the mine related water control facilities are:

- Segregation of clean water from mine related water, to minimise the quantities of mine

related water to be managed;

- On site storage to prevent escape to Coal Shaft Creek and Mammy Johnsons River; and
- Management of the stored quantity of dirty water by irrigation.

The principal sources of mine related water are:

(a) Mine Water

- Incident rainfall
- Groundwater seeping into mining pits;
- Rainfall induced runoff and seepage from active sections of the overburden dump; and
- Rainfall induced runoff from the Industrial Area.

(b) Sediment Laden Water

- Rainfall induced runoff from roads;
- Rainfall induced runoff from areas stripped of topsoil (typically exposing clays); and
- Rainfall induced runoff from areas yet to adequately vegetate within sediment dam catchments.

Mine related water uses and losses are:

- Evaporation and seepage losses from water storages;
- Haul road dust suppression;
- Railed coal dust suppression;
- Water retained in ROM coal railed to the Stratford Mine; and
- Stored water applied to land via irrigation (evapotranspiration) including evaporative sprays.

The dirty water storages on site are:

- Main Water Dam (MWD)
- Auxiliary Dam 1 (AD1)
- Auxiliary Dam 2 (AD2)
- Sediment Dam VC1 (rehabilitated waste dump)
- Sediment Dams RS1 and RS6 (rail siding dams)

The locations of mine and sediment laden water storage areas are shown in **Figure 3 (Appendix 1)**.

7.2.2 Surface Water Monitoring

DCPL monitors surface water quality on and surrounding the mine site by sampling from a series of selected locations. These locations comprise both streams and water storage structures. A meteorological monitoring station (i.e. weather station) provides site rainfall data. The locations of these monitoring sites are shown on **Figure 2 (Appendix 1)**.

Surface water monitoring is conducted in accordance with the approved SWMP and the EPA Environment Protection Licence (EPL) 11701.

Surface water is sampled and analysed on a weekly, monthly, event basis or following a sediment dam spill.

Collected waters are analysed for a suite of physical and chemical parameters. Results are compared with water quality triggers for the DCM developed in accordance with the methodology in ANZECC/ARMCANZ (2000). "Gilberts & Associates 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project" and EPA requirements (DCM Surface Water Management Plan Appendix B).

7.2.2.1 Review of Local Streams Monitoring Results

Reference should be made to accompanying data tables provided in **Appendix 4**. The routine surface water monitoring sites at the DCM are:

- SW2 – Coal Shaft Creek (CSC)
- SW2 Rail Culvert – Coal Shaft Creek Downstream
- SW6 – Former RS3/4 Culvert
- SW9 – Un-named Tributary (UNT)
- SW10 – Coal Shaft Creek Upstream
- GB1 – Mammy Johnsons River (MJR)
- Highnoon – Mammy Johnsons River (MJR)
- Site 9 – Karuah River (KR)
- Site 11 – Mammy Johnsons River (MJR)
- Site 12 – Mammy Johnsons River (MJR)
- Site 15 – Mammy Johnsons River (MJR)
- Site 19 – Karuah River (KR)
- North Drain
- South Drain

The surface water monitoring results are used to assess the DCM against the performance indicators and performance measures as detailed in Table 7 of the Surface Water Management Plan. If data analysis indicates a performance indicator has been exceeded or is likely to be exceeded, an assessment will be made against the performance measure. If a performance measure is considered to have been exceeded, the Contingency Plan will be implemented (WMP Section 10). If data analysis indicates that the performance measure has not been exceeded, DCPL will continue to undertake monitoring.

Table 29: Summary of Surface Water Monitoring Results and Trigger Levels – pH, EC and TSS

Site	pH			EC		TSS	
MJR	20 th %ile	80 th %ile	Trigger	80 th %ile	Trigger	80 th %ile	Trigger
Site 11	7.2	8.0	7.1-7.6	451	370	13	15
GB1	7.1	7.5		337		13	
Site 12	7.3	7.6		364		7	
CSC							
SW2 (RC)	7.2	7.8	7.1-7.9	613	544	76	80
SW10	7.2	7.4		110		44	
UT							
SW9	7.2	7.5	6.4-7.1	291	461	25	57
SW10	7.2	7.4		110		44	

Table 30: Summary of Surface Water Monitoring Results and Trigger Levels – Copper, Turbidity, Zinc and Aluminium

Site	Copper		Turbidity		Zinc		Aluminium	
	80 th ile	Trigger	80 th ile	Trigger	80 th ile	Trigger	80 th ile	Trigger
MJR								
Site 11	0.001	0.002	32	24	0.008	0.011	0.40	1.24
GB1	0.001		42		0.005		0.21	
Site 12	0.001		17		0.008		0.16	
CSC								
SW2 (RC)	0.002	0.003	76	119	0.036	0.064	1.78	3.02
SW10	0.005		87		0.009		4.02	
UT								
SW9	0.003	0.004	60	94	0.011	0.024	1.38	2.96
SW10	0.005		87		0.009		4.02	

Assessment of the Performance Indicators and Performance outcomes are presented in **Table 30**.

Table 31: Surface Water Monitoring Performance Outcomes – 2017-18 Reporting Period

Performance Measure	Monitoring of Environmental Consequences			Data Analysis to Assess against Performance Indicators	Performance Indicators	Assessment of Performance Indicators	Assessment of Performance Measure	Relevant Management and Contingency Measures
	Sites	Parameters	Frequency					
No more than a negligible impact on water quality in Mammy Johnsons River as a result of the Duralie Extension Project	<ul style="list-style-type: none"> Site 11 GB1 Site 12 	<ul style="list-style-type: none"> EC, pH, turbidity, Copper (total), Zinc (total), Aluminium (total), Hardness, TSS, BOD and DO. 	<ul style="list-style-type: none"> Monthly / Event 	The 80th percentile concentration calculations for EC, pH, total copper, turbidity, total zinc, total aluminium, and TSS in addition to The 20th percentile value of pH at Site 11, GB1 and Site 12 are presented in Tables 29 & 30	Water quality at Site 11 is not worse than the pre-irrigation water quality at Site 11 whilst water quality is better at GB1 and Site 12 compared to the pre-irrigation water quality at these sites.	<p>Data analysis indicates Site 11 exceeded the performance indicator for pH, EC and Turbidity. Analysis of the monitoring data shows EC to be elevated on occasion under low flow conditions. EC was also elevated at upstream sites GB1 and Site 12 on these occasions. Whilst EC at Site 11 slightly exceeded the 80thile trigger it was found to not be significantly higher than EC concentrations at GB1 and Site 12. Hence similar trends observed upstream and downstream.</p> <p>Analysis of the monitoring data also shows similar trends observed upstream and downstream for pH and Turbidity. Whilst pH at site 11 exceeded the 80thile trigger it was found not to be significantly higher than the average pH at the upstream sites GB1 and Site 12.</p> <p>The performance indicator for DO was not exceeded except for one reading at the three sites in June 2018. Other than one result, DO is consistently below 85% at Site 11, Site 12 and GB1.</p>	No further requirement for assessment of Performance Measure.	Continue monitoring.

Table 31 (Continued): Surface Water Monitoring Performance Outcomes – 2017-18 Reporting Period

Performance Measure	Monitoring of Environmental Consequences			Data Analysis to Assess against Performance Indicators	Performance Indicators	Assessment of Performance Indicators	Assessment of Performance Measure	Relevant Management and Contingency Measures
	Sites	Parameters	Frequency					
No more than a negligible impact on water quality in Coal Shaft Creek as a result of the Duralie Extension Project	<ul style="list-style-type: none"> SW2 (RC) SW10 	<ul style="list-style-type: none"> EC, pH, turbidity, Copper (total), Zinc (total), Aluminium (total), Hardness, TSS, BOD and DO. 	<ul style="list-style-type: none"> Monthly / Event 	The 80th percentile concentration calculations for EC, pH, total copper, turbidity, total zinc, total aluminium, and TSS in addition to the 20th percentile value of pH at SW2 (RC) and SW10 are presented in Tables 29 & 30	Water quality at Site SW2 (RC) is not worse than the pre-irrigation water quality at Site SW2 (RC) whilst water quality is better at SW10 compared to the pre-irrigation water quality at that site.	<p>Data analysis indicates Site SW2 (RC) exceeded the performance indicator for EC.</p> <p>Analysis of the monitoring data shows EC to be elevated on occasion under low flow conditions. Whilst EC at SW2 (RC) slightly exceeded the 80th percentile trigger it is difficult to compare to SW10 EC results as SW10 was dry for all sampling events except two in the reporting period.</p> <p>The performance indicator for DO was exceeded on four occasions. The performance indicator for DO was also exceeded upstream at SW10 on one of the two sampling events.</p>	No further requirement for assessment of Performance Measure.	Continue monitoring.

Table 31 (Continued): Surface Water Monitoring Performance Outcomes – 2017-18 Reporting Period

Performance Measure	Monitoring of Environmental Consequences			Data Analysis to Assess against Performance Indicators	Performance Indicators	Assessment of Performance Indicators	Assessment of Performance Measure	Relevant Management and Contingency Measures
	Sites	Parameters	Frequency					
No more than a negligible impact on water quality in Unnamed Tributary as a result of the Duralie Extension Project	<ul style="list-style-type: none"> SW9 SW10 	<ul style="list-style-type: none"> EC, pH, turbidity, Copper (total), Zinc (total), Aluminium (total), Hardness, TSS, BOD and DO. 	<ul style="list-style-type: none"> Monthly/Event 	The 80th percentile concentration calculations for EC, pH, total copper, turbidity, total zinc, total aluminium, and TSS in addition to the 20th percentile value of pH at SW9 and SW10 are presented in Tables 29 & 30	Water quality at Site SW9 is not worse than the pre-irrigation water quality at SW9 whilst water quality is better at SW10 compared to the pre-irrigation water quality at that site.	<p>Data analysis indicates SW9 exceeded the performance indicator for pH. Analysis of the monitoring data shows pH to be elevated on one occasion with all other results well below the triggers.</p> <p>Analysis of the monitoring data also shows similar trends observed upstream and downstream for pH.</p> <p>The performance indicator for DO was exceeded once at Site SW9 and upstream at SW10.</p>	No further requirement for assessment of Performance Measure.	Continue monitoring.

The above results were consistent with previous year's monitoring results. The Duralie Coal EIS 1996 indicated that water quality in Mammy Johnsons River was variable, but was generally good. It was also found that the salinity of the stream was higher during periods of low flow and generally showed a relative reduction in EC during higher flow periods (Gilbert, 2010). The current monitoring results are consistent with these observations.

Historical monitoring data presented in the DCM Environmental Assessment, Surface Water Assessment (Gilbert, 2010) show that Coal Shaft Creek is generally more saline than Mammy Johnsons River and the Karuah River. Results during the reporting period concur with these observations. It is considered that Coal Shaft Creek is generally more saline due to its ephemeral nature and the outcropping/sub-cropping of coal seams within the catchment.

In general, surface water monitoring results were consistent with predictions made in the Environmental Assessment (2010).

7.2.2.2 Review of Mine Water Monitoring Results

Mine water comprises water that is generated within the mine workings, waste rock emplacements (prior to reshaping and topsoiling), storage areas for such water and runoff from areas where coal is handled. Mine water is generally characterised by elevated EC, elevated sulphate concentrations and low turbidity/TSS.

The three principal mine water storage areas are the Main Water Dam (sampling location SW3 major), Auxiliary Dam 1 (AD1) and Auxiliary Dam 2 (AD2). Monitoring of mine water quality is also conducted within the Weismantel pit (sampling location SW4) and the Clareval pit (sampling location Clareval).

Monitoring for SW3 (major) during the reporting period indicated, on average, a moderate EC (2987 uS/cm), slightly alkaline pH (8.0) and low miscellaneous metals concentration. Reference should be made to **Table 32** and the water monitoring results in **Appendix 4**.

Table 32: Summary of Mine Water Monitoring Results – pH, EC and TSS

Site	pH		EC (µS/cm)		TSS (mg/L)	
	Range	Average	Range	Average	Range	Average
MWD (SW3)	6.7-8.6	8.0	2270-3210	2987	<5-25	12
AD1	7.4-8.5	8.0	2630-3140	2830	*	*
AD2	6.9-8.6	8.0	2500-3160	2942	*	*
Clareval	7.0-7.6	7.4	4490-5360	4890	62-64	63
Weismantel (SW4)	3.2-7.5	6.5	3750-5420	4506	<5-46	17

Note * = TSS not monitored at AD1 and AD2

The simulated water quality for the Main Water Dam was prepared for the Environmental Assessment (2010) including a salinity balance and an assessment of the suitability for irrigation water (Gilberts, 2010). Mine water pH has remained generally near neutral or slightly alkaline for the life of the project. The Mine Water Dam EC trend has been generally consistent with the simulated EC showing a slightly increasing trend up to 2015 and then decreasing towards 2018, however the average EC (2987 uS/cm) in 2018 has remained higher than the predicted EC of 2140 uS/cm. This is predominantly due to the higher EC water from the Clareval pit. Clareval Pit was only monitored on two occasions during the reporting period due to no safe access into the pit since operations were completed in September 2017.

The electrical conductivity (EC) performance indicator in Table 7 of the Surface Water Management Plan (SWMP) was exceeded during the reporting period in the MWD. As a requirement of the SWMP, the increasing salinity triggered an assessment of performance measure. Hollingsworth (2014) concluded that there has been no significant detrimental effect on soil properties, or suitability of soil in irrigated areas for future agricultural use.

An assessment of the irrigation water quality was undertaken in the 2018 Irrigation Area Monitoring Report (Horizon Environmental, 2018) and is included in Section 7.4.1. Irrigation and soil monitoring in 2018 concluded that there has been no significant detrimental effect on soil properties, or suitability of soil in irrigated areas for current or future agricultural use. Additionally, the monitoring found no detectable adverse impact from irrigation management on pasture cover or composition.

7.2.3 Biological Monitoring

As part of Duralie Coal's environmental monitoring program, Invertebrate Identification Australasia was commissioned to conduct biological (aquatic ecology – macroinvertebrates) monitoring of the streams near the DCM.

Biological monitoring has been conducted each year since the start of mining operations.

Monitoring during this reporting period was conducted during September 2017 and February 2018 and involved sampling from seven sites. The September survey identified a total of 47 families of aquatic invertebrates which represents a general increase in number of families. For the February survey a total of 38 families of aquatic macroinvertebrates were recorded representing a general decrease in number of families. The report summaries are provided below.

The September 2017 report concluded that;

"the results of the current survey confirm what has previously been predicted and demonstrated, i.e. that the aquatic biodiversity is continuing to show the same or similar trends to that recorded in previous years and under similar environmental conditions. The continued presence of high numbers of EPT taxa recorded at most river sites above and below the mining operations (9-10 taxa per site) indicates that both river systems are still healthy. The other off-river sites recorded lower values than the river sites. However, as they are much smaller systems they do not have the same scale of resources, permanence of flow levels and variety of niches to support more complex biodiversity. They are also more impacted by decreases in flow or changes in environmental conditions. In conclusion, the results from the current survey suggest that the overall biodiversity and river environmental conditions have remained good and that there are no apparent adverse effects on the aquatic macroinvertebrate fauna in the Mammy Johnsons River as a result of any activities arising from the operations of the Duralie Mine. The only significant impact to the river in addition to the very low flows was presence of cattle at Site M1 that has impacted water quality, habitat availability and the riverbed, bank and riparian structure." (Invertebrate Identification Australasia 2017)."

The February 2018 report concluded that;

"the results of the current survey confirm what has previously been predicted and demonstrated, i.e. that the aquatic biodiversity is continuing to show the same or similar trends to that recorded in previous years and under similar environmental conditions. The continued presence of moderate numbers of EPT taxa recorded at most river sites above and below the mining operations (9-10 taxa per site) indicates that both river systems are still healthy. The other off-river sites recorded lower values than the river sites. However, as they are much smaller systems they do not have the same scale of resources, permanence of flow levels and variety of niches to support more complex biodiversity. They are also more impacted by decreases in flow or changes in environmental conditions. In conclusion, the results from the current survey suggest that the overall biodiversity and river environmental conditions have remained good and that there are no apparent adverse effects on the aquatic macroinvertebrate fauna in the Mammy Johnsons River as a result of any activities arising from the operations of the Duralie Mine. The only significant impact to the river in addition to the very low to no flows and the presence of cattle at Site M1 that has impacted water quality, habitat availability and the riverbed, bank and riparian structure." (Invertebrate Identification Australasia 2018)."

Biodiversity values have been generally similar to those noted from prior reporting periods. Biological monitoring reports to date have not indicated any significant adverse effects on the aquatic ecosystem as a result of the mine's operations as per predictions made in the environmental assessments.

7.2.4 Riparian Vegetation Monitoring

The Riparian Vegetation “Health” Monitoring program is conducted in accordance with the Duralie Coal Mine SWMP. Visual monitoring and photography is conducted in order to detect any potential change in the quality and quantity of riparian vegetation. The unnamed Tributary, Coal Shaft Creek and Mammy Johnsons River are monitored on an annual basis in conjunction with the biological monitoring for signs of leaf scorching, desiccation and dieback. Riparian health monitoring includes the development of a photographic database of riparian vegetation at fixed photo points.

Riparian vegetation health monitoring was conducted in September 2017. Results for the reporting period are generally similar to results from last year with some minor seasonal variation. Monitoring continues to demonstrate negligible impact related to mining operations on riparian vegetation. Seasonal changes generally reflect climatic conditions. The photographic database is maintained at the DCM.

7.2.5 Ecotoxicity Testing Program

In accordance with the Surface Water Management Plan and Condition 29(b) of Project Approval (08_0203), DCM have undertaken ecotoxicity testing of samples taken from selected water monitoring sites in Mammy Johnsons River, Coal Shaft Creek and DCM Main Water Dam since 2013. The ecotoxicity testing programme was initially required to be undertaken quarterly and then revised following analysis of the monitoring results. The ecotoxicity tests were undertaken by Ecotox Services Australasia during 2013 to 2015. A review of the ecotoxicity monitoring data was undertaken by the University of Queensland Centre for Mined Land Rehabilitation in May 2014 and again in October 2015. A review of the monitoring data collected up to 2015 concluded the following;

“The results for aquatic testing of five aquatic species of Coal Shaft Creek, Mammy Johnsons River at four sampling times during 2014 -2015 show that there was no evidence for any significant toxicity and no connection with any effects from mining. The Main Water Dam at Duralie Coal Mine showed that sporadic effects to some test species, but not all. This is considered to indicate the potential for minor effects to occur on an on-going basis but does not show affects from the offsite natural waters. If the Main Water Dam water is discharged, it should be tested for aquatic toxicity.

Based on the evidence for some aquatic testing in the Main Water Dam it is recommended that the Ecotoxicity Testing Program be reduced to yearly sampling corresponding to the commencement of summer using sampling at the same four sites for a further two years. If any water release is undertaken from Duralie Mine site, the mine site and downstream waters should be tested before and after release.”

In accordance with the recommendation above ecotoxicity monitoring is undertaken annually. Monitoring was undertaken in March 2018. This was postponed from December 2017 due to persistent no flow conditions. The results continue to show there was no evidence of any significant toxicity and no connection with any effects from mining. The Main Water Dam shows minor sporadic effects although no discharges have occurred. Full reports are available on request. A review of the ecotoxicity results will be undertaken following the next round of sampling scheduled in December 2018.

7.3 GROUNDWATER

7.3.1 Groundwater Management

Groundwater monitoring is conducted in accordance with the DCM Water Management Plan (WMP) Appendix 3 Groundwater Management Plan (GWMP).

DCM monitors groundwater quality on and surrounding the mine site by sampling from a series of selected monitoring bore locations. The location of these bores is shown in **Figure 2 (Appendix 1)**.

Collected waters are analysed for a suite of physical and chemical parameters. Results are evaluated for observable trending and compared to the predicted results from the EA 2010.

7.3.2 Groundwater Monitoring Results

A summary of groundwater monitoring results for the reporting period can be found in **Table 33** and **Appendix 4**. Comments on analysed parameters for monitoring conducted during the reporting period are as follows:

- Depth to groundwater was comparable with recent historical data for most monitored wells and consistent with predicted levels.
- pH is comparable with historical data with minor fluctuations apparent. pH in the reporting period varied from a slightly acidic 5.3 (DB5W in August 2017) to a neutral 7.5 (SI2W in Nov 2017);
- Electrical conductivity generally showed a high degree of variability across many of the wells as has historically been the case. This would appear to reflect the cycle of dry and wet conditions. Shallow wells intercept generally low conductivity alluvial aquifers, whilst deep wells associated with coal measures generally have higher conductivity;
- Calcium and magnesium concentrations across all wells tended to fluctuate within reasonably tight ranges;
- Sulphate concentrations varied across wells. SI2W exhibited the widest range of any bore spanning over 295mg/l;
- Aluminium concentrations are quite low (often being close to the limit of analytical detection) in all the deeper wells but comparatively higher in the shallower wells. The highest concentration recorded was 97 mg/l (BH4BW in February 2018);
- Iron concentrations showed no common trend with rises and falls across wells generally. Concentrations showed a wide range from a low of <0.05 mg/l (SI1W) to a high of 155.0 mg/l (BH4BW in February 2018);
- Manganese concentrations across all wells were not high with the highest being 4.4 mg/l within BH4BW in February 2018; and
- Zinc concentrations were essentially low and consistent with available historical data.

Table 33: Summary of Groundwater Monitoring Results – Average depth, pH and EC.

Site	Depth (m)	pH	EC (µS/cm)
DB1W	15.9	6.0	4100
DB2W	13.9	6.3	1474
DB3W	3.6	6.7	170
DB4W	6.3	6.7	3500
DB5W	12.0	5.8	2363
DB6W	21.2	6.7	5383
DB7W	10.8	6.8	2683
DB8W	19.9	*	*
DB9W	20.8	7.3	3533
DB10W	12.4	5.9	3763
DB11W	10.7	6.8	3218
BH4BW	5.0	6.3	258
SI1W	10.0	7.1	2788
SI2W	19.1	7.3	3068
SI3W	28.2	7.0	6158
WR1	9.4	6.7	2067
WR2	67.8	7.0	5193

Note * = Depth only monitored at DB8W

It should be noted that the EA (2010) described groundwater in the Project area as being characterised by the following parameters/ranges:

- pH – 6.0 to 8.0
- Electrical conductivity – 100 to 7600 uS/cm

Groundwater monitoring results are assessed against Performance Indicators and Measures as described Section 7.1 and Table 6 of the GWMP. Monitoring data for the reporting period was in accordance with the performance measures which indicate:

- No more than a negligible impact on stream baseflow as a result of the Duralie Project;
- No more than a negligible impact on water levels in groundwater production bores on private land.

Refer **Table 34** below.

Table 34: Groundwater Monitoring Performance Outcomes – 2017-18 Reporting Period

Performance Measure	Performance Indicators	Assessment of Performance Indicators	Assessment of Performance Measure
No more than negligible impact on stream baseflow and/or natural river leakage of Mammy Johnsons River to the deeper groundwater system as a result of the Duralie Extension Project (incorporating the Open Pit Modification).	Groundwater inflows to open pits are consistent with Duralie Open Pit Modification Environmental Assessment (EA) predictions.	Data analysis indicates groundwater inflows to open pits are have been less than the Duralie Open Pit Modification Environmental Assessment (EA) predictions. Refer to the site water balance review for 2017.	No further requirement for assessment of Performance Measure.
	Groundwater levels in alluvium bores are consistent with Duralie Open Pit Modification EA predictions (accounting for temporal changes in rainfall recharge).	Data analysis of daily alluvium bore pressure sensors indicates groundwater levels in alluvium bores are consistent with Duralie Open Pit Modification EA predictions (accounting for temporal changes in rainfall recharge). Refer to groundwater monitoring data.	No further requirement for assessment of Performance Measure.
No more than negligible impact on water levels in groundwater production bores on privately-owned land as a result of the Duralie Extension Project (incorporating the Open Pit Modification).	No groundwater related complaints received	No groundwater related complaints were received during the reporting period.	No further requirement for assessment of Performance Measure.

Groundwater quality results for the reporting period indicate results consistent with EA predictions and historical groundwater data trends. For this reporting period, the groundwater pH range for bores likely to be influenced by the coal measures was between 5.3 and 7.5. This is a generally similar range to that noted in the EA. Similarly, the electrical conductivity range for the bores was 102 to 6410 uS/cm. These results are generally similar to and within the range noted in the EA.

Irrigation bores (SI Series) indicate no obvious signs of deep drainage generated from irrigation activities.

No indication of an increase in connectivity between alluvial bores (DB3W and BH4BW) and the deeper groundwater system has been observed based on monitoring results for water quality and groundwater table level.

The waste emplacements bores (WR Series) indicate signs of recharging of the backfilled void, particularly at WR1. This is consistent with the numerical modelling of the post-mining groundwater levels (EA 2010) which shows slow but complete recovery of the groundwater system over many decades and that the Clareval void, once filled with water, would act as a sink, while the Weismantel void lake would act as a flow-through lake system. Additional detail is available within the EA for the DEP Modification 2 approved in December 2014.

7.3.3 Groundwater Depressurisation

Depth to water information from piezometer monitoring indicates that bore water levels are generally consistent between bores and are generally consistent with EA (2010) predictions.

The four bores to the west of the open cut pit (SI1W, SI2W, SI3W & DB6W) are all above or close to maximum predicted levels.

No depressurisation has been observed to date at Bore DB11W, located north of operations.

Results for the reporting period are provided in **Appendix 4**. In summary, hydrographic plots (Graph 1, Graph 2 and Graph 3), indicate that groundwater monitoring results for the period are generally consistent with predicted outcomes as assessed in the EA (2010). Further review occurred in line with the GWMP where inflows to pits and water levels within bores were consistent with modelled predictions and indicators as per the GWMP. No trigger levels or exceedance of performance measures were identified during the reporting period. No complaints related to groundwater were received during the reporting period.

7.4 IRRIGATION

The Duralie Coal Mine operates under a continual stored water surplus. The Project Approval conditions precludes the disposal of mine water from the approved project approval boundary and Duralie is managed as a zero discharge site.

Irrigation at the DCM is managed in accordance with the WMP, specifically Appendix 2 Surface Water Management Plan Attachment 1 Irrigation Management Plan (IMP). Irrigation consists of a substantial network of fixed sprays in the Type I, II and IV irrigation areas supported by evaporative fans in the Type I and Type V irrigation areas (waste rock emplacement) only.

During the previous reporting period the fixed spray system was removed from the Type IV area (rehabilitated waste emplacement). The evaporative sprays were also removed from the Type I and Type V (waste rock emplacement area) during the reporting. No irrigation currently occurs within Type III irrigation areas located in the catchment of Coal Shaft Creek above Dam 3.

The irrigation system management controls were maintained during the reporting period. An overview of the site irrigation system including the fixed sprays and areas are outlined in the WMP which is available on the Duralie Coal website.

During the 2017 calendar year a total of 256 ML of mine water was irrigated within Type I, II, IV & V areas (compared with 536 ML 2016 calendar year). The reduced volume was predominantly due to reduced number of evaporative sprays.

ROM coal mining in the Clareval Pit was finalised in September 2017 and the void space has now become available for water storage and waste rock backfill. Since this time open cut dewatering to the Main Water Dam has also ceased with water preferentially transferred to the Clareval void. As such, the demand for irrigation to reduce the total site water storage has reduced and all irrigation activities on site have now ceased.

Monitoring of irrigation water quality from the Main Water Dam ("SW3") was undertaken on a monthly basis during the review period. Analytical results are shown in Section 7.2.2.2 and also in **Appendix 4**. Results for the MWD irrigation water quality was assessed against the relevant performance measures from the WMP by Horizon Environmental Soil Survey (refer extract within 7.4.1 below).

7.4.1 Irrigation Area Soil and Vegetation Monitoring

Irrigation area monitoring is conducted in accordance with the DCM Water Management Plan (WMP) which incorporates the Irrigation Management Plan (IMP) as an attachment of the Surface Water Management Plan (SWMP). The annual irrigation area monitoring includes an assessment of soil characteristics and vegetation condition with consideration to the irrigation water quality applied.

The irrigation area performance indicators in Table 6 of SWMP Section 9 relate to pH in the **MWD** being maintained between 6.0 and 8.5; SAR less than 6 and EC less than 2500 $\mu\text{S}/\text{cm}$ (2.5 dS/m). If a performance indicator is exceeded an assessment of the performance measure is also included in the irrigation monitoring report.

The 2018 Irrigation Area Monitoring Report (Horizon Environmental, 2018) concluded that there has been no significant detrimental effect on soil properties, pasture condition or suitability of soil in irrigated areas for future agricultural use, i.e. grazing on native pasture. Irrigation area monitoring was undertaken during April 2018 and a summary from the 2018 irrigation area monitoring report is provided below:

"The impact of cumulative electrolyte and contaminant loadings from trace metals and metalloids in irrigation water on the sustainability of the irrigation areas at Duralie Coal Mine (DCM) was investigated. The implications for irrigation area management and longer term agricultural land use are discussed.

Rainfall and climate conditions in 2017-2018, which control irrigation management were below average (2-3 decile). Metal and metalloid concentrations in the Main Water Dam (MWD) were below the ANZECC & ARMICANZ short term contaminant guidelines for irrigation periods up to 20 years that would warrant site-based risk assessment of cumulative contaminant loadings in the irrigation management system. The maximum manganese (Mn) concentration measured in the MWD since the previous monitoring campaign in May 2017 (mg/L) was above the long-term contaminant guideline for irrigation periods up to 100 years (i.e. 0.2 mg/L).

Irrigation water salinity exceeded the salinity trigger levels in the IMP at DCM. Irrigation water quality has improved during the reporting period (2017-18) at DCM and while the irrigation rate has been the same, a reduction in the number of irrigation days has reduced the amount of irrigated mine water application. The risks from land application of water from the MWD to soil and pasture quality appear to be low. Management intervention may be needed if electrical conductivity (EC) in irrigation water exceeds 9 dS/m (9000 $\mu\text{S}/\text{cm}$).

There was no evidence of trend over time in soil salinity, sodicity or metal and metalloid concentrations from annual soil monitoring results. In particular, decommissioning of the evaporators in the Type II irrigation area (DUR8) and the decommissioning of the Type IV and Type V waste rock irrigation areas (DUR6) has not had a persistent detrimental effect on soil quality. A high soil sodicity level (relative to guidelines) recorded in the surface 10cm at site DUR8 in 2017 under the evaporators in the Type II

irrigation area did not exceed the soil guideline in 2018. This site was sampled for the first time in 2017. The evaporator was decommissioned in 2017 and the final 2018 campaign found no persistent detriment. The results for DUR8 appear to be related to sampling variation rather than trends over time.

We found no detectable adverse impact from irrigation management on pasture cover or composition. Complete ground cover is being maintained on the irrigated pasture. Introducing grazing appears to be changing pasture composition to dominance of *Paspalum dilatatum* in the irrigated pastures. Decreased pasture biomass may be associated with seasonal conditions and grazing pressure. Soil salinities in irrigation areas were comparable to respective reference sites on different geologies. The surface soils have low levels of major nutrients (extractable phosphorus and potassium) that will limit productivity. Also, micronutrients including Cu and Zn appear to be deficient in pasture soils.

There may be a general lack of soil porosity to depth that could promote waterlogging. Low soil porosity at depth may be due to over-clearing for pasture. Deep ripping combined with revegetation or pasture improvement may improve salt leaching should the salinity of applied irrigation water increase above 9 dS/m (9000µS/cm), or soil salinity (ECse) increase above 1.9 dS/m in the surface soil. Importantly, the irrigated water supply from the MWD needs to be managed to reduce the risk of this occurring.

Pasture growth depends on a range of factors including grazing pressure, seasonal rainfall variation, as well as local soil conditions. There does not appear to be a detrimental effect on ground cover or pasture composition in the irrigated pastures compared with the dryland, reference sites. Annual monitoring has provided a relative assessment of pasture condition over time. There was no evidence of trend over time in soil salinity, sodicity or metal and metalloid concentrations from annual soil monitoring results.

Recommendations:

1. If salinity and sodicity in the MWD supply continue to trigger the SWMP performance indicators for irrigated land disposal of mine water the potential impacts should continue to be assessed annually against the performance measure.
2. Continue to assess soil fertility (particularly salinity and sodicity) and pasture condition with respect to irrigation water quality and water quality trends in the mine water storages in 2018-2019 using a method consistent with the current monitoring regime in the IMP.
3. Review irrigation area management if irrigation water salinities increase above 9 dS/m.
4. The evaporators in the Type II irrigation area at DCM can be decommissioned without soil or pasture remediation being required.
5. At SCM, no detrimental effects to the developing soils and pasture growth on the rehabilitated waste rock emplacement, or receiving environment were identified with irrigation management."

8. REHABILITATION

Rehabilitation of disturbed land at DCM is undertaken in accordance with the Mining Operations Plan and Rehabilitation Management Plan (MOP 2017). A MOP Amendment was prepared during the previous reporting period to merge the MOP with the previous RMP and also include the addition of a mine closure planning program. The MOP term covers mining operations and rehabilitation activities up to the end of 2019. The MOP is available on the Duralie Coal website.

The primary objectives of the rehabilitation program are provided in **Table 35** below.

Table 35: Rehabilitation Objectives

Feature	Objective
Mine site (as a whole of the disturbed land and water)	Safe, stable and non-polluting, fit for the purpose of the intended post-mining land use(s).
Surface infrastructure	To be decommissioned and removed, unless the Secretary agrees otherwise.
Coal Shaft Creek Diversion	Hydraulically and geomorphologically stable, with riparian vegetation that is the same or better than prior to mining.
Landforms	Final landforms sustain the intended land use for the post-mining domain(s). Final landforms are consistent with and compliment the topography of the surrounding region to minimise the visual prominence of the final landforms in the post-mining landscape. Final landforms incorporate design relief patterns and principles consistent with natural drainage.
Other land affected by the project	Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprising: <ul style="list-style-type: none"> • local native plant species; and • a landform consistent with the surrounding environment
Water Quality	Water retained on site is fit for the intended land use(s) for the post-mining domain(s). Water discharged from site is consistent with the baseline ecological, hydrological and geomorphic conditions of the creeks prior to mining disturbance. Water management is consistent with the regional catchment management strategy.
Native flora and fauna habitat and corridors	Size, locations and species of native tree lots and corridors are established to sustain biodiversity habitats. Species are selected that re-establishes and complements regional and local biodiversity.
Final void	Safe, stable and non-polluting.
Post-mining agricultural pursuits	The land capability classification for the relevant nominated agricultural pursuit for each domain is established and self-sustaining within 5 years of land use establishment (first planting of vegetation).
Community	Minimise the adverse socio-economic effects associated with mine closure.

8.1 BUILDINGS & INFRASTRUCTURE

During the reporting period several of the demountable buildings in the administration and muster area were decommissioned and relocated to the Stratford Mining Complex as a result of the reduced operations at the DCM. No other buildings or infrastructure were constructed, demolished or renovated during the reporting period. No decommissioning of infrastructure is scheduled during the next reporting period. This will be further addressed during the mine closure planning process.

8.2 REHABILITATION OF DISTURBED LAND

Rehabilitation of disturbed areas is undertaken progressively and concurrently with ongoing mining operations. Rehabilitation planning, management and implementation is described in the MOP. The overburden dump is rehabilitated in progressive increments to the final landform so the area of

disturbed land is minimised and disturbed water catchment areas are reduced. Stage plans for the Duralie rehabilitation are provided in the MOP.

Vegetation is cleared ahead of mine progression. Details are included in the Annual Biodiversity Report included in **Appendix 8**.

Topsoil is removed ahead of the advancing pit or overburden dump. All suitable and accessible topsoil material is recovered. The topsoil is pushed into piles by dozers and loaded into trucks by excavator. The topsoil is either immediately respread onto re-contoured areas or is stockpiled for later re-use. Topsoil, previously stripped from the site, is respread to a nominal thickness of 100mm and revegetated. Direct placement of freshly stripped topsoil on areas under rehabilitation is undertaken wherever possible.

Following the bulk shaping of waste emplacements, drainage works and topsoil placement, site preparation involves chisel ploughing on level ground or ripping (300-400mm) on slopes as required.

Areas to be rehabilitated will comprise a combination of native forest/woodland and pasture with scattered trees as described in the MOP. Trees are planted to achieve maximum aesthetic and screening effects as well as providing windbreaks, woodlots, stock shelter and habitat enhancement. As per Table 10 in the MOP, local endemic native species (particularly trees identified in the EIS) will be used wherever possible based on trialling of various species in the initial rehabilitation areas and the species pallets from the biodiversity offset areas. Pasture seed utilised will consist of a mix based on previous sowings, seasonal availability and external advice.

The DCM rehabilitation progress is generally in accordance with the planned activities described in the MOP Plan 3D - Mining and Rehabilitation 2018. The MOP makes provision for 138 hectares of rehabilitated area by the end of 2018.

During the reporting period approximately 52 hectares of bulk shaping (landform establishment) has been completed on the Weismantel waste emplacement and approximately 18 hectares of this area was spread with topsoil and planted with pasture species in April 2018.

Table 36 presents a summary of the rehabilitation undertaken at the Duralie mine site up to the current reporting period. The current mining areas and rehabilitation as of 30 June 2018 are shown in **Figure 3**, provided in **Appendix 1**.

Table 36 – Rehabilitation status

Mine area type	Previous RP (actual hectares)	Current RP (actual hectares)	Next RP (forecast hectares)
Total Mining Lease	942.8	942.8	942.8
Total mine footprint	403	406	406
Total active disturbance	299	250	212
Land being prepared for rehab (Landform Establishment)	5	41	38
Land under active rehabilitation (Growth Medium Development)	0	0	0
Completed rehabilitation (Ecosystem Establishment & Sustainability)	99	115	156

Note: ML area corrected based registered title areas.

Rehabilitation Resources

Topsoil resources are managed in accordance with the MOP Section 3.3.4. No vegetation clearance or topsoil stripping was undertaken during the reporting period.

The site topsoil balance is updated annually to ensure adequate resources are available for rehabilitation of disturbed areas. At the end of the reporting period an estimated 205,000 cubic metres of topsoil was held in various stockpiles. This would provide for rehabilitation of 205 hectares to the nominal topsoil depth of 100mm. The current area of disturbance which will require topsoil (i.e. not including final void of 65ha) is 185 hectares, therefore sufficient topsoil resources are available to complete rehabilitation of the operation.

Topsoil stripping has now been completed up to the northern extent of both the Clareval pit and the Weismantel pit.

Rehabilitation Maintenance

Recommendations for maintenance activities on rehabilitated land has been included in the rehabilitation monitoring reports, refer to Section 8.3.

During the reporting period maintenance activities included repair of minor erosion on a previously rehabilitated contour bench with poor establishment. This including shaping, re-topsoiling and spreading of seed. Maintenance activities also included slashing and clearing of access tracks and weeds spraying. Weed control has been undertaken across the rehabilitation areas targeting lantana, blackberry, wild tobacco and giant parramatta grass.

8.3 REHABILITATION MONITORING

In accordance with the DCM Mining Operations Plan & Rehabilitation Management Plan (MOP) monitoring of rehabilitation areas at the DCM, using Landscape Function Analysis (LFA) and vegetation dynamics was conducted during May 2018. A summary of the findings follows;

“The survey of the Duralie Coal Mine Rehabilitation areas conducted in May 2018 was the fifth survey in accordance with the Duralie Coal Mine – Mining Operations Plan & Rehabilitation Management Plan (MOP) (2017) to assess the rehabilitation progress against the project specific performance and completion criteria. Using Landscape Functional Analysis (LFA) and vegetation dynamics the survey provides indicators of rehabilitation success and assessment of landscape processes obtained from measurements at ten 25m transects representing the various ages of rehabilitation.

Processes associated with the soil surface are reported as three main indices;

- Stability Index - measures the ability of the soil to resist erosion and to reform after disturbances;*
- Infiltration Index - measures how the soil partitions rainfall into soil-water that is plant available and runoff that is lost from the local system and may also remove nutrients and other materials; and,*
- Nutrient Cycling Index - how efficiently organic matter is cycled back into the soil.*

The development of the woody vegetation is tracked by measuring the number of plants per hectare and calculating the volume of canopy for each distinct layer of vegetation. This is presented as Vegetation Structure.

The results for the above indices from this year's survey were compared to the average index scores from a subset of six analogue transects established in remnant woodland vegetation communities of the Duralie Biodiversity Offset area and surveyed in January 2017.

Overall, the rehabilitation of the Duralie Spoil Emplacement continues to progress satisfactorily and is on a trajectory towards meeting the performance and completion criteria detailed in the MOP. LFA indices are continuing to achieve or approach the analogue site.

By index:

- Stability Index – most of the spoil emplacement rehabilitation has achieved Analogue index scores. Some variation within the 2008 and 2012 rehabilitation has resulted in average*

values below the 2017 survey and Analogue scores but are isolated to a single transect. Overall the soil surface is intact with no active erosion observed.

- Infiltration Index – the transects surveyed in 2018 remain below the Analogue benchmark score and require further time for development. The 2008 rehabilitation achieved the highest index score, with the younger rehabilitation achieving progressively lower scores;
- Nutrient Cycling Index – 2010 and 2011 rehabilitation areas achieved the analogue values, with the remaining rehabilitation ages requiring some time to develop. Transect 3443 in the 2008 rehabilitation returned a very low index score of 29.7 ± 6.7 .

The vegetation structure on the spoil emplacement is still at a relatively early stage of development when compared to remnant vegetation found on the analogue sites. Canopy volumes and stem densities have generally continued to increase as the vegetation matures, as expected. This is evident where direct comparison between surveys can be made. For instance, the 2010 and 2011 rehabilitation has increased for both parameters when compared to the 2016 surveys when these transects were last surveyed. The 2016 rehabilitation continues to improve as it matures. Variations in stem density and canopy volume can be attributed in part to different transects and hence areas of the spoil emplacement being surveyed year to year. One transect in the 2008 rehabilitation shows a decline in canopy volume when compared to the 2017 survey. This may be due to the revegetation species planted where part of the spoil emplacement has not been seeded with Eucalypts (and hence has decreased vegetation dynamics) and an area of poor vegetation establishment. As noted above, the area represented by transect 3443 on the 2008 rehabilitation has lower than previously recorded soil surface indices which can be attributed to low woody vegetation cover. While some natural regeneration was observed, recommendations for this specific area included soil analysis to determine if there is a physicochemical explanation and/or examination of the initial seeding density and species mix to ascertain whether this may have influenced the current situation.

It is suggested that these issues are limited to this section of the spoil emplacement as other areas to the east (e.g. transect 3444) are progressing satisfactorily with excellent vegetation growth and LFA indices.

Rehabilitation recommendations included:

- Modify the rehabilitation monitoring methodology to recognise that the different planting objectives (i.e., non-Eucalypt vs Eucalypt seeded areas) will cause results that may affect interpretation of the success of the rehabilitation;
- Improve the overall vegetation structure of the older areas of rehabilitation by implementing a modest seeding and/or planting program of shrub species to better match the structure of the analogue sites."

In addition to the monitoring above a walkover style survey was conducted between the 11th and 18th July 2017. The walkover focused on factors that will impact on the achievement of the rehabilitation objectives. These include erosion (stability), weeds and native vegetation (self-sustaining ecosystems), bush fire risk, habitat enhancement features/structures and feral pest control. A summary of the findings is provided below:

- The rehabilitation and revegetation of the DCM spoil emplacement is progressing satisfactorily;
- DCM staff having undertaken considerable remediation work since the 2016 survey;
- Observations of erosion were limited to the powerline corridor and the 2016 rehabilitation area to the north of the corridor;
- Areas of soil crusting and topsoil removal affecting vegetation establishment were observed in the 2011, 2013 and 2016 rehabilitation areas. Recommendations made here to revegetate these areas using suitable machinery if possible;
- Revegetation has progressed with a dramatic increase in floral biodiversity this survey. An additional 26 native species were recorded, with an estimated 18 being species new to the emplacement;
- Seedling and sapling recruitment of Eucalypts and Acacias was observed, with a total of 19 species of plants observed to be in flower and/or fruit;
- Weeds are becoming an issue, especially in the older 2008 rehabilitation areas where the structure is beginning to open;
- Other observations noted the widespread appearance of mycorrhizal fungi, important for nutrient cycling, and small mammal activity indicating habitat development;

- *Bush fire risk was still considered to be relatively high given the dense vegetation and the amount of litter, but has decreased due to the reduction in the biomass of grasses.*

8.4 REHABILITATION TRIALS AND RESEARCH

DCPL has extensive experience in both native woodland/forest revegetation and agricultural pasture rehabilitation, with successful rehabilitation areas completed over the past 20 years at both the Duralie and Stratford mine sites. Learnings from the rehabilitation works undertaken onsite to date along industry best practice guidelines are employed in the methodology for new rehabilitation areas.

Rehabilitation trials are currently being implemented in the biodiversity offset area in accordance with the Biodiversity Management Plan. The program has trialled several methods for ground preparation, seeding and planting to determine the most suitable and cost effective methods for completing the remaining offset revegetation and mine site rehabilitation. The techniques include both direct seeding and tube stock with inoculated and un-inoculated seed. Refer to Section 6.5 of this report and the Duralie Coal Mine Annual Biodiversity Report (DCPL, 2018) for a summary of works undertaken during the reporting period.

8.5 DEVELOPMENT OF THE FINAL REHABILITATION PLAN

8.5.1 Mine Closure Planning

DCPL representatives met with DRG on 24 May 2017 to discuss the DCM Mining Operations Plan and mine closure planning for the Duralie operation.

A MOP Amendment (Amendment B) was prepared following the issue of a notice under section 240(1)(C) of the *Mining Act 1992* by the Department of Planning and Environment (DP&E). In accordance with the notice, the MOP Amendment included the addition of a mine closure planning program, which includes a schedule of all technical and/or environmental assessments that will be required to undertake final rehabilitation following the cessation of open-cut mining at the DCM. Additionally, the MOP Amendment was prepared to address comments from the DRG regarding the inclusion of additional detail on a strategy for designing the Coal Shaft Creek alignment, rehabilitation indicators and completion criteria and the development and inclusion of additional rehabilitation monitoring. The MOP Amendment was approved by DRG on 11 December 2017.
31 August 2017.

The MOP Section 10 details the mine closure planning program. The planning program is designed to inform the preparation of a detailed Mine Closure Plan, which is required to be prepared and submitted to the DRG prior to the expiry of the MOP term (i.e. prior to 31 December 2019). The Mine Closure Plan would include final rehabilitation measures for all areas including infrastructure areas, water management areas, waste emplacements, final voids and biodiversity offsets.

The subsections below provide progressive updates on the key mine closure planning requirements for the DCM and the actions completed during the reporting period.

8.5.2 Landform designs

The rehabilitation objectives for the final landforms requires final landform designs which sustain the intended land use for the post-mining domain(s). Final landforms are to be consistent with and complement the topography of the surrounding region to minimize the visual prominence of the final landforms in the postmining landscape. Final landforms are to incorporate design relief patterns and principles consistent with natural drainage.

DCPL have continued to develop the detailed final landform designs consistent with the conceptual rehabilitation strategy in the EIS 2014 and rehabilitation objectives in the DCM Project Approval. The MOP also includes detail regarding the rehabilitation implementation requirements and the conceptual

final rehabilitated landform for the DCM.

DCPL will continue to progress the final landform designs during the next reporting period.

8.5.3 Water & Final Void Management

Under the Project Approval, at the cessation of mining, the northern extents of the currently approved DEP include final voids in the Clareval pit and Weismantel pit. A final void water balance and groundwater model was prepared for the DEP EA 2010 and was revised for the Open Pit Modification EA 2014.

The mine closure planning schedule includes several components relating to water management and final voids.

Final Void Design

DCPL is required to rehabilitate the final void to ensure the landform is safe, stable and non-polluting. During the reporting DCPL engaged an independent consultant to provide advice on the development of a detailed final void design. The report provides advice on rehabilitated wall stability and slope design. The final void design will continue to be developed during the next reporting period.

Final Void Water Balance

A review of the final void water balance is required to ensure the water balance incorporates the final landform design and surface water inflows and outflows to/from final void. HEC were engaged during the reporting period to revise the site water balance and provide advice on the predicted post-mining final void equilibrium level. This report will be finalised during the next reporting period.

Groundwater model

The groundwater model for the post-mining groundwater system is intrinsically related to the final void water balance. In conjunction with the final void water balance review, HydroSimulations has also been engaged to undertake a verification of the site groundwater model in relation to the final landform designs. This report will be finalised during the next reporting period.

8.5.4 Re-Establishment of Coal Shaft Creek

Re-construction of the lower reaches of Coal Shaft Creek is required following the completion mining activities. The Coal Shaft Creek Reconstruction Plan was prepared in December 2012 and provides a conceptual design for the creek reconstruction. The plan is included as an attachment to the DCM Water Management Plan. The final Coal Shaft Creek design will be included in the mine closure planning process as described in the MOP Section 5.4

The MOP requires an analysis to be conducted into the geotechnical, hydrological and hydraulic design of the final alignment focussing on long-term stability, seepage management and the creation of habitat. The outcomes of these analyses will inform the final detailed design of the post-mining alignment and reconstruction of Coal Shaft Creek.

During the reporting period HEC was commissioned to prepare a detailed final design of the Coal Shaft Creek re-alignment and reconstruction. This report will be finalised during the next reporting period and would include updating the Coal Shaft Creek Reconstruction Plan.

8.5.5 Mine Water Dams

The Main Water Dam, Auxiliary Dam 1 and Auxiliary Dam 2 are all prescribed under the Dams Safety Act 1978.

DCPL is required to prepare a strategy for decommissioning of the mine water dams or for integration with the final land use,

DCPL has engaged an independent dams engineer to assist with preparing plans for the decommissioning the of the prescribed dams with consideration of future approvals or mine closure requirements in consultation with relevant agencies (e.g. Dam Safety Committee).

During the reporting period AD1 was dewatered and AD2 is planned to be dewatered during the next reporting period. Since the completion of mining in the Clareval Open Cut the void has become available for water storage. Decommissioning of the prescribed dam structures is expected to be undertaken over the coming years.

8.6 REHABILITATION TARGETS

The DCM MOP Plan 3D - Mining and Rehabilitation 2018 rehabilitation target for end of 2018 calendar year is a cumulative total of 138 hectares of rehabilitation. To date 156 hectares of rehabilitation has been completed with 115 hectares comprised of Ecosystem Establishment and Sustainability and 41 hectares comprised of Landform Establishment.

The DCM MOP Plan 3E - Mining and Rehabilitation 2019 rehabilitation target is a cumulative total of 215 hectares of rehabilitation. Bulk shaping works (Landform Establishment phase) of approximately 38 hectares of waste emplacement is scheduled be undertaken in the next reporting period in accordance with the MOP.

The rehabilitation targets for the next 12 months will focus on bulk shaping of waste emplacements and the maintenance and monitoring of existing rehabilitation.

9. **COMMUNITY RELATIONS**

9.1 **COMMUNITY ENGAGEMENT ACTIVITIES**

Yancoal Australia Ltd is committed to making a positive contribution in the areas in which it operates. To help facilitate this commitment Stratford Coal Pty Ltd and Duralie Coal Pty Ltd have established the Community Support Program to provide assistance to local initiatives within the local area in which they operate. The aim of the Community Support Program is to help benefit a diverse range of community needs such as education, environment, health, infrastructure projects, arts, leisure and cultural heritage.

The Stratford Coal Community Support Program has granted over \$550,000 since commencing in 2010 and during 2018 a total of \$52,000 in grants was distributed between 20 community organisations for a diverse range of community projects and initiatives.

The community groups to receive grants in 2018 were:

Community Support Program 2018 Recipients	Project Description
Pure NRG	Defibrillators for Gloucester Schools
Ronald McDonald House and Mark Hughes Foundation	Massive Murray River Paddle - Ronald McDonald House and Mark Hughes Foundation
Gloucester RSL Sub Branch	Gloucester Cemetery Memorial refurbishment
Stroud Road Public School P&C Association	Classroom air-conditioning
Stroud Neighbourhood Children's Cooperative	Air-conditioning for playroom
Booral Rural Fire Brigade	Fire Hose Drying Rack
Gloucester Country Club	Stratford Coal Super Sevens Golf Competition 2018
Stroud Rodeo Association	2018 Stroud Rodeo and Campdraft
Stroud Show Association Inc.	2018 Stroud Show - Major Sponsor
Gloucester Mountain Man Triathlon Inc.	2018 Gloucester Mountain Man Tri Challenge
Gloucester Agricultural, Horticultural & Pastoral Assoc.	Gloucester Show 2018
Stroud Raiders Rugby League Club	Replacement training equipment damaged in Stroud floods
MidCoast Science & Engineering Challenge	MidCoast Science & Engineering Challenge 2018
Stroud Community Lodge Inc	Community and Resident Entertainment Program
Gloucester High School P & C Ass. Inc.	Senior Common Area Upgrade - landscaping and facilities
Barrington Public School	Classroom reading eggs and headphones.
Scout Association NSW Branch	New Scout group equipment
Stratford Public School	Sphero SPRK + Robotics
Stroud Road Community Hall & Progress Assoc	Stroud Road Spring "Bash 'n Bang" 2018
Stroud & District Country Club	Family Fun Day

Stratford Coal Pty Ltd and Duralie Coal Pty Ltd have also continued their commitment to education and training in the Gloucester region through Stratford Coal's Education Support Program, providing much needed funding for the next generation of young students. The Education Support Program is

managed by an independent committee and the funds distributed by MidCoast Council. In 2018, \$22,000 has been allocated in funding to help support local students and businesses in university degrees, TAFE courses and apprenticeships.

Since the commencement of mining in 1995, Stratford Coal has contributed more than \$700,000 to locally based community and training initiatives via the Education Support Program. During that time, the funding has made a genuine difference to the lives of over 150 tertiary students, 100 apprentices and 50 businesses.

Yancoal and Stratford Coal have continued their partnership with the Clontarf Foundation Chatham Academy. During 2018 SCPL engaged in several activities with the Chatham Academy students including a site visit to the Duralie Coal mine site. The site visit provided an example of an operational mine site and what goes into running a mine including the rehabilitation of mine land. Another site visit was also arranged for the Gloucester Activity Centre Men's Group who undertook a tour of the Duralie operations.

9.2 COMMUNITY CONSULTATIVE COMMITTEE

The Duralie Community Consultative Committee (CCC) was established in 2003 and operates under the guidance of the NSW Department of Planning & Environment. Meetings are held quarterly and provide a forum for open discussion between the community, Council, the Company and other stakeholders on issues relating to the mine's operations, environmental performance and community engagement.

The Community Consultative Committee (CCC) for the Duralie Coal Mine is currently comprised of:

- An independent Chairperson;
- Five (4) local community representatives;
- Two (2) local government representatives (MidCoast Council); and
- Two (2) DCPL representatives.

The CCC was formed in accordance with Schedule 5, Condition 5 of the Project Approval for the Duralie Extension Project. The Committee operates in such a manner as to generally satisfy the *Community Consultative Committees Guidelines for State Significant Projects* (Department of Planning, 2016) and to the satisfaction of the Secretary of the Department of Planning & Environment.

Items raised and/or discussed during the four (4) quarterly CCC meetings held during the reporting period include but are not limited to:

- Mine progress;
- Environmental monitoring, including air quality, noise, surface water and groundwater;
- Water management including irrigation activities;
- Community complaints;
- Community engagement and Council contributions;
- Karuah River Catchment Management Plan and associated works;
- Biodiversity Offset area works;
- General land management;
- Mine rehabilitation and mine closure planning; and
- Post-mining land use planning.

Site inspections have also been undertaken during the CCC meetings and have included the active operations, rehabilitation areas and biodiversity offsets. The CCC meeting agendas, presentations and minutes are available on the Duralie Coal website (www.duraliecoal.com.au).

9.3 ENVIRONMENTAL COMPLAINTS

Complaints (by category) received by Duralie Coal Pty Ltd over the last 6 reporting years are shown in Table 37:

Table 37 – Environmental Complaints

Complaint Category	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Noise	25	26	39	10	3	0
Blasting	1	12	13	3	0	0
Air Quality	4	4	1	1	14	1
Water	0	0	0	0	0	0
Lighting	1	0	0	0	0	0
Visual	1	1	0	0	0	0
Train	0	0	3	0	0	0
Other	0	1	0	0	0	0
Total Complaints	46	42	56	14	17	1

Summary comments:

- The total number of complaints received during the reporting period was one (1) with the total number of complainants also being 1.
- A single air quality (odour) complaint was received during the reporting period.
- Overall the total number of complaints received by category during 2017/2018 decreased compared to the previous reporting period.
- The reduced noise and air quality complaints potentially reflect the reduced production (i.e. no weekend work and no night shift), current location of operations and improved management practices.

A full complaints listing is provided in **Appendix 7** and includes details on DCPL's responses to complaints. A summary of complaints by category is provided in the relevant sections of the report.

9.3.1 Liaison and Complaint Resolution

In accordance with the Project Approval Conditions, DCPL is required to establish and maintain a complaint handling and response procedure. DCPL operates a system to receive, handle, respond to and record complaints or information requests relating to operation of the DCM which is described in the Environmental Management Strategy.

DCPL operates a dedicated community information hotline (1300 658 239) 24 hours per day. The number is advertised within the Sensis *White Pages Directory (Newcastle)*, a local telephone directory (*Pink Pages*) and in the local newspapers (*Gloucester Advocate and Dungog Chronicle*) on a six-monthly basis.

Designated DCPL staff, when notified of a complaint, determine an appropriate response on the basis of the nature of the complaint during business hours. This may involve a site visit/inspection, liaison with personnel on site or other appropriate action. After business hours, all complaints and operations are reviewed as soon as practicable by the open cut examiner and responded to by DCPL staff during business hours.

All complaints received and responses taken in relation to each complaint are recorded in a Complaints Register which is tabled at each Community Consultative Committee meeting for the period covered since the last Committee meeting and is included in **Appendix 7** for the reporting year. The complaints register is also made available on the Duralie Coal website.

9.4 EMPLOYMENT STATUS AND DEMOGRAPHY

During the reporting period, the total number of staff and FTE's employed at the Duralie Coal Mine was **51**, including **1** environment & community representative shared with the nearby Stratford Mining Complex. However, as at 30 June 2018, DCPL was in the process of transitioning employees to the Stratford Mining Complex and the DCM workforce would be reduced to a dayshift only working Monday to Friday.

In addition to direct permanent employment at the mine, on the basis of a conservative employment multiplier of one mine site job generating one job within the general community, up to 51 (full time equivalent) jobs are expected to have been provided in supporting services. On the basis of a review of employees' living location, 60% of mine employees resided within the greater local area (defined as being bounded by Stroud, Gloucester and Dungog).

9.5 EMPLOYEE ENVIRONMENTAL AWARENESS TRAINING

DCPL environmental management objectives include:

- providing all employees with the knowledge, skills and equipment necessary to meet their environmental obligations;
- promoting an awareness and concern for good environmental management amongst all employees; and
- ensuring employees and contractors are informed about DCPL's policies and are made aware of their environmental and community responsibilities in relation to DCPL's activities.

New employees and contractors working at site are provided with information on environmental issues as part of Yancoal induction training which is updated periodically. This includes elements such as the Pollution Incident Response Management Plan and reporting obligations of personnel and the management of environmental incidents. Ongoing environmental awareness training is also undertaken with staff and employees periodically.

During the reporting period employee and contractor training included presentations on:

- General environmental management and awareness – Training was undertaken across four sessions during June 2018 with all employees and contractors at the Stratford & Duralie operations. This included information on the DCM Pollution Incident Response Management Plan and incident reporting.
- Mining Operations Plan & Rehabilitation Management Plan - A presentation was provided to the site managers and supervisor on the obligations and requirements in regard to rehabilitation and mine closure planning.
- Duralie shuttle train operations – Training was undertaken in September 2017 with the new shuttle train operator regarding the environmental compliance requirements for train operations.

10. INDEPENDENT ENVIRONMENTAL AUDIT

An Independent Environmental Audit (IEA) of the DCM was conducted during December 2017. Hansen Bailey was commissioned by DCPL to undertake the audit in accordance with the Project Approval conditions PA 08_0203 Schedule 5 Condition 8. Additionally, it is a requirement under Schedule 5 Conditions 9A to complete a Rail Haulage Audit. This audit was undertaken at the same time as the IEA and included in a single audit report.

The audit team was approved by the Secretary for DP&E and included experts in the areas of rehabilitation, ecology and surface water. The rail audit team included experts in the areas of noise, air quality and logistics.

The final IEA report along with DCPL's responses to the recommendations was submitted to DP&E on 26 February 2018. On 25 May 2018 DP&E provided confirmation of acceptance of the IEA 2017 Report.

The IEA identified some non-compliances against conditions of Project Approval PA 08_0203 and other licences and approvals. The audit identified a total of seven non-compliances comprised of five issues. The non-compliances were risk ranked and no high or medium risks were identified during the audit. Five issues were identified as low risk and two issues classified as administrative in nature.

The field inspection revealed that the site was generally well maintained and in good condition, particularly around the administration area. The rail load out facility was well maintained as was the truck maintenance area. Spill kits were observed in the vicinity of the refuelling bay and appropriate bunding and contouring was visible to adequately contain any dirty surface water runoff from the area.

Progressive and high quality rehabilitation of the site was observed, including active final shaping in preparation for rehabilitation. The site has established suitable landforms and successful rehabilitation of forest communities are well underway to achieving final completion criteria. Ecological succession was observed in the older rehabilitation.

Community concerns are well managed and are recorded within the Duralie Community Complaints Register, which was viewed during the site component of the audit. The number of complaints received has decreased substantially during the audit period compared to previous years. This audit has concluded that a good standard of environmental management is being applied in Duralie Coal Mine Operations.

The IEA report also provided a series of recommendations arising from a review of site documentation and identified non-compliances. DP&E have requested an update on the IEA Responses to Recommendations to be included in this Annual Review. Accordingly, the status of actions against each audit recommendations are included in **Appendix 9**.

The full audit report and responses to the recommendations are available on the Duralie Coal website at <http://www.duraliecoal.com.au>. The next Independent Environmental Audit of the DCM is scheduled to be undertaken prior to the end of 2020.

11. **INCIDENTS AND NON-COMPLIANCE**

Activities at the DCM continue to be carried out in accordance with Project Approval 08_0203.

A protocol for managing incidents and non-compliances is included in the DCM Environmental Management Strategy. A statement of compliance is included in **Section 1**. During the reporting period there was one incident/non-compliance at the Duralie Coal Mine in addition to non-compliances identified during the IEA 2017. A summary is included in **Table 3** and **Appendix 9**.

The non-compliance related to one dust deposition sample not being recorded during the month of February 2018 as the dust gauge was damaged when struck by a tractor undertaking slashing. The non-compliances identified during the IEA 2017 related to environmental management plans and the reporting of incidents. These non-compliances have also been discussed within the relevant sections in this report.

No further action was taken by neither DPE nor EPA in relation to the non-compliances.

12. **ACTIVITIES PROPOSED IN THE NEXT AR PERIOD**

The following environmental targets have been set for the next 12 months:

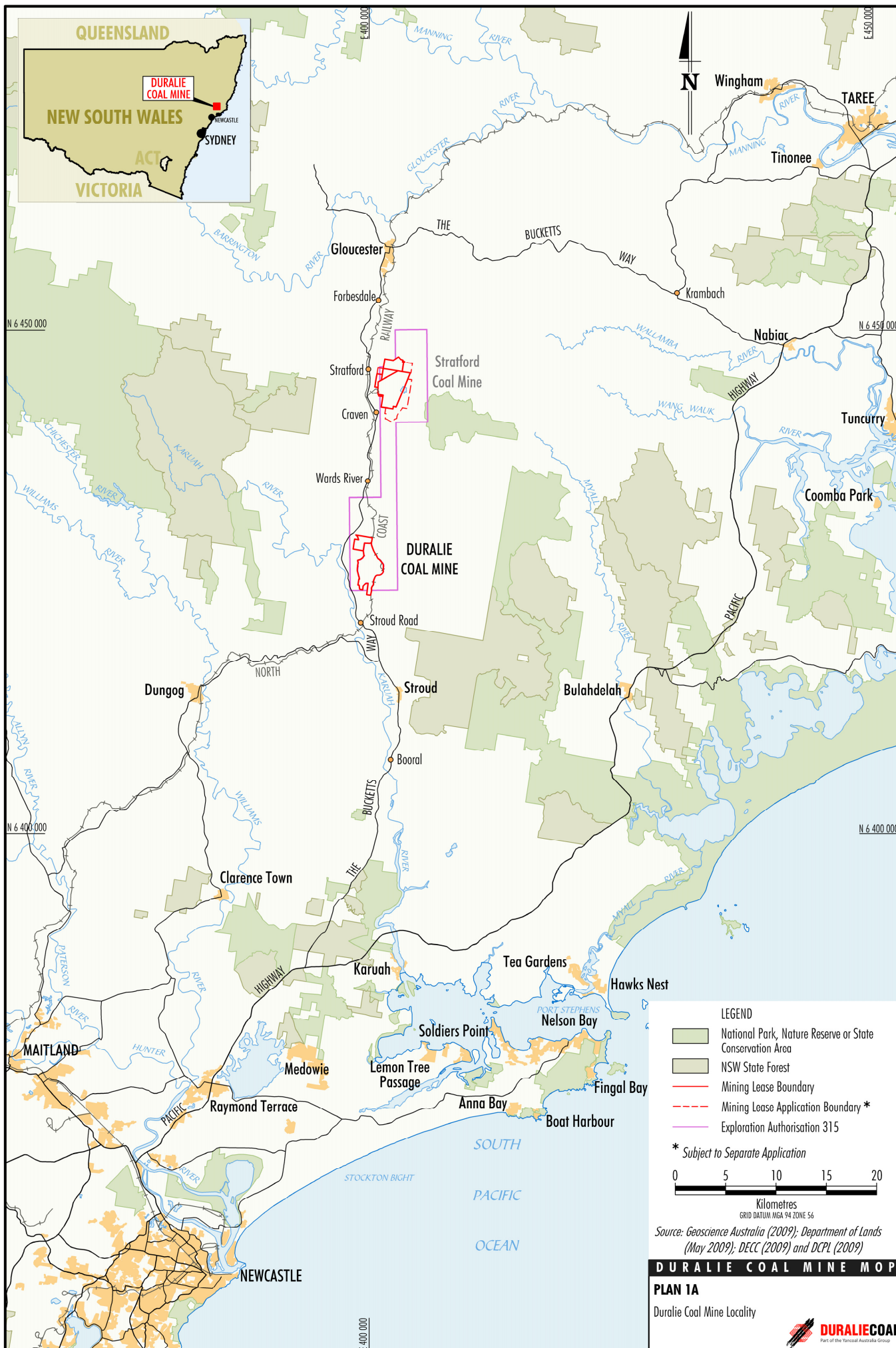
- Progress rehabilitation works to satisfy DEP EA and MOP nominated rehabilitation targets;
- Progress biodiversity offset works in accordance with the BMP including full implementation of the revegetation works;
- Maintain low level of complaints reported to the mine; and
- Continuing developing the detailed Mine Closure Plans in accordance with the mine closure planning schedule in the MOP for the Duralie Coal Mine.

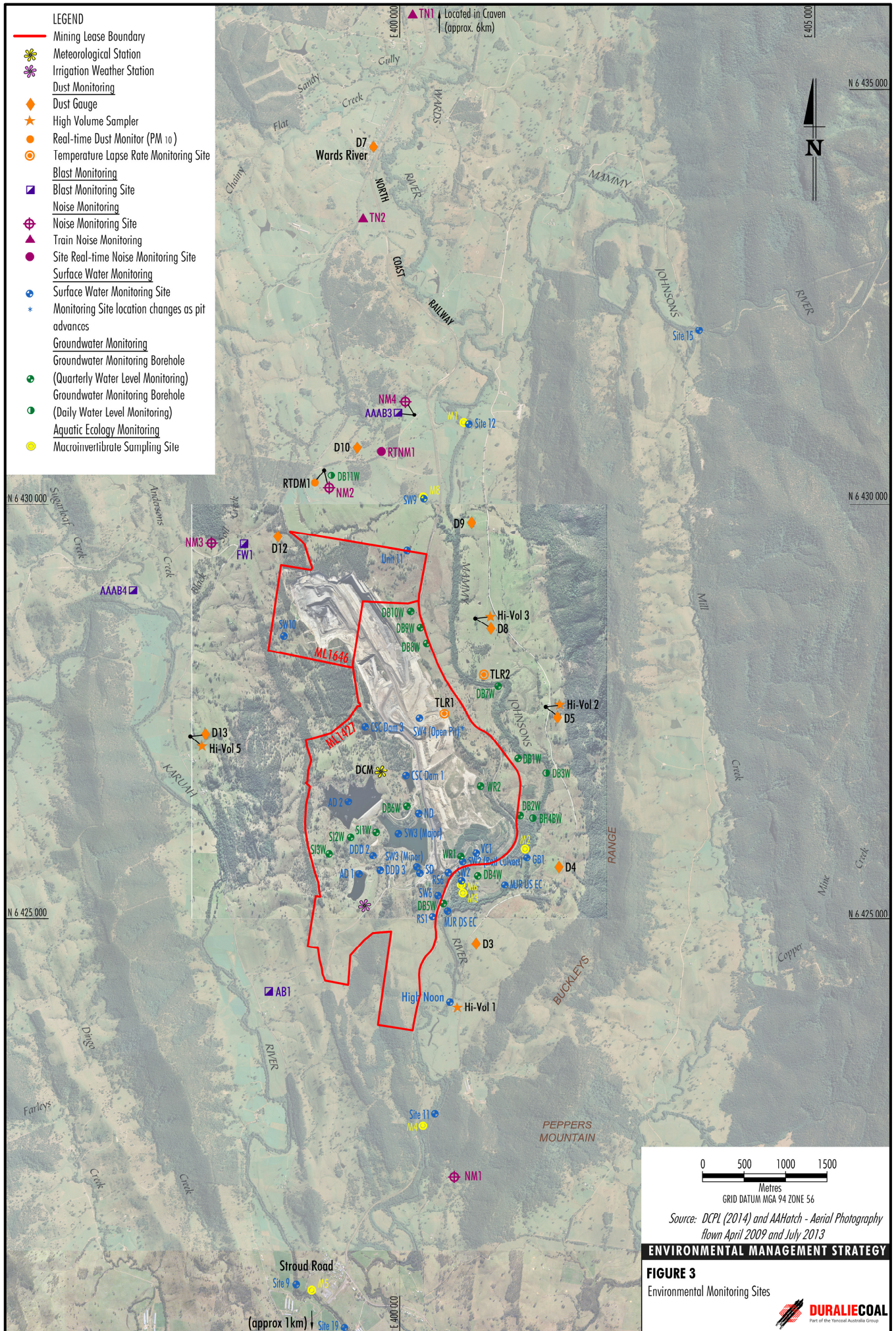
13. **REFERENCES**

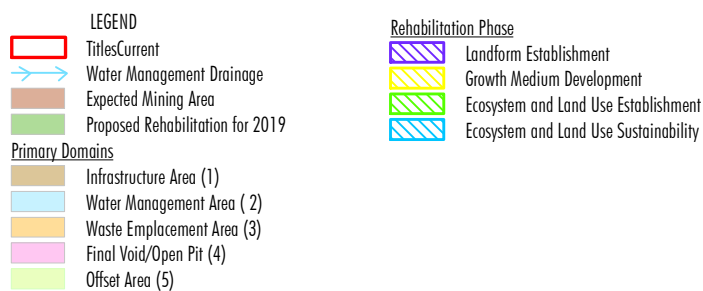
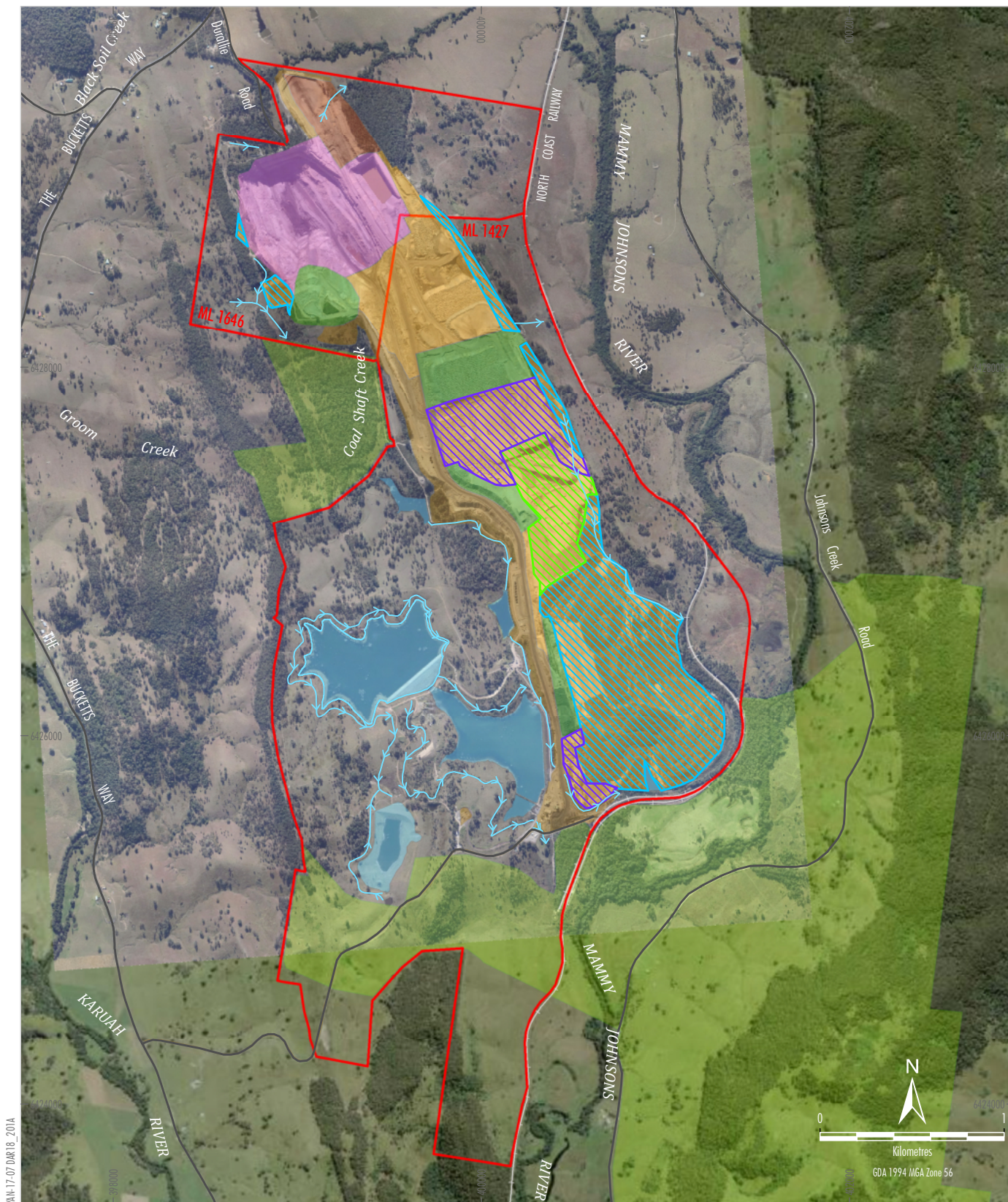
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Appendix 1:

- **Site Locality Plan**
- **Monitoring Locations**
- **Disturbed and Rehabilitated Land Plan.**







Source: © State of New South Wales and Department of Planning and Environment (2017); © Department Finance, Services & Innovation (2018); Yancoal (2016)

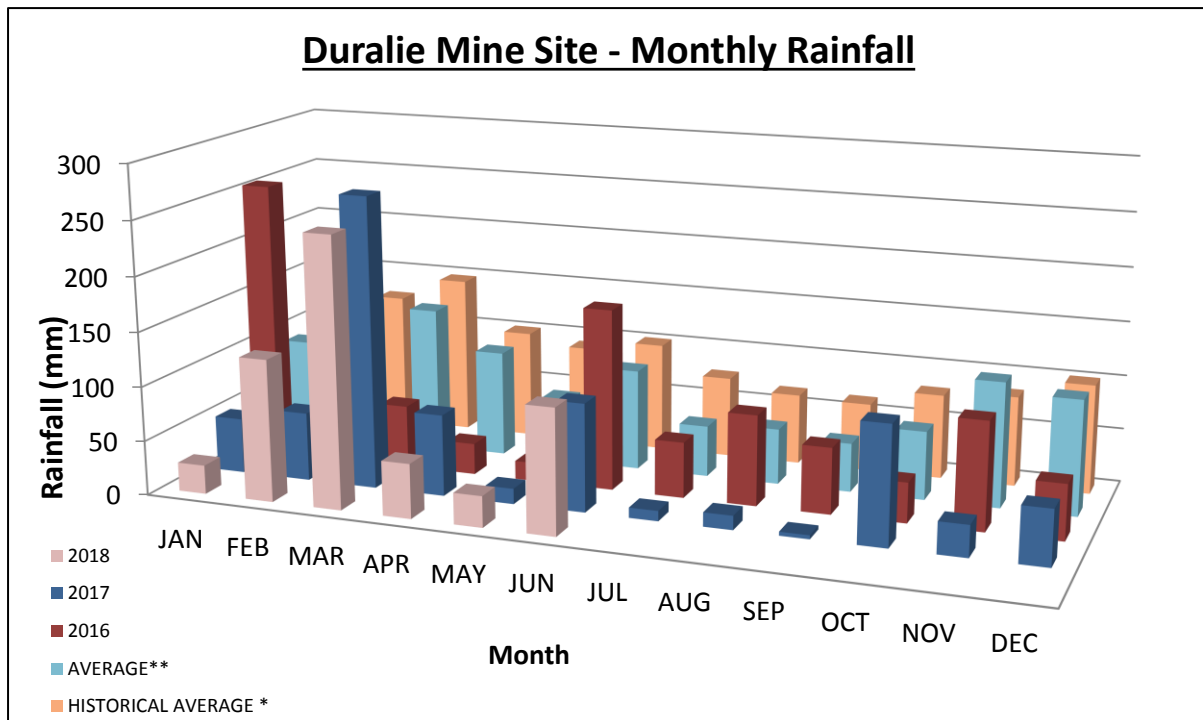


DURALIE COAL MINE REVIEW 2018
Mining and Rehabilitation Areas

Figure 3

Appendix 2:

Meteorological Monitoring



*Stroud + Duralie 1889 to 2010 (inclusive)

**Duralie Mine 2002 – 2018 (inclusive)

Figure 2-1: Monthly Rainfall for 2017 to 2018 and Historical Averages

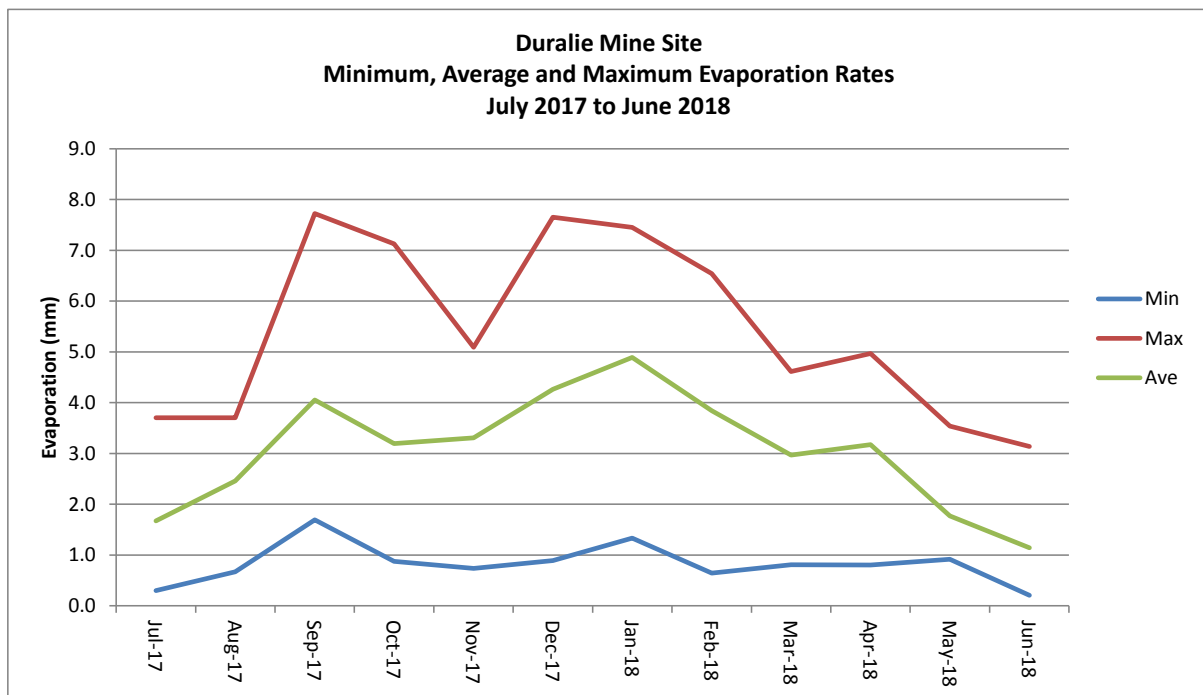


Figure 2-2: Minimum, Maximum and Average Evaporation Rates During the Reporting Period

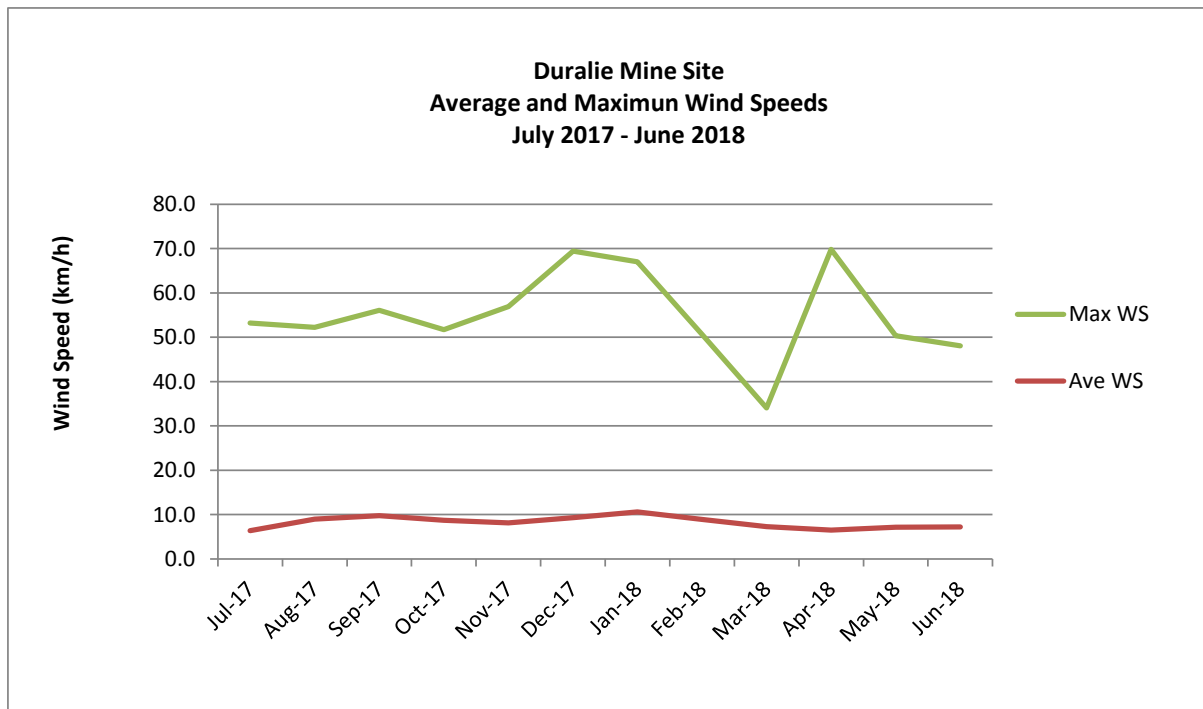


Figure 2-3: Maximum and Average Wind Speeds During the Reporting Period

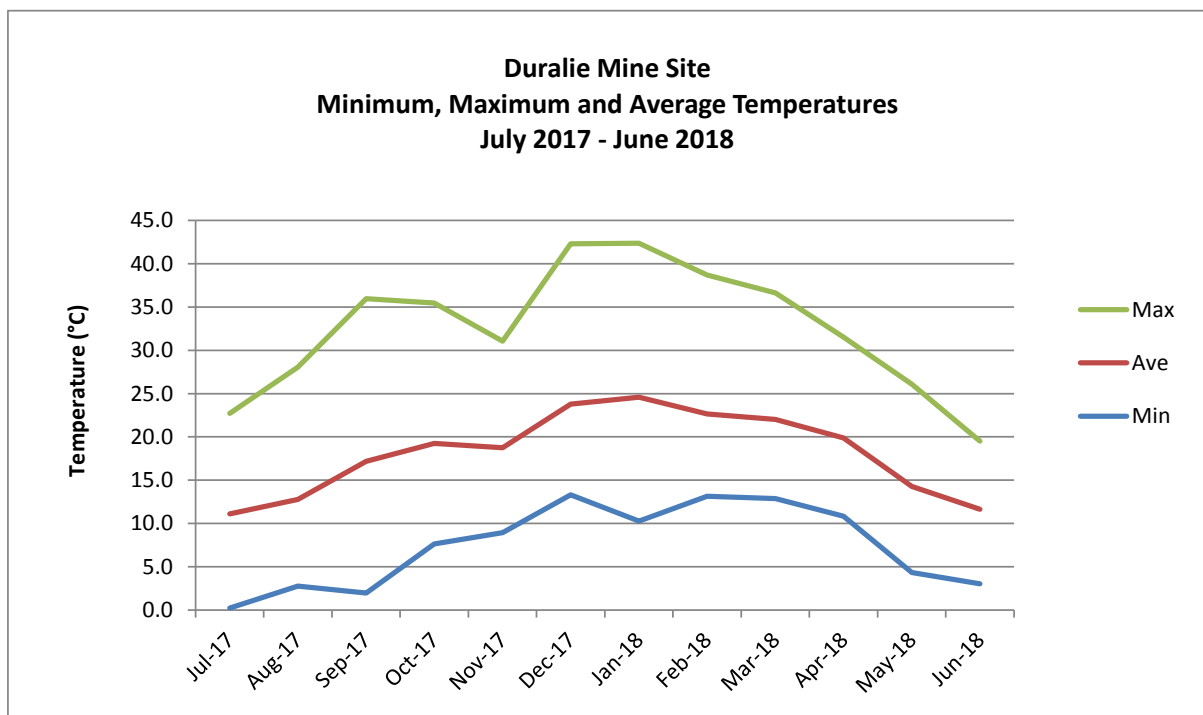
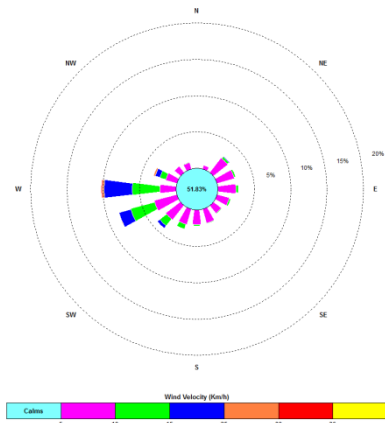
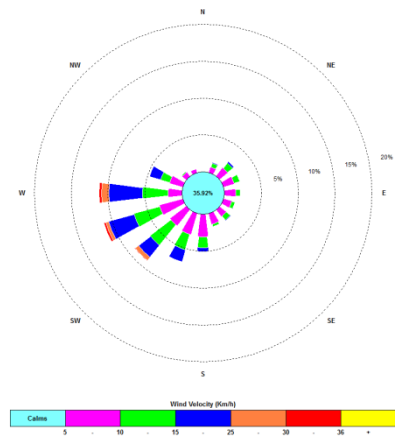


Figure 2-4: Minimum, Maximum and Average Temperatures During the Reporting Period

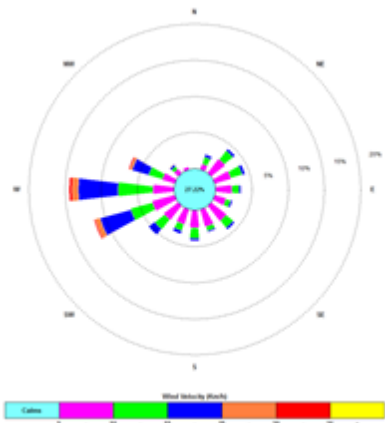
July 2017



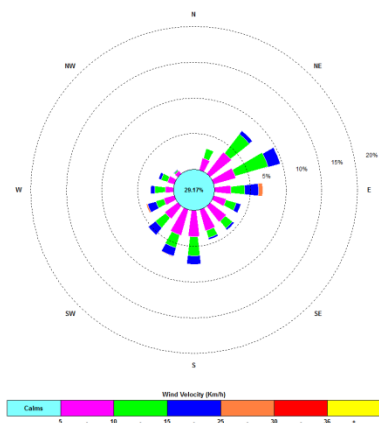
August 2017



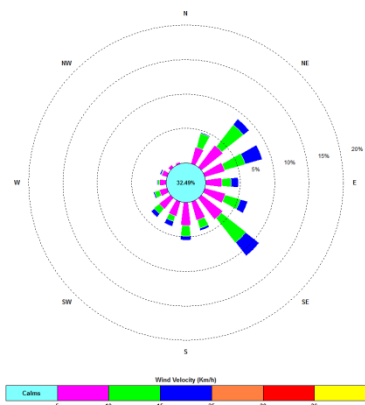
September 2017



October 2017



November 2017



December 2017

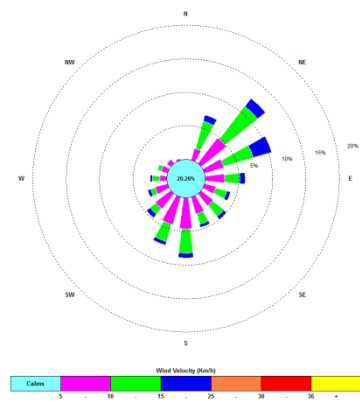
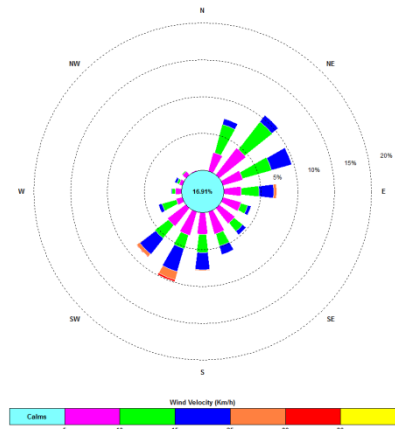


Figure 2-5: Monthly Windroses showing wind direction, speed and frequencies

January 2018



Appendix 3:

Air Quality Monitoring Results

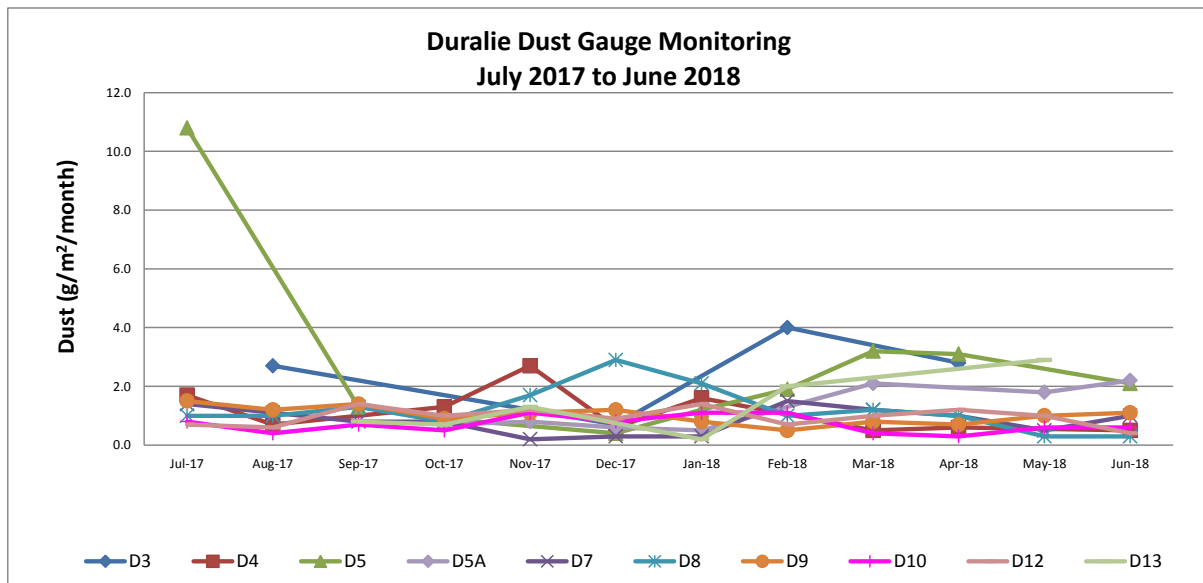


Figure 3-1: Monthly Depositional Dust Monitoring Results (minus contaminated results) during the Reporting Period

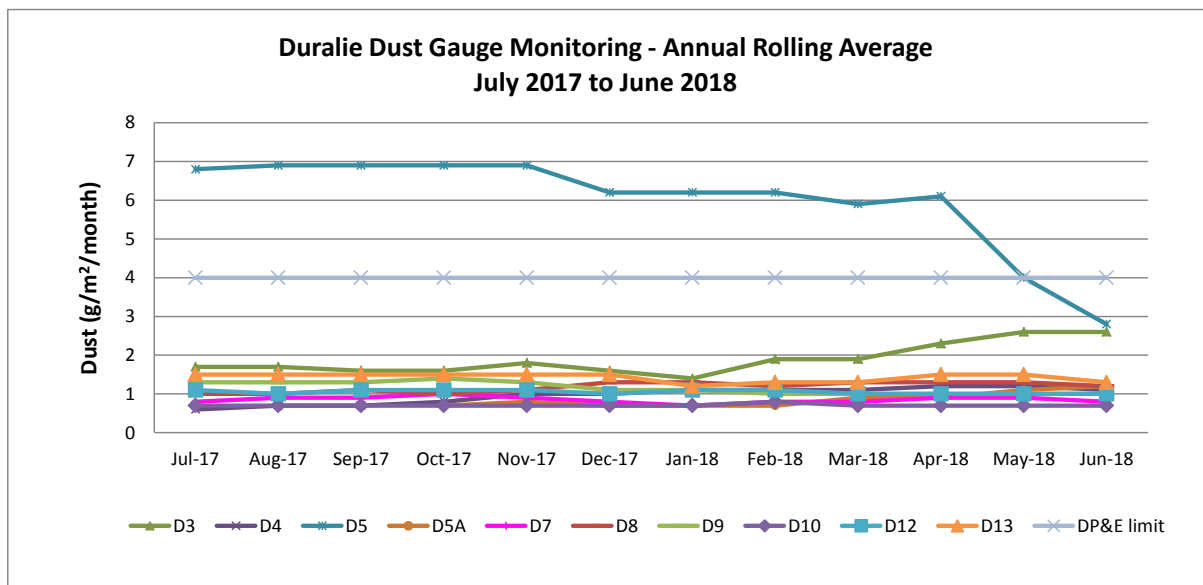


Figure 3-2: Rolling Annual Average Depositional Dust Monitoring Results (minus contaminated results) during the Reporting Period

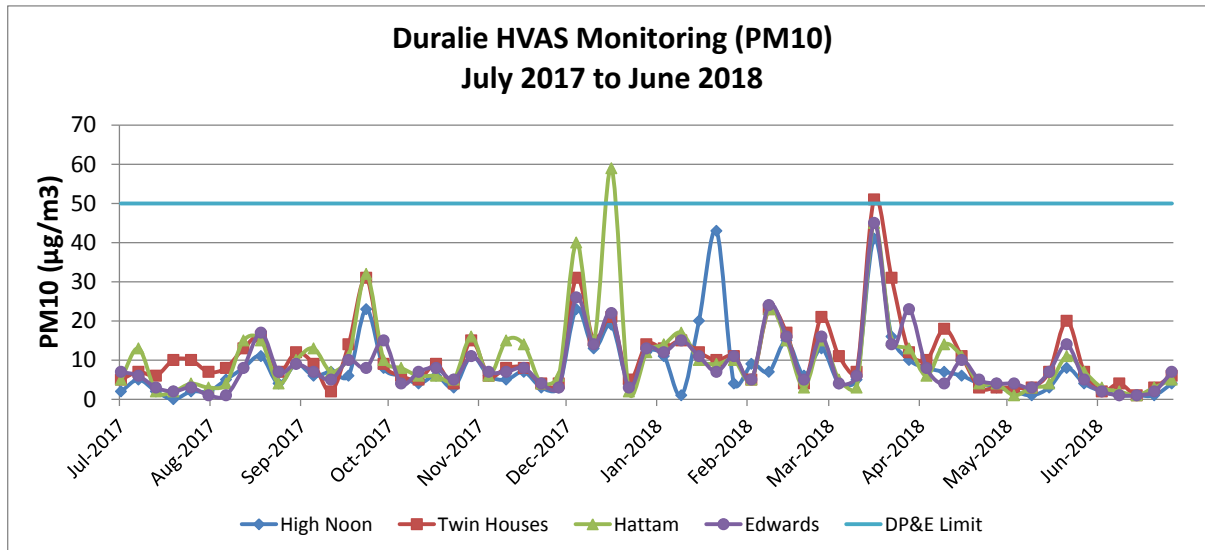


Figure 3-3: High Volume Air Sampling (PM₁₀) Results during the Reporting Period

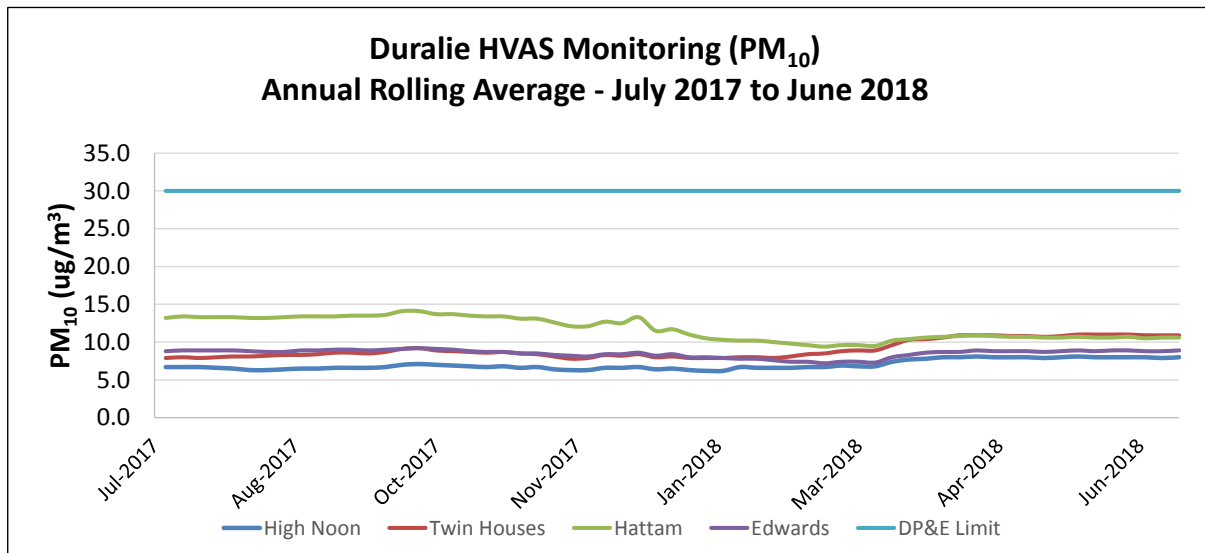


Figure 3-4: Rolling Annual Average HVAS (PM₁₀) Results during the Reporting Period

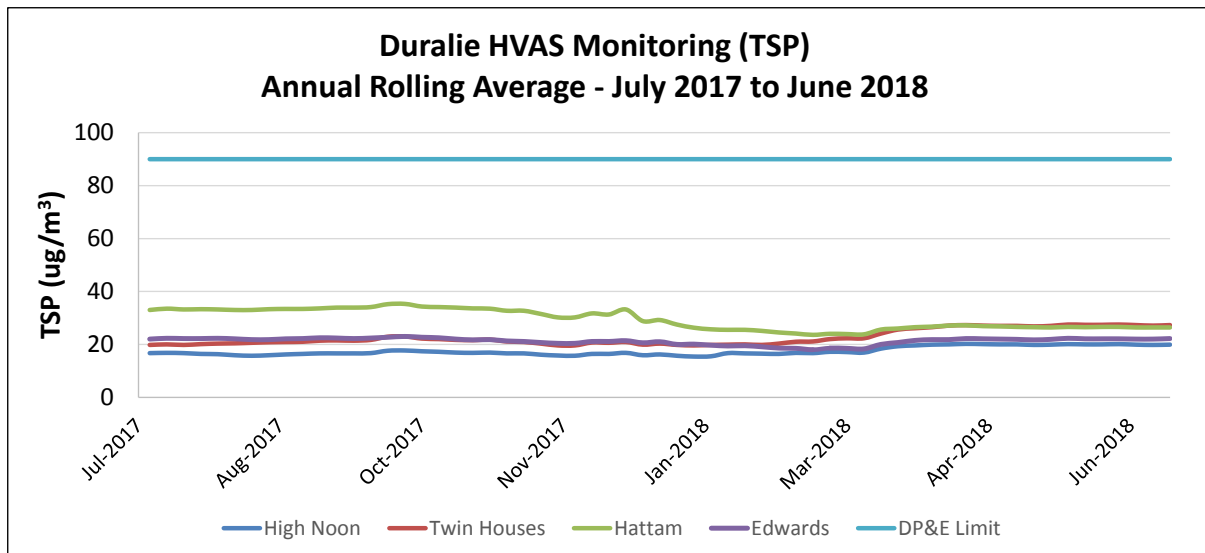


Figure 3-5: Rolling Annual Average HVAS (TSP) Results during the Reporting Period

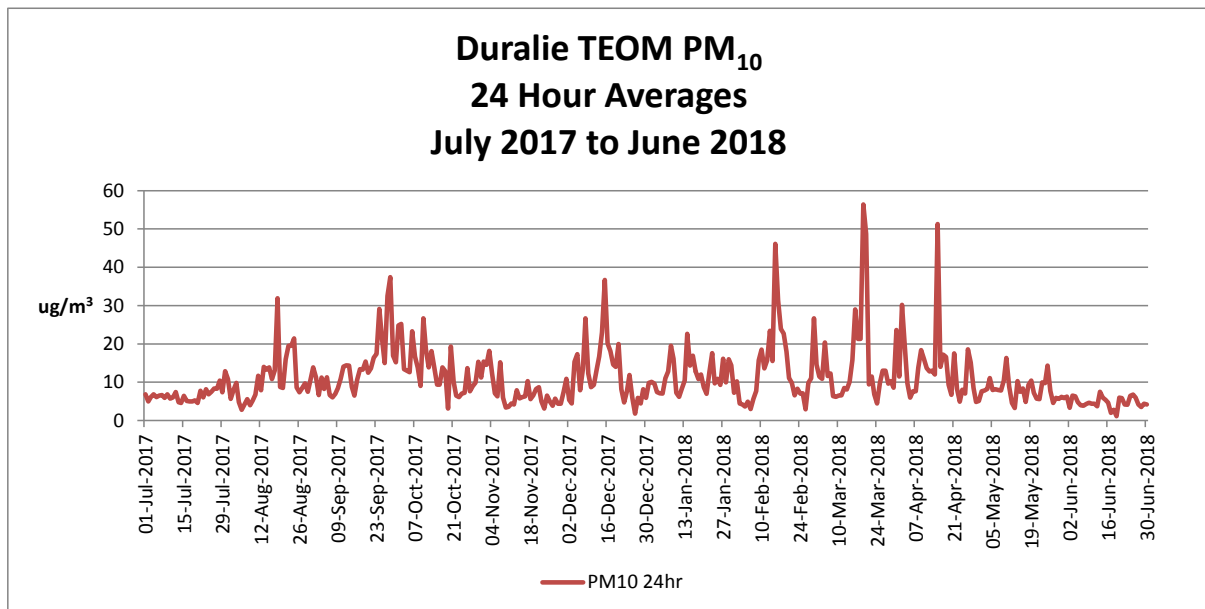


Figure 3-6: Real Time Dust Monitoring (PM₁₀) Results during the Reporting Period

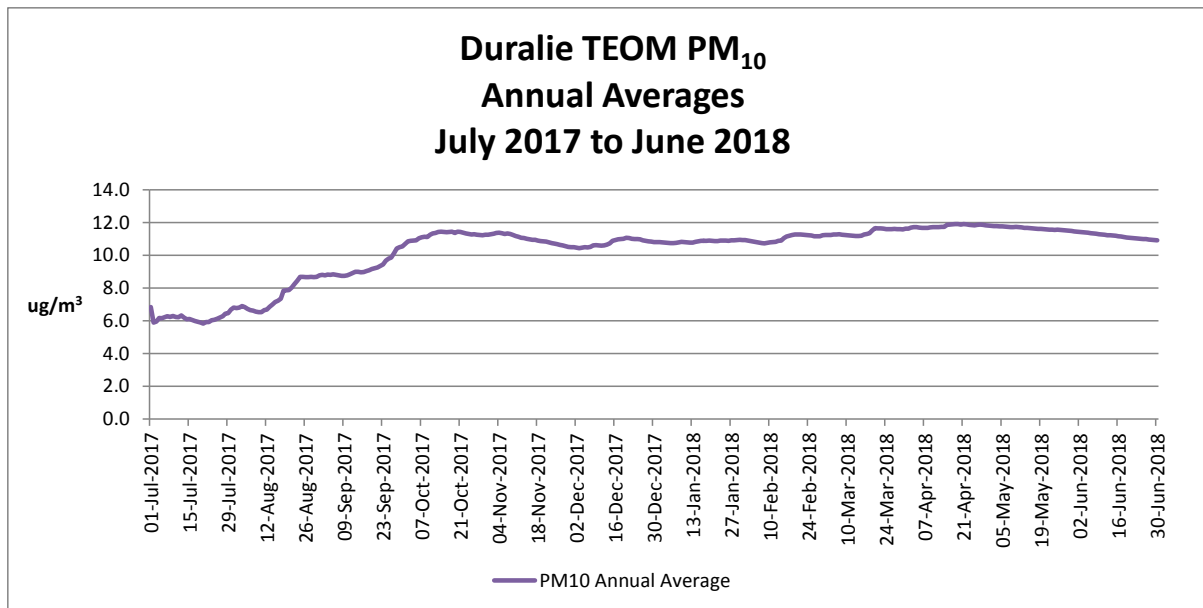


Figure 3-7: Rolling Annual Average TEOM (PM₁₀) Results during the Reporting Period

Real Time Dust Monitoring (PM₁₀) Results during the Reporting Period

	PM10 24hr	PM10 Annual Average		PM10 24hr	PM10 Annual Average		PM10 24hr	PM10 Annual Average		PM10 24hr	PM10 Annual Average		PM10 24hr	PM10 Annual Average		PM10 24hr	PM10 Annual Average
1/07/2017	6.8	6.8	1/09/2017	11.3	8.8	1/11/2017	15.4	11.3	1/01/2018	10.1	10.8	1/03/2018	26.7	11.2	1/05/2018	7.6	11.8
2/07/2017	5.0	5.9	2/09/2017	6.6	8.8	2/11/2017	14.5	11.3	2/01/2018	9.6	10.8	2/03/2018	14.6	11.2	2/05/2018	7.8	11.8
3/07/2017	6.1	6.0	3/09/2017	11.2	8.8	3/11/2017	18.2	11.4	3/01/2018	7.4	10.8	3/03/2018	11.5	11.2	3/05/2018	8.2	11.8
4/07/2017	6.8	6.2	4/09/2017	8.2	8.8	4/11/2017	12.3	11.4	4/01/2018	7.1	10.8	4/03/2018	10.9	11.2	4/05/2018	11.1	11.8
5/07/2017	6.1	6.2	5/09/2017	11.3	8.8	5/11/2017	7.1	11.3	5/01/2018	7.0	10.7	5/03/2018	20.4	11.3	5/05/2018	7.9	11.8
6/07/2017	6.5	6.2	6/09/2017	6.7	8.8	6/11/2017	6.3	11.3	6/01/2018	11.0	10.7	6/03/2018	11.6	11.3	6/05/2018	8.1	11.7
7/07/2017	6.6	6.3	7/09/2017	6.0	8.8	7/11/2017	15.2	11.3	7/01/2018	12.8	10.8	7/03/2018	12.3	11.3	7/05/2018	7.9	11.7
8/07/2017	5.9	6.2	8/09/2017	6.9	8.7	8/11/2017	6.0	11.3	8/01/2018	19.5	10.8	8/03/2018	6.4	11.3	8/05/2018	7.8	11.7
9/07/2017	6.8	6.3	9/09/2017	8.4	8.7	9/11/2017	3.4	11.2	9/01/2018	16.1	10.8	9/03/2018	6.2	11.2	9/05/2018	10.4	11.7
10/07/2017	5.7	6.2	10/09/2017	10.9	8.8	10/11/2017	3.6	11.2	10/01/2018	7.2	10.8	10/03/2018	6.5	11.2	10/05/2018	16.3	11.7
11/07/2017	6.1	6.2	11/09/2017	14.1	8.8	11/11/2017	4.4	11.1	11/01/2018	6.2	10.8	11/03/2018	6.6	11.2	11/05/2018	8.9	11.7
12/07/2017	7.4	6.3	12/09/2017	14.4	8.9	12/11/2017	4.2	11.1	12/01/2018	8.4	10.8	12/03/2018	8.5	11.2	12/05/2018	4.6	11.7
13/07/2017	4.8	6.2	13/09/2017	14.3	9.0	13/11/2017	7.9	11.1	13/01/2018	10.4	10.8	13/03/2018	8.1	11.2	13/05/2018	3.3	11.7
14/07/2017	4.6	6.1	14/09/2017	8.7	9.0	14/11/2017	5.8	11.0	14/01/2018	22.6	10.8	14/03/2018	10.1	11.2	14/05/2018	10.3	11.7
15/07/2017	6.4	6.1	15/09/2017	6.5	9.0	15/11/2017	6.1	11.0	15/01/2018	14.3	10.8	15/03/2018	15.8	11.2	15/05/2018	7.5	11.7
16/07/2017	5.1	6.1	16/09/2017	10.7	9.0	16/11/2017	6.3	10.9	16/01/2018	16.9	10.9	16/03/2018	29.0	11.3	16/05/2018	8.4	11.6
17/07/2017	5.0	6.0	17/09/2017	13.4	9.0	17/11/2017	10.3	10.9	17/01/2018	12.8	10.9	17/03/2018	21.3	11.3	17/05/2018	4.9	11.6
18/07/2017	5.0	5.9	18/09/2017	13.3	9.1	18/11/2017	5.6	10.9	18/01/2018	10.8	10.9	18/03/2018	21.3	11.3	18/05/2018	9.3	11.6
19/07/2017	5.3	5.9	19/09/2017	15.4	9.2	19/11/2017	6.6	10.9	19/01/2018	12.0	10.9	19/03/2018	56.4	11.5	19/05/2018	10.4	11.6
20/07/2017	4.6	5.8	20/09/2017	12.5	9.2	20/11/2017	8.2	10.9	20/01/2018	8.7	10.9	20/03/2018	48.7	11.7	20/05/2018	7.2	11.6
21/07/2017	7.7	5.9															

DCPL Real-time Dust Monitoring Response Register

**Note: Alarming operational as of January 2014.*

**Note: For the baseline data from the 12 month period April 2012 to April 2013, no exceedances of the 24-hour average criterion of 50 µg/m³ were recorded.*

Alarm		Validate Data	Source Identification	Management Strategy	Review
Alarm Date/Time	What Performance Indicator has been exceeded?	Assess potential for influence of extreme activities or irregular events non-mine related.	Visually assess if excessive dust being generated and identify source?	Management measure taken, i.e. Additional mitigation measures applied or ceasing of activities.	Review of real-time data to determine whether the management strategy has resulted in a discernible dust reduction.
2017-09-24,18:10:19	PM10>25=25.1 Hi	Extended period of dry weather and strong winds. Smoke haze from bushfires.	N/A	N/A	N/A
2017-09-27,13:23:37	MED24H=25.32M/ug Hi	Thick smoke haze from bushfires near Dungog all day.	N/A	N/A	N/A
2017-10-20,08:29:06	PM10>100=326.5 Hi	Calibration and filter changes.	N/A	N/A	N/A
2018-02-06,11:37:18	PM10>100=-233.5	Faulty reading, negative value.	N/A	N/A	N/A
2018-02-15,08:07:43	MED24H=25.72M/ug	Very dry and hazy. Some smoke	No visible dust from operations.	N/A	N/A
2018-03-01,17:08:34	MED24H=25.48M/ug	Spike in PM10 following southerly change. 1min max PM10 was 50ug/m3 and 24hr ave max was 26ug/m3 and the decreased.	No visible dust from operations.	Water cart operating.	
2018-03-19,09:10:00	MED24H=25.72M/ug	Very hazy conditions throughout valley. Spike in PM10 following southerly change. 1min max PM10 was 50ug/m3 and 24hr ave max was 25ug/m3 and then decreased .	No operations on day prior to alarm which could have contributed to the 24hr alarm. Operations commence Monday morning.	Water cart operating.	N/A
2018-04-27,10:08:33,	MED24H=25.49M/ug Hi	South winds. Hazy conditions from back burning smoke south of the Gloucester basin.	N/A	N/A	N/A

Appendix 4:

Surface Water and Groundwater Monitoring

Surface Water

SW2 - Coal Shaft Creek

EPL 11701 Point 30

Date	Category	Comment	ph	EC uS/cm	Turbidity NTU	DO %	TSS mg/l	Alkalinity (as CaCO ₃) mg/l	Acidity (as CaCO ₃) mg/l	SO ₄ mg/l	Cl mg/l	Ca mg/l	Mg mg/l	Al mg/l	Mn mg/l	Zn mg/l	Fe mg/l	Cu mg/l
27-Jul-17	Monthly	Low flow clear	7.5	564	4	5	<5	109	4	64	76	23	22	0.05	0.149	0.007	0.74	<0.001
28-Aug-17	Monthly	Trickle, Clear	7.6	705	4	28	8	134	10	49	105	29	24	0.002	0.809	<0.005	1.04	<0.001
12-Sep-17	Macro						10	168	9	44	130	33	29	0.11	0.098	0.046	0.75	<0.001
27-Sep-17	Monthly	Nil flow																
27-Oct-17	Monthly	Mod flow	7.1	471	61.4	50	38	49	12	84	53	17	15	0.42	0.212	0.025	0.83	0.002
27-Nov-17	Monthly	Nil flow																
27-Dec-17	Monthly	Nil flow																
31-Jan-18	Monthly	Dry																
26-Feb-18	Monthly	Nil flow																
6-Mar-18	Discharge Event	Low flow	7.0	716	20.6	61	13	28	18	193	56	26	17	0.41	1.030	0.107	4.5	0.002
16-Mar-18	Ecotox	brown	6.9	808	34.6													
21-Mar-18	Discharge	High	7.6	450	311.0		85											
22-Mar-18	Discharge	fast, Light Brown	7.1	418	138.0		86											
23-Mar-18	Discharge	Flow	7.6	302	81.9		163											
24-Mar-18	Discharge	High, Light brown	6.6	339	42.2		19											
26-Mar-18	Discharge	moderate, Brown	7.5	353	35.9		37											
27-Mar-18	Discharge	moderate, clear	7.1	329	31.7		18											
28-Mar-18	Discharge	Slow, Light brown	7.1	497	21.6		6											
26-Apr-18	Monthly	Clear	7.7	385	21.4	76	12	105	19	34	43	18	14	0.08	0.684	<0.005	3.92	<0.001
29-May-18	Monthly	Still pools, Clear	7.1	557	15.5	24	<5	143	16	19	74	24	20	0.02	0.749	<0.005	3.07	<0.001
19-Jun-18	Discharge Event	Steady, brown	6.9	405	37.9	83	35	52	11	63	52	17	13	1.39	0.225	0.011	3.13	0.001
20-Jun-18	Discharge	MJR, Water level very	7.1	390	57.3		22											
21-Jun-18	Discharge	Moderate, clear	7.2	278	15.4		<5											
22-Jun-18	Discharge	Slow, clear	7.4	274	7.4		<5											
29-Jun-18	Discharge	Slow, clear	7.4	319	10.7		<5											
Min			6.6	274	3.5		6	28	4	19	43	17	13	0.00	0.098	0.007	0.74	0.001
Avg			7.2	451	50.1		39	99	12	69	74	23	19	0.31	0.495	0.039	2.25	0.002
Max			7.7	808	311.0		163	168	19	193	130	33	29	1.39	1.030	0.107	4.50	0.002
Var			0.1	24328	5030.5		1934	2544	25	2916	901	35	31	0.22	0.131	0.002	2.47	0.000
SD			0.3	156	70.9		44	50	5	54	30	6	6	0.47	0.362	0.041	1.57	0.001
*Water Quality Trigger			7.1 - 7.9	544	119	85 - 110%	80							3.02		0.064		0.003

*Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000). "Gilberts & Associates 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

SW2 RC - Coal Shaft Creek at Rail Siding Culvert (Entrance)

Date	Category	Comment	ph	EC uS/cm	Turbidity NTU	DO %	TDS mg/l	TSS mg/l	Hardness mg/l	Alkalinity (as CaCO ₃) mg/l	Acidity (as CaCO ₃) mg/l	SO ₄ mg/l	Cl mg/l	Ca mg/l	Mg mg/l	Al mg/l	Mn mg/l	Zn mg/l	Fe mg/l	CO ₃ CaCO ₃ mg/l	Bicarb (as CaCO ₃) mg/l	BOD mg/l	Na mg/l
27-Jul-17	Monthly	Low flow clear	7.8	548	1.16	7.61	284	<5	144	105	2	65	54	23	21	0.04	0.02	0.007	0.14	<1	105	<2	56
28-Aug-17	Monthly	Trickle, Clear	8.0	629	3.45	77.7	329	9	168	103	5	76	68	26	25	0.04	0.099	0.013	0.34	<1	103	2	70
27-Sep-17	Monthly	Nil flow																					
27-Oct-17	Monthly	Mod flow	6.6	426	330	94	220	169	147	42	4	172	58	26	20	5.37	0.082	0.045	3.92	<1	42	<2	65
27-Nov-17	Monthly	Nil flow																					
27-Dec-17	Monthly	Nil flow																					
31-Jan-18	Monthly	Nil flow																					
26-Feb-18	Monthly	Nil flow																					
6-Mar-18	Discharge Event	Low flow	7.1	956	15.7	91	612	8	198	30	12	269	110	35	27	0.37	0.032	0.051	0.5	<1	30	<2	84
16-Mar-18	Monthly	Slow flow, clear	7.9	419	4.22	136.2	258	6	109	85	2	49	55	19	15	0.14	0.048	0.009	0.2	<1	85	<2	45
29-May-18	Monthly	No flow, clear	7.4	495	1.1	72.5	317	16	136	101	4	69	57	23	19	0.02	0.076	0.007	0.12		101	<2	54
19-Jun-18	Discharge Event	Steady flow, brown	7.2	474	90.8	99.4	303	76	126	49	2	115	45	24	16	1.78	0.03	0.036	1.66	<1	49	<2	49
Min			6.6	419	1.1	7.6	220	6	109	30	2	49	45	19	15	0.02	0.020	0.007	0.12	<1	30	<2	45
Avg			7.4	564	63.9	92.5	333	47	147	74	4	116	64	25	20	1.11	0.055	0.024	0.98	<1	74	3	60
Max			8.0	956	330.0	136.2	612	169	198	105	12	269	110	35	27	5.37	0.099	0.051	3.92	<1	105	2	84
Var			0.3	35179	14825.3	1517.5	16401	4266	843	1039	13	6241	460	24	19	3.93	0.001	0.000	1.97		1039		183
SD			0.5	188	121.8	39.0	128	65	29	32	4	79	21	5	4	1.98	0.030	0.019	1.40		32		14
*Water Quality Trigger			7.1 - 7.9	544	119	85 - 110%	80									3.02		0.064					

*Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000). "Gilberts & Associates 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

SW2 RC - Coal Shaft Creek at Rail Siding Culvert (Entrance)

Date	As mg/l	Ba mg/l	Cd mg/l	Cr mg/l	Cu mg/l	Pb mg/l	Mo mg/l	Ni mg/l	Se mg/l	Ag mg/l	U mg/l	B mg/l	Hg mg/l	F mg/l	NH3 (as N) mg/l	NO2 (as N) mg/l	NO3 (as N) mg/l	N mg/l	P mg/l	
27-Jul-17	<0.001	0.02	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	0.1	<0.01	<0.01	<0.01	0.4	<0.01	
28-Aug-17	<0.001	0.029	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.05	0.4	<0.01	
27-Oct-17	<0.001	0.071	<0.0001	0.002	0.003	0.002	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	0.1	<0.01	<0.01	0.16	0.5	0.04	
6-Mar-18	<0.001	0.053	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.03	<0.01	0.11	0.5	<0.01	
26-Apr-18	<0.001	0.037	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.08	0.5	<0.01	
29-May-18	<0.001	0.021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	0.1	<0.01	<0.01	0.02	0.3	<0.01	
19-Jun-18	<0.001	0.029	<0.0001	<0.001	0.002	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.13	<0.01	0.22	0.6	0.02	
Min	<0.001	0.020		<0.001	<0.001	<0.001		<0.001						<0.1	<0.01		<0.01	0.3	<0.01	
Avg		0.037		0.002	0.003	0.002		0.002							0.08			0.11	0.5	0.03
Max	0.003	0.071		0.002	0.003	0.002		0.002						0.1	0.13		0.22	0.6	0.04	
Var		0.000		#DIV/0!	0.000	#DIV/0!		0.000							0.01		0.01	0.0	0.00	
SD		0.019		#DIV/0!	0.001	#DIV/0!		0.000							0.07		0.07	0.1	0.01	
*Water Quality Trigger					0.003										0.05			1.2	0.08	

*Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000). "Gilberts & Associates 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

SW6

Date	Category	Comment	ph	EC uS/cm	Turbidity NTU	DO %	TSS mg/l	Alkalinity (as CaCO ₃) mg/l	Acidity (as CaCO ₃) mg/l	SO ₄ mg/l	Cl mg/l	Ca mg/l	Mg mg/l	Al mg/l	Mn mg/l	Zn mg/l	Fe mg/l	Cu mg/l
27-Jul-17	Monthly	Dry																
28-Aug-17	Monthly	No Flow																
27-Sep-17	Monthly	No flow																
27-Oct-17	Monthly	No flow																
27-Nov-17	Monthly	Nil flow																
27-Dec-17	Monthly	Nil flow																
31-Jan-18	Monthly	No flow																
26-Feb-18	Monthly	Mod flow	7.4	252	218	92	102	28	2	64	17	13	7	4.05	0.046	0.037	3.2	0.007
6-Mar-18	Discharge Event	Low Flow	7.0	956	12	51	14	42	8	343	59	46	24	0.26	0.016	<0.005	0.28	<0.001
26-Apr-18	Monthly	Dry																
29-May-18	Monthly	Dry																
19-Jun-18	Discharge Event	Trickle flow, brown	7.5	881	47	94	36	70	5	267	64	49	33	0.52	0.019	0.006	0.56	0.002
Min			7.0	252	12	51	14	28	2	64	17	13	7	0.26	0.016	0.006	0.28	0.002
Avg			7.3	696	92	79	51	47	5	225	47	36	21	1.61	0.027	0.022	1.35	0.005
Max			7.5	956	218	94	102	70	8	343	64	49	33	4.05	0.046	0.037	3.20	0.007
Var			0.1	149480	12150	589	2097	457	9	20804	666	399	174	4.48	0.000	0.000	2.60	0.000
SD			0.3	387	110	24	46	21	3	144	26	20	13	2.12	0.017	0.022	1.61	0.004
*Water Quality Trigger			7.1 - 7.9	544	119	85 - 110%	80							3.02		0.064		0.003

*Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).

*Gilberts & Associates 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

SW9 - Un-named Tributary (Fisher-Webster)

Date	Category	Comment	ph	EC uS/cm	Turbidity NTU	DO %	TDS mg/l	TSS mg/l	Hardness mg/l	Alkalinity (as CaCO ₃) mg/l	Acidity (as CaCO ₃) mg/l	SO ₄ mg/l	Cl mg/l	Ca mg/l	Mg mg/l	Al mg/l	Mn mg/l	Zn mg/l	Fe mg/l	CO ₂ (as CaCO ₃) mg/l	Bicarb (as CaCO ₃) mg/l	BOD mg/l	Na mg/l
27-Jul-17	Monthly	Nil flow																					
28-Aug-17	Monthly	No Flow																					
12-Sep-17	Macro	No flow																					
27-Sep-17	Monthly	No Flow																					
27-Oct-17	Monthly	Dry/ No flow																					
27-Nov-17	Monthly	Nil flow																					
27-Dec-17	Monthly	Nil flow																					
27-Dec-17	Monthly	Nil flow																					
31-Jan-18	Monthly	Dry/ No flow																					
26-Feb-18	Monthly	Nil flow																					
6-Mar-18	Discharge Event	No Flow																					
26-Apr-18	Monthly	bw, brown, Water in	7.1	331	7.63	33.5	211.8	6	83	66	16	<10	56	15	11	0.24	0.702	<0.005	4.71	<1	66	3	35
29-May-18	Monthly	Dry																					
19-Jun-18	Discharge Event	sample not collected																					
20-Jun-18	Additional	Slow flow	7.6	133.4	72.6	102.6	85.38	30	20	15	4	11	22	3	3	1.66	0.035	0.012	1.94	<1	15	7	14
Min			7.1	133	8	34	85	6	20	15	4	11	22	3	3	0.24	0.035	0.012	1.94		15	3	14
Avg			7.3	232	40	68	149	18	52	41	10	11	39	9	7	0.95	0.369	0.012	3.33		41	5	25
Max			7.6	331	73	103	212	30	83	66	16	11	56	15	11	1.66	0.702	0.012	4.71		66	7	35
Var			0.1	19523	2124	2387	7991	288	1985	1301	72	###	578	72	32	1.01	0.222	#DIV/0!	3.84		1391		221
SD			0.3	140	46	49	89	17	45	36	8	###	24	8	6	1.00	0.472	#DIV/0!	1.96		36		15
*Water Quality Trigger			6.4 - 7.1	461	94	85 - 110%	57									2.96		0.024					

*Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).

*Gilberts & Associates 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

SW9 - Un-named Tributary (Fisher-Webster)

Date	As mg/l	Ba mg/l	Cd mg/l	Cr mg/l	Cu mg/l	Pb mg/l	Mo mg/l	Ni mg/l	Se mg/l	Ag mg/l	U mg/l	B mg/l	Hg mg/l	F mg/l	NH ₃ (as N) mg/l	NO ₂ (as N) mg/l	NO ₃ (as N) mg/l	N mg/l	P mg/l
26-Apr-18	0.004	0.07	<0.0001	<0.001	<0.001	<0.001	<0.001	0.004	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.74	<0.10	<0.10	3	0.8
20-Jun-18	0.002	0.032	<0.0001	<0.001	0.003	0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.18	0.02	0.16	2.8	0.8
Min	0.002	0.032		0.000	0.003	0.001		0.002						<0.1	0.18		0.16	2.8	0.80
Avg	0.003	0.051		#DIV/0!	0.003	0.001		0.003							0.46		0.16	2.9	0.80
Max	0.004	0.070		0.000	0.003	0.001		0.004						0.0	0.74		0.16	3.0	0.80
Var	0.000	0.001		#DIV/0!	#DIV/0!	#DIV/0!		0.000							0.16		#DIV/0!	0.0	0.00
SD	0.001	0.027		#DIV/0!	#DIV/0!	#DIV/0!		0.001							0.40		#DIV/0!	0.1	0.00
*Water Quality Trigger				0.002	0.0040										0.13			2.6	0.68

*Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).

*Gilberts & Associates 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

SW10 - Coal Shaft Creek (Holmes Upstream)

Date	Category	Comment	ph	EC uS/cm	Turbidity NTU	DO %	TDS mg/l	TSS mg/l	Hardness mg/l	Alkalinity (as CaCO ₃) mg/l	Acidity (as CaCO ₃) mg/l	SO ₄ mg/l	Cl mg/l	Ca mg/l	Mg mg/l	Al mg/l	Mn mg/l	Zn mg/l	Fe mg/l	CO ₃ (as CaCO ₃) mg/l	Bicarb (as CaCO ₃) mg/l	Na mg/l	BOD mg/l
27-Jul-17	Monthly	Dry																					
28-Aug-17	Monthly	No Flow																					
27-Sep-17	Monthly	No flow																					
27-Oct-17	Monthly	No flow																					
27-Nov-17	Monthly	No flow																					
27-Dec-17	Monthly	No flow																					
31-Jan-18	Monthly	No flow																					
26-Feb-18	Monthly	No flow																					
6-Mar-18	Discharge Event	Trickle	7.4	119	38	71	87	12	30	14	14	20	30	7	3	1.28	0.03	0.011	1.21	<1	14	3	18
26-Apr-18	Monthly	Dry																					
28-May-18	Monthly	Dry																					
19-Jun-18	Discharge Event	Trickle, brown	7.1	75	100	90	48	44	18	14	5	1	12	4	2	4.02	0.028	0.009	4.43	<1	14	4	9
Mn			7.1	75	38	71	48	12	18	14	5	1	12	4	2	1.3	0.028	0.008	1.2		14	3	
Avg			7.3	97	69	81	68	28	24	14	10	11	21	6	3	2.7	0.029	0.010	2.8		14	4	
Max			7.4	119	100	90	87	44	30	14	14	20	30	7	3	4.0	0.030	0.011	4.4		14	4	
Var			0.0	968	1922	181	761	512	72	0	41	181	162	5	1	3.8	0.000	0.000	5.2		0	1	
SD			0.2	31	44	13	28	23	8	0	6	13	13	2	1	1.9	0.001	0.001	2.3		0	1	
*Water Quality Trigger			7.1 - 7.9	544	119	85 - 110%		80								3.02		0.064					

*Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000). *Gilberts & Associates 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

SW10 - Coal Shaft Creek (Holmes Upstream)

Date	As mg/l	Ba mg/l	Cd mg/l	Cr mg/l	Cu mg/l	Pb mg/l	Mo mg/l	Ni mg/l	Se mg/l	Ag mg/l	U mg/l	B mg/l	Hg mg/l	F mg/l	NH ₃ (as N) mg/l	NO ₂ (as N) mg/l	NO ₃ (as N) mg/l	N mg/l	P mg/l
6-Mar-18	<0.001	0.014	<0.0001	0.001	0.003	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.02	1.3	0.04
19-Jun-18	<0.001	0.016	<0.0001	0.003	0.005	<0.001	<0.001	0.003	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.01	<0.01	0.09	1.6	0.12
	0.014			<0.001	0.003			0.002							0.010		0.020	1.300	0.040
	0.015			0.002	0.004			0.003							0.010		0.055	1.450	0.080
	0.016			0.003	0.005			0.003							0.010		0.090	1.600	0.120
	0.000			0.000	0.000			0.000							#DIV/0!		0.002	0.045	0.003
	0.001			0.001	0.001			0.001							#DIV/0!		0.049	0.212	0.057
*Water Quality Trigger					0.003										0.05			1.2	0.08

*Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).

"Gilberts & Associates 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

GB1 - Mammy Johnsons River

EPL 11701 Point 31

Date	Category	Comment	ph	EC uS/cm	Turbidity NTU	DO %	TDS mg/l	TSS mg/l	Hardness mg/l	Alkalinity (as CaCO ₃) mg/l	Acidity (as CaCO ₃) mg/l	SO ₄ mg/l	Cl mg/l	Ca mg/l	Mg mg/l	Al mg/l	Mn mg/l	Zn mg/l	Fe mg/l	CO ₃ (as CaCO ₃) mg/l	Bicarb (as CaCO ₃) mg/l	BOD mg/l	Na mg/l
27-Jul-17	Monthly	Mod flow	7.71	294	5	8	151	<5	63	51	2	10	52	12	8	0.21	0.027	<0.005	0.77	<1	51	3	36
28-Aug-17	Monthly	Low flow clear	7.36	342	2	70	176	<5	79	57	4	8	57	15	10	0.06	0.053	<0.005	0.55	<1	57	3	42
12-Sep-17	Macro																						
27-Sep-17	Monthly	Trickle	7.27	402	2	6	207	6	65	81	5	7	69	13	8	0.08	0.088	0.008	0.65	<1	81	<2	44
27-Oct-17	Monthly	Mod flow	7.1	382	18	55	197	14	70	77	10	4	63	13	9	0.40	0.314	<0.005	1.48	<1	77	<2	43
27-Nov-17	Monthly	Trickle	7.29	419	2	52	216	<5	90	93	3	3	61	18	11	0.03	0.210	0.005	0.60	<1	93	<2	45
27-Dec-17	Monthly	Trickle	7.14	406	4	26	209	9	84	88	12	<1	61	17	10	0.03	2.200	0.006	1.74	<1	88	2	46
31-Jan-18	Monthly	No flow																					
26-Feb-18	Monthly	Trickle	6.98	272	8	58	174	8	46	66	2	<1	40	10	5	0.13	0.426	<0.005	1.53	<1	66	<2	27
6-Mar-18	Discharge Event	Mod Flow	7.63	245	108	64	157	57	40	25	7	19	38	8	5	2.82	0.062	0.009	2.74	<1	25	3	26
16-Mar-18	Ecotox	Mod Flow, Clear	7.31	283	5																		
21-Mar-18	Discharge	Mod Flow, clear	7.51	261	12			26															
22-Mar-18	Discharge	Fast, Light Brown	7.37	86	77			59															
23-Mar-18	Discharge	gh Flood flow, Brov	7.5	133	47			10															
24-Mar-18	Discharge	High, Light brown	6.94	140	33			<5															
26-Mar-18	Discharge	High, Brown	7.72	199	15			<5															
27-Mar-18	Discharge	Mod flow, clear	7.46	192	17			7															
28-Mar-18	Discharge	Slow, light brown	7.1	217	10			<5															
26-Apr-18	Monthly	Slow, clear	7.23	330	3	65	211	<5	77	57	5	11	69	16	9	0.11	0.127	<0.005	1.24	<1	57	<2	42
29-May-18	Monthly	Slow, clear	7.19	305	2	64	195	<5	70	61	4	10	57	15	8	0.06	0.036	<0.005	0.76	<1	61	<2	37
19-Jun-18	Discharge Event	Sample not collected																					
20-Jun-18	Additional	Mod flow, brown	7.57	143	59	101	92	50	27	20	3	8	28	6	3	1.72	0.078	<0.005	1.78	<1	20	3	18
20-Jun-18	Discharge	Mod flow, brown	7.59	143	59			46															
21-Jun-18	Discharge	Mod flow, orange	7.24	140	34			<5															
22-Jun-18	Discharge	Slow flow, clear	7.09	126	16			10															
29-Jun-18	Discharge	Slow flow, clear	7.37	211	14			<5															
Mn			6.9	86	2	6	92	6	27	20	2	3	28	6	3	0.03	0.027	0.005	0.50				
Avg			7.3	247	24	52	180	24	65	62	5	9	55	13	8	0.48	0.305	0.007	1.20		20	<2	18
Max			7.7	419	108	101	216	59	90	93	12	19	69	18	11	2.82	2.200	0.009	2.74		62	3	38
Var			0.1	10288	793	795	1350	441	381	513	10	19	176	14	6	0.77	0.371	0.000	0.47		513		84
SD			0.2	101	28	28	37	21	20	23	3	4	13	4	2	0.88	0.609	0.002	0.68		23		9
*Water Quality Trigger			7.1 - 7.6	370	24	85 - 110%		15								1.24		0.011					

*Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).

"Gilberts & Associates 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

GB1 - Mammy Johnsons River

Date	As mg/l	Ba mg/l	Cd mg/l	Cr mg/l	Cu mg/l	Pb mg/l	Mo mg/l	Ni mg/l	Se mg/l	Ag mg/l	U mg/l	B mg/l	Hg mg/l	F mg/l	NH3 (as N) mg/l	NO2 (as N) mg/l	NO3 (as N) mg/l	N mg/l	P mg/l
27-Jul-17	<0.001	0.04	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.01	0.03	0.01	0.3	0.01
28-Aug-17	<0.001	0.04	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.10	0.3	0.01
12-Sep-17															<0.1	0.03	<0.01	0.58	<0.01
27-Sep-17	<0.001	0.05	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.01	<0.01	0.05	0.4	0.01
27-Oct-17	<0.001	0.05	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.01	<0.01	0.08	0.5	0.05
27-Nov-17	<0.001	0.06	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	0.1	0.04	<0.01	0.01	0.4	0.15
27-Dec-17	0.002	0.09	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	<0.01	0.5	0.08
31-Jan-18																			
26-Feb-18	0.002	0.04	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.05	<0.01	0.06	0.6	0.07
6-Mar-18	0.002	0.07	<0.0001	0.002	0.002	0.002	<0.001	0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.05	0.02	0.45	1.4	0.07
16-Mar-18															0.06	<0.01	0.03	0.6	0.06
21-Mar-18																			
22-Mar-18																			
23-Mar-18																			
24-Mar-18																			
26-Mar-18																			
27-Mar-18																			
28-Mar-18																			
26-Apr-18	<0.001	0.05	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.05	0.4	0.05
29-May-18	<0.001	0.04	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.05	0.2	0.02
19-Jun-18																			
20-Jun-18	<0.001	0.04	<0.0001	<0.001	0.002	0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.05	0.06	0.09	1.4	0.14
20-Jun-18																			
21-Jun-18																			
22-Jun-18																			
29-Jun-18																			
Min	0.002	0.040		<0.001	0.002	0.001		<0.001							0.010		0.01	0.2	0.01
Avg	0.002	0.052			0.002	0.002									0.034		0.13	0.6	0.06
Max	0.002	0.090		0.002	0.002	0.002		0.001							0.060		0.58	1.4	0.15
Var	0.000	0.000			0.000	0.000									0.000		0.03	0.2	0.00
SD	0.000	0.016			0.000	0.001									0.020		0.18	0.4	0.05
*Water Quality Trigger				0.001	0.0020										0.06			0.8	0.15

*Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).

"Gilberts & Associates 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

Highnoon - Mammy Johnsons River

EPL 11701 Point 35

Date	Category	Comment	ph	EC uS/cm	Turbidity NTU	DO %	TDS mg/l	TSS mg/l	Hardness mg/l	Alkalinity (as CaCO ₃) mg/l	Acidity (as CaCO ₃) mg/l	SO4 mg/l	Cl mg/l	Ca mg/l	Mg mg/l	Al mg/l	Mn mg/l	Zn mg/l	Fe mg/l	CO3 (as CaCO ₃) mg/l	Bicarb (as CaCO ₃) mg/l	BOD mg/l	Na mg/l
27-Jul-17	Monthly	Mod clear	7.87	304	7	8	156	<5	60	50	3	11	50	11	8	0.22	0.035	<0.005	0.79	<1	50	3	38
28-Aug-17	Monthly	Low flow clear	7.33	349	2	66	179	<5	74	65	5	10	57	15	9	0.08	0.049	<0.005	0.50	<1	65	2	42
27-Sep-17	Monthly	Low	7.04	424	2	6	219	8	70	85	6	9	73	13	9	0.03	0.085	<0.005	0.46	<1	85	<2	46
27-Oct-17	Monthly	Mod flow	7.16	497	28	46	257	27	93	88	5	16	77	16	13	0.94	0.485	<0.005	1.69	<1	88	<2	53
27-Nov-17	Monthly	Low flow	7.29	462	3	60	239	<5	99	93	3	4	71	20	12	0.07	0.129	<0.005	0.52	<1	93	3	50
27-Dec-17	Monthly	Trickle	6.75	474	3	27	245	<5	94	96	11	<1	79	18	12	0.02	0.569	<0.005	0.95	<1	96	2	54
31-Jan-18	Monthly	No Flow																					
26-Feb-18	Monthly	Trickle	7.08	466	3	63	298	7	90	103	2	1	76	18	11	0.03	0.245	<0.005	0.39	<1	103	<2	45
6-Mar-18	Discharge Event	Mod flow	7.82	236	133	56	151	68	40	24	8	18	37	8	5	3.07	0.087	0.010	3.09	<1	24	2	28
21-Mar-18	Discharge	Mod flow	7.44	275	20			28															
22-Mar-18	Additional	Jam. High flow, EC probe fault	80																				
22-Mar-18	Discharge	Fast flow	7.24	86	83			59															
23-Mar-18	Discharge	High flow, brown	7.51	132	45			31															
24-Mar-18	Discharge	High flow, light brown	6.9	138	30			9															
26-Mar-18	Discharge	High flow, brown	7.55	208	16			<5															
27-Mar-18	Discharge	Mod flow, Clear	7.33	195	15			<5															
28-Mar-18	Discharge	Slow, Light brown	7.19	237	10			6															
28-Apr-18	Monthly	Slow, clear	7.17	311	2	59	199	<5	68	51	6	11	65	14	8	0.06	0.113	<0.005	1.17	<1	51	<2	40
28-May-18	Monthly	Slow, clear	7.56	357	3	60	229	<5	84	66	4	11	82	17	10	0.06	0.043	<0.005	0.95	<1	66	<2	46
19-Jun-18	Discharge Event	Slow flow, brown	7.72	220	6	90	141	34	47	32	3	13	42	9	6	1.83	0.057	0.005	2.19	<1	32	<2	26
20-Jun-18	Discharge	Mod flow, brown	7.54	177	61			41															
21-Jun-18	Discharge	Mod flow, orange	7.24	102	37			8															
22-Jun-18	Discharge	Slow flow, brown	7.51	134	17			<5															
28-Jun-18	Discharge	Slow flow, orange	7.53	206	62			31															
Min			6.8	80	2	6	141	<5	40	24	<1	<1	37	8	5	0.02	0.035	<0.005	0.39		24		26
Avg			7.4	264	27	49	210	27	74	68	5	10	64	14	9	0.58	0.172	0.008	1.15		68		42
Max			7.9	497	133	90	298	68	99	103	11	18	82	20	13	3.07	0.569	0.010	3.09		103		54
Var			0.1	17639	1091	658	2470	406	387	718	7	25	245	15	6	1.00	0.034	0.000	0.72		718		90
SD			0.3	133	33	26	50	20	27	3	5	16	4	3	1.00	0.186	0.004	0.85			27		9
*Water Quality Trigger			7.1 - 7.6	370	24	85 - 110%		15								1.24		0.011					

*Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).

"Gilberts & Associates 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

Highnoon - Mammy Johnsons River

Date	As mg/l	Ba mg/l	Cd mg/l	Cr mg/l	Cu mg/l	Pb mg/l	Mo mg/l	Ni mg/l	Se mg/l	Ag mg/l	U mg/l	B mg/l	Hg mg/l	F mg/l	NH3 (as N) mg/l	NO2 (as N) mg/l	NO3 (as N) mg/l	N mg/l	P mg/l
27-Jul-17	<0.001	0.04	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.01	0.02	0.02	0.2	0.02
28-Aug-17	<0.001	0.04	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.05	0.2	0.02
27-Sep-17	<0.001	0.05	<0.0001	<0.001	0.002	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	<0.01	0.2	0.08
27-Oct-17	<0.001	0.05	<0.0001	<0.001	0.002	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.10	0.7	0.05
27-Nov-17	<0.001	0.05	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	<0.01	0.5	0.04
27-Dec-17	0.001	0.07	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	<0.01	0.6	0.04
31-Jan-18																			
26-Feb-18	0.001	0.05	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.06	0.6	0.02
6-Mar-18	0.001	0.07	<0.0001	0.001	0.002	0.002	<0.001	0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.08	0.02	0.46	1.2	0.05
21-Mar-18																			
22-Mar-18																			
22-Mar-18																			
23-Mar-18																			
24-Mar-18																			
26-Mar-18																			
27-Mar-18																			
28-Mar-18																			
26-Apr-18	<0.001	0.05	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.03	<0.01	0.11	0.5	0.03
29-May-18	<0.001	0.04	<0.0001	<0.001	0.001	<0.001	<0.001	0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.04	0.2	0.01
19-Jun-18	<0.001	0.03	<0.0001	0.002	0.001	<0.001	<0.001	0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	0.1	<0.01	<0.01	0.07	0.7	0.06
20-Jun-18																			
21-Jun-18																			
22-Jun-18																			
29-Jun-18																			
Min	<0.001	0.03		<0.001	<0.001	<0.001		<0.001							<0.01		0.0	0.2	<0.01
Avg	0.001	0.05													0.04		0.1	0.5	0.0
Max	0.001	0.07		0.002	0.002	0.002		0.001							0.08		0.5	1.2	0.1
Var	0.000	0.00													0.00		0.0	0.1	0.0
SD	0.000	0.01													0.03		0.1	0.3	0.0
*Water Quality Trigger				0.001	0.0020										0.06			0.8	0.15

*Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).

"Gilberts & Associstes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

Site 9 - Karuah River (Near Stroud Road Village)

Date	Category	Comment	ph	EC uS/cm	Turbidity NTU	DO %	TDS mg/l	TSS mg/l	Hardness mg/l	Alkalinity (as CaCO ₃) mg/l	Acidity (as CaCO ₃) mg/l	SO4 mg/l	Cl mg/l	Ca mg/l	Mg mg/l	Al mg/l	Mn mg/l	Zn mg/l	Fe mg/l	CO3 (as CaCO ₃) mg/l	Bicarb (as CaCO ₃) mg/l	BOD mg/l	Na mg/l
27-Jul-17	Monthly	Mod clear	6.7	154	3	10	78	<5	40	37	<1	5	26	8	5	0.09	0.006	<0.005	0.24	<1	37	3	18
28-Aug-17	Monthly	mod flow clear	7.4	194	2	89	99	<5	50	48	<1	4	28	10	6	0.06	0.006	<0.005	0.20	<1	48	3	19
12-Sep-17	Macro							<5		53	3	4	33	12	7	0.04	0.006	<0.005	0.18	<1	53		22
27-Sep-17	Monthly	Low	6.9	261	2	6	134	<5	50	69	4	5	37	10	6	0.02	0.028	<0.005	0.31	<1	69		25
27-Oct-17	Monthly	Mod flow	8.3	157	61	79	80	46	31	36	4	<1	20	6	4	2.49	0.045	0.006	2.82	<1	36		16
27-Nov-17	Monthly	Mod flow	7.2	211	2	68	108	<5	55	54	2	3	29	12	6	0.09	0.029	<0.005	0.55	<1	54		21
27-Dec-17	Monthly	Low Mod flow	8.3	274	1	56	140	<5	68	66	10	1	39	14	8	<0.01	0.098	<0.005	0.31	<1	66		25
31-Jan-18	Monthly	Low flow	8.2	343	5	3	220	9	73	88	4	<1	46	17	8	0.02	1.110	0.009	1.52	<1	88		25
26-Feb-18	Monthly	Mod flow	7.8	295	2	69	189	7	68	74	1	1	42	14	8	0.09	0.042	<0.005	0.50	<1	74		26
6-Mar-18	Discharge Event	Moderate flow, Light brown	8.3	155	31	81	99.2	15	27	20	9	9	23	6	3	1.10	0.018	<0.005	1.05	<1	20		14
26-Apr-18	Monthly	Slow flow, clear	7.2	150	2	88	96	<5	39	42	3	4	30	9	4	0.06	0.013	<0.005	0.43	<1	42		16
29-May-18	Monthly	Steady, clear	7.5	150	2	92	96.2	<5	34	37	3	4	23	7	4	0.07	0.006	<0.005	0.24	<1	37		14
19-Jun-18	Discharge Event	Strong & fast, brown	7.6	134	50	96	86	16	36	37	4	4	22	8	4	1.02	0.022	<0.005	1.30	<1	37		16
Min			6.7	134	1	3	78	7	27	20	1	<1	20	6	3	0.02	0.006	0.006	0.18		20		14
Avg			7.6	207	14	61	119	19	48	51	4	4	31	10	6	0.43	0.110	0.008	0.74		51		20
Max			8.3	343	61	96	220	46	73	88	10	9	46	17	8	2.49	1.110	0.009	2.82		88		26
Var			0.3	4879	457	1232	2002	249	245	360	8	5	68	12	3	0.57	0.091	0.000	0.58		360		0
SD			0.6	70	21	35	45	16	16	19	3	2	8	3	2	0.76	0.302	0.002	0.76		19		4
*Water Quality Trigger			N/A	N/A	N/A											N/A		N/A					

*Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).

"Gilberts & Associstes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

Site 9 - Karuah River (Near Stroud Road Village)

Date	As mg/l	Ba mg/l	Cd mg/l	Cr mg/l	Cu mg/l	Pb mg/l	Mo mg/l	Ni mg/l	Se mg/l	Ag mg/l	U mg/l	B mg/l	Hg mg/l	F mg/l	NH3 (as N) mg/l	NO2 (as N) mg/l	NO3 (as N) mg/l	N mg/l	P mg/l
27-Jul-17	<0.001	0.014	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	0.1	<0.01	0.02	0.03	0.2	<0.01
28-Aug-17	<0.001	0.016	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.06	0.2	0.02
12-Sep-17					<0.001									<0.1	0.06	<0.01	0.06	0.3	<0.01
27-Sep-17	<0.001	0.026	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.09	0.3	0.02
27-Oct-17	<0.001	0.022	<0.0001	0.002	0.002	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.19	0.8	0.09
27-Nov-17	<0.001	0.02	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.03	<0.01	0.07	0.5	0.05
27-Dec-17	<0.001	0.025	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.14	<0.01	0.15	0.8	0.09
31-Jan-18	0.002	0.043	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.12	<0.01	0.04	0.7	0.12
26-Feb-18	<0.001	0.028	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.03	<0.01	0.12	0.5	0.04
6-Mar-18	<0.001	0.022	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	0.1	0.05	<0.01	0.24	0.8	0.03
26-Apr-18	<0.001	0.018	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.03	<0.01	0.12	0.3	0.02
29-May-18	<0.001	0.014	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.08	0.2	0.01
19-Jun-18	<0.001	0.014	<0.0001	0.001	0.002	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.01	<0.01	0.15	0.8	0.15
Min		0.014		<0.001	<0.001										<0.01		0.03	<0.1	0.01
Avg		0.022													0.05		0.11	0.5	0.06
Max		0.043		0.002	0.002										0.14		0.24	0.8	0.15
Var		0.000													0.00		0.00	0.1	0.00
SD		0.008													0.04		0.06	0.3	0.05

*Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).
 "Gilberts & Associstes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

Site 11 - Mammy Johnsons - Downstream of High Noon

Date	Category	Comment	ph	EC uS/cm	Turbidity NTU	DO %	TDS mg/l	TSS mg/l	Hardness mg/l	Alkalinity CaCO ₃ mg/l	Acidity CaCO ₃ mg/l	SO4 mg/l	Cl mg/l	Ca mg/l	Mg mg/l	Al mg/l	Mn mg/l	Zn mg/l	Fe mg/l	CO3 CaCO ₃ mg/l	Bicarb (as CaCO ₃) mg/l	BOD mg/l	Na mg/l
27-Jul-17	Monthly	Mod clear	8.03	426	6	9	220	<5	63	54	2	11	52	12	8	0.2	0.031	<0.005	0.77	<1	54	<2	36
28-Aug-17	Monthly	Low flow, clear	7.33	360	2	76	185	<5	74	67	3	10	59	15	9	0.08	0.044	0.005	0.57	<1	67	2	37
12-Sep-17	Macro							<5	76	4	10	70	18	12	0.04	0.022	0.008	0.38	<1	76	48	48	
27-Sep-17	Monthly	Trickle	6.98	451	1	6	233	8	76	89	4	9	79	14	10	0.02	0.042	<0.005	0.27	<1	89	<2	48
27-Oct-17	Monthly	Mod flow	7.19	388	32	66	200	22	67	71	5	8	63	12	9	1.21	0.161	0.009	1.54	<1	71	3	44
27-Nov-17	Monthly	Low flow	7.18	481	2	57	249	<5	106	100	2	4	72	21	13	0.04	0.139	<0.005	0.65	<1	100	<2	106
27-Dec-17	Monthly	Minimal flow - trickle	6.23	582	3	32	302	11	117	109	11	<1	120	22	15	0.03	2.200	0.006	1.74	<1	109	2	62
31-Jan-18	Monthly	No Flow																					
26-Feb-18	Monthly	No Flow																					
06-Mar-18	Discharge Event	Mod flow, brown	8.32	248	114	68	159	60	40	24	7	17	37	8	5	1.93	0.062	<0.005	2.18	<1	24	3	26
16-Mar-18	Ecotox	Moderate flow, clear	7.53	334	6		214																
26-Apr-18	Monthly	Slow flow, clear	7.2	320	5	73	205	10	74	56	6	12	66	15	9	0.1	0.122	<0.005	1.40	<1	56	<2	41
28-May-18	Monthly	Steady flow, clear	7.34	360	2	77	230	<5	81	68	4	12	85	16	10	0.05	0.037	<0.005	0.86	<1	68	<2	44
19-Jun-18	Discharge Event	st flow, brown - No signage for	8.09	243	34	91	156	35	47	34	4	11	43	9	6	1.84	0.064	0.009	2.28	<1	34	<2	26
Min			6.2	243	1	6	156	<5	40	24	<1	4	37	8	5	0.02	0.022	<0.005	0.27		24	<2	26
Avg			7.4	381	19	56	214	24	75	68	5	10	68	15	10	0.50	0.266	0.007	1.16		68		47
Max			8.3	582	114	91	302	60	117	109	11	17	120	22	15	1.93	2.200	0.009	2.28		109	3	106
Var			0.3	10092	1140	876	1713	408	553	665	7	11	509	20	8	0.58	0.414	0.000	0.50		665		486
SD			0.6	100	34	30	41	20	24	26	3	3	23	4	3	0.76	0.643	0.002	0.71		26		22
*Water Quality Trigger			7.1 - 7.6	370	24	85 - 110%	15									1.24		0.011					

*Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).
 "Gilberts & Associates 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

Site 11 - Mammy Johnsons - Downstream of High Noon

Date	As mg/l	Ba mg/l	Cd mg/l	Cr mg/l	Cu mg/l	Pb mg/l	Mo mg/l	Ni mg/l	Se mg/l	Ag mg/l	U mg/l	B mg/l	Hg mg/l	F mg/l	NH3 (as N) mg/l	NO2 (as N) mg/l	NO3 (as N) mg/l	N mg/l	P mg/l
27-Jul-17	<0.001	0.036	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	0.02	0.02	0.3	0.01
28-Aug-17	<0.001	0.042	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.06	0.3	0.01
12-Sep-17					<0.001									<0.1	0.03	<0.01	0.27	0.5	<0.01
27-Sep-17	<0.001	0.05	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.02	0.2	<0.01
27-Oct-17	<0.001	0.048	<0.0001	<0.001	0.002	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.18	0.8	0.06
27-Nov-17	<0.001	0.048	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.03	0.4	0.02
27-Dec-17	0.002	0.081	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	0.0001	0.1	0.04	<0.01	0.02	0.7	0.09
31-Jan-18																			
26-Feb-18																			
06-Mar-18	0.001	0.058	<0.0001	0.001	0.001	0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.07	0.02	0.44	1.1	0.04
16-Mar-18															0.07	<0.01	0.06	0.9	0.08
26-Apr-18	<0.001	0.048	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	0.01	0.07	0.5	0.04
29-May-18	<0.001	0.043	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.06	0.4	0.02
19-Jun-18	<0.001	0.033	<0.0001	0.002	0.005	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.09	0.8	0.06
Min	<0.001	0.033		<0.001	0.001	0.001		<0.001							0.02		0.02	0.2	0.01
Avg		0.049			0.003	0.001									0.04		0.11	0.6	0.04
Max	0.002	0.081		0.002	0.005	0.001		0.002							0.07		0.44	1.1	0.09
Var		0.000			0.000	#DIV/0!									0.00		0.02	0.1	0.00
SD		0.013			0.002	#DIV/0!									0.02		0.13	0.3	0.03
*Water Quality Trigger				0.001	0.0020										0.06			0.8	0.15

*Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).
 "Gilberts & Associstes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

Site 12 - Mammy Johnsons - Relton Property

Date	Category	Comment	ph	EC uS/cm	Turbidity NTU	DO %	TDS mg/l	TSS mg/l	Hardness mg/l	Alkalinity (as CaCO ₃) mg/l	Acidity (as CaCO ₃) mg/l	SO ₄ mg/l	Cl mg/l	Ca mg/l	Mg mg/l	Al mg/l	Mn mg/l	Zn mg/l	Fe mg/l	CO ₃ (as CaCO ₃) mg/l	Bicarb (as CaCO ₃) mg/l	BOD mg/l	Na mg/l
27-Jul-17	Monthly	Mod flow clear	7.57	269	5.8	9	138	<5	56	50	2	9	46	11	7	0.17	0.018	0.008	0.74	<1	50	14	32
28-Aug-17	Monthly	Low Flow, clear	7.41	318	2.1	71	163	<5	70	59	<1	8	52	15	8	0.08	0.042	<0.005	0.46	<1	59	2	36
12-Sep-17	Macro							<5		68	5	6	55	15	9	0.06	0.04	<0.005	0.47	<1	68		36
27-Sep-17	Monthly	Trickle	7.18	350	1.6	5	180	6	63	79	7	6	56	12	8	0.06	0.099	0.007	0.34	<1	79	<2	37
27-Oct-17	Monthly	Low flow	7.29	332	6.6	52	171	6	63	75	6	3	52	12	8	0.16	0.173	<0.005	0.68	<1	75	<2	35
27-Nov-17	Monthly	Trickle	7.46	421	3.1	45	217	13	104	127	4	3	49	22	12	0.03	0.196	0.01	0.42	<1	127	3	42
27-Dec-17	Monthly	Trickle	7.36	445	2.3	38	230	<5	102	104	11	3	62	21	12	<0.01	0.513	<0.005	0.35	<1	104	2	47
31-Jan-18	Monthly	No flow																					
26-Feb-18	Monthly	No flow																					
6-Mar-18	Discharge Event	mod flow, brown	7.52	276	63.0	76	177	34	52	30	6	21	42	11	6	1.50	0.062	0.009	1.65	<1	30	2	29
26-Apr-18	Monthly	Slow flow, clear	7.56	320	2.7	75	205	<5	68	58	6	11	66	14	8	0.07	0.073	<0.005	1.28	<1	58	<2	36
29-May-18	Monthly	Slow flow, clear	7.18	295	1.5	70	189	<5	68	58	3	10	54	14	8	0.05	0.025	<0.005	0.79	<1	58	<2	35
19-Jun-18	Discharge Event	Mod flow, brown	7.84	180	58.7	94	115	45	34	24	3	10	38	7	4	1.34	0.148	0.019	1.80	<1	24	<2	22
Min			7.2	180	2	5	115	5	34	24	2	<1	38	7	4	0.03	0.02	<0.005	0.34		24	<2	22
Avg			7.4	321	15	54	179	21	68	67	5	8	52	14	8	0.35	0.13	0.011	0.82		67	5	35
Max			7.8	445	63	94	230	45	104	127	11	21	66	22	12	1.50	0.51	0.019	1.80		127	14	47
Var			0.0	5737	595	871	1213	315	451	891	7	27	67	19	5	0.32	0.02	0.000	0.28		891	28	41
SD			0.2	76	24	30	35	18	21	30	3	5	8	4	2	0.57	0.14	0.005	0.52		30	5	6
*Water Quality Trigger			7.1 - 7.6	370	24	85 - 110%		15								1.24		0.011					

*Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).

Gilberts & Associates 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project.

Site 12 - Mammy Johnsons - Relton Property

Date	As mg/l	Ba mg/l	Cd mg/l	Cr mg/l	Cu mg/l	Pb mg/l	Mo mg/l	Ni mg/l	Se mg/l	Ag mg/l	U mg/l	B mg/l	Hg mg/l	F mg/l	NH ₃ (as N) mg/l	NO ₂ (as N) mg/l	NO ₃ (as N) mg/l	N mg/l	P mg/l
27-Jul-17	<0.001	0.036	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.01	0.02	0.03	0.4	<0.01
28-Aug-17	<0.001	0.045	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.08	0.3	0.01
27-Sep-17					<0.001									<0.1	0.03	<0.01	0.04	0.2	<0.01
27-Sep-17	<0.001	0.053	<0.0001	<0.001	0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.03	<0.01	0.02	0.3	<0.01
27-Oct-17	<0.001	0.050	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.01	<0.01	0.05	0.4	0.02
27-Nov-17	<0.001	0.056	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.08	<0.01	0.02	0.8	0.03
27-Dec-17	<0.001	0.078	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	<0.01	0.5	0.04
6-Mar-18	0.001	0.057	<0.0001	<0.001	0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.08	0.01	0.33	0.9	0.03
26-Apr-18	<0.001	0.050	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.08	0.4	0.02
29-May-18	<0.001	0.040	<0.0001	<0.001	0.007	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	0.10	<0.01	<0.01	0.06	0.3	0.02
19-Jun-18	<0.001	0.040	<0.0001	<0.001	0.001	<0.001	<0.001	0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.05	0.6	0.07
Min	0.001	0.036		<0.001	<0.001	<0.001		<0.001				<0.05	<0.0001	<0.1	0.010		0.02	0.2	0.01
Avg	0.001	0.051													0.040		0.08	0.5	0.03
Max	0.001	0.078		0.000	0.007	0.000		0.002						0.100	0.080		0.33	0.9	0.07
Var	#DIV/0!	0.000													0.001		0.01	0.0	0.00
SD	#DIV/0!	0.012													0.032		0.09	0.2	0.02
*Water Quality Trigger				0.001	0.0020										0.06			0.8	0.15

*Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).

Gilberts & Associates 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project.

Site 15 - Mammy Johnsons - Tereel

Date	Category	Comment	ph	EC uS/cm	Turbidity NTU	DO %	TDS mg/l	TSS mg/l	Hardness mg/l	Alkalinity (as CaCO ₃) mg/l	Acidity (as CaCO ₃) mg/l	SO ₄ mg/l	Cl mg/l	Ca mg/l	Mg mg/l	Al mg/l	Mn mg/l	Zn mg/l	Fe mg/l	CO ₃ (as CaCO ₃) mg/l	Bicarb (as CaCO ₃) mg/l	BOD mg/l	Na mg/l
27-Jul-17	Monthly	Mod flow clear	7.7	202	4	10	103	<5	40	27	<1	8	62	8	5	0.18	0.010	<0.005	0.62	<1	27	5	24
28-Aug-17	Monthly	Low Flow, clear	7.5	224	2	77	114	<5	47	27	<1	7	44	9	6	0.1	0.015	<0.005	0.47	<1	27	2	26
27-Sep-17	Monthly	Trickle	7.3	275	3	5	141	6	47	40	4	6	52	9	6	0.06	0.101	<0.005	0.47	<1	40	<2	29
27-Oct-17	Monthly	Trickle	7.3	245	4	22	125	<5	47	37	7	4	46	9	6	0.11	0.358	<0.005	0.46	<1	37	<2	27
27-Nov-17	Monthly	Trickle	7.3	272	2	44	139	<5	61	46	3	2	46	13	7	0.07	0.400	<0.005	0.93	<1	46	<2	27
27-Dec-17	Monthly	Nil flow																					
31-Jan-18	Monthly	No flow																					
26-Feb-18	Monthly	No flow																					
6-Mar-18	Discharge Event	mod flow	7.7	181	17	86	116	11	34	23	5	5	33	7	4	0.48	0.027	<0.005	0.85	<1	23	<2	20
26-Apr-18	Monthly	Steady flow, clear	7.6	195	2	83	125	<5	36	28	3	8	47	8	4	0.1	0.026	<0.005	0.47	<1	28	<2	23
29-May-18	Monthly	Steady flow, clear	7.2	201	1	86	129	<5	43	27	4	7	47	9	5	0.07	0.010	<0.005	0.86	<1	27	<2	28
19-Jun-18	Discharge Event	runoff from road works	7.7	141	1364	91	90	1070	31	37	5	3	24	6	4	20.3	0.331	0.057	22.70	<1	37	<2	22
Min			7.2	141	1	5	90	<5	31	23	<1	2	24	6	4	0.06	0.010	<0.005	0.46		23	<2	20
Avg			7.5	215	155	56	120	362	43	32	4	6	45	9	5	2.39	0.142		3.09		32		25
Max			7.7	275	1364	91	141	1070	61	46	7	8	62	13	7	20.30	0.400	0.057	22.70		46	5	29
Var			0.0	1903	205422	1277	272	####	82	60	2	5	117	4	1	45.15	0.029		54.10		60		8
SD			0.2	44	453	36	16	613	9	8	1	2	11	2	1	6.72	0.169		7.36		8		3
*Water Quality Trigger			7.1 - 7.6	370	24	85 - 110%		15								1.24		0.011					

*Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).

Gilberts & Associates 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project.

Site 15 - Mammy Johnsons - Tereel

Date	As mg/l	Ba mg/l	Cd mg/l	Cr mg/l	Cu mg/l	Pb mg/l	Mo mg/l	Ni mg/l	Se mg/l	Ag mg/l	U mg/l	B mg/l	Hg mg/l	F mg/l	NH3 (as N) mg/l	NO2 (as N) mg/l	NO3 (as N) mg/l	N mg/l	P mg/l
27-Jul-17	<0.001	0.030	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	0.02	<0.01	0.2	<0.01
28-Aug-17	<0.001	0.032	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.06	0.3	<0.01
27-Sep-17	<0.001	0.047	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.07	0.3	<0.01
27-Oct-17	<0.001	0.045	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	0.10	0.01	<0.01	0.06	0.4	0.02
27-Nov-17	0.002	0.052	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.03	<0.01	<0.01	0.4	0.03
6-Mar-18	<0.001	0.037	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.11	0.6	<0.01
26-Apr-18	<0.001	0.034	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.01	<0.01	0.03	0.2	<0.01
29-May-18	<0.001	0.031	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.04	0.2	<0.01
19-Jun-18	0.003	0.194	<0.0001	0.027	0.015	0.012	<0.001	0.016	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.01	<0.01	0.23	2.0	0.36
Min		0.030			<0.001	<0.001									0.01		0.03	0.2	<0.01
Avg		0.056													0.02		0.09	0.5	0.14
Max		0.194			0.015	0.012									0.03		0.23	2.0	0.36
Var		0.003													0.00		0.00	0.3	0.04
SD		0.052													0.01		0.07	0.6	0.19
*Water Quality Trigger				0.001	0.0020										0.06			0.8	0.15

*Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).

Gilberts & Associstes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project.

Site 19 - Karuah River (Washpool Turnoff)

Date	Category	Comment	ph	EC uS/cm	Turbidity NTU	DO %	TDS mg/l	TSS mg/l	Hardness mg/l	Alkalinity (as CaCO ₃) mg/l	Acidity (as CaCO ₃) mg/l	SO ₄ mg/l	Cl mg/l	Ca mg/l	Mg mg/l	Al mg/l	Mn mg/l	Zn mg/l	Fe mg/l	CO ₃ (as CaCO ₃) mg/l	Bicarb (as CaCO ₃) mg/l	BOD mg/l	Na mg/l
27-Jul-17	Monthly	Mod flow clear	6.7	209	3	10	107	<5	52	47	3	7	35	11	6	0.13	0.012	<0.005	0.38	<1	47	3	26
28-Aug-17	Monthly	Mod flow clear	7.49	238	3	91	122	7	55	54	3	6	34	12	6	0.06	0.015	<0.005	0.24	<1	54	3	21
27-Sep-17	Monthly	Low	6.59	318	3	7	163	<5	54	75	4	5	42	10	7	0.06	0.050	<0.005	0.26	<1	75	3	31
27-Oct-17	Monthly	Mod flow	7.9	291	11	75	149	9	63	<1	7	4	43	12	8	0.45	0.108	<0.005	0.95	<1	<1	3	31
27-Nov-17	Monthly	Mod flow	7.08	271	2	72	139	<5	68	65	3	4	37	14	8	0.06	0.041	<0.005	0.46	<1	65	<2	27
27-Dec-17	Monthly	Mod flow	8.05	258	2	72	132	<5	65	61	10	2	36	13	8	0.01	0.085	<0.005	0.46	<1	61	2	26
31-Jan-18	Monthly	Low flow	7.97	278	2	4	178	<5	82	73	3	1	40	18	9	0.01	0.294	<0.005	0.66	<1	73	<2	26
26-Feb-18	Monthly	Mod flow	7.75	309	3	81	198	8	68	86	1	3	39	14	8	0.06	0.046	<0.005	0.35	<1	86	<2	27
18-Mar-18	Discharge Event	Mod flow, light brown	7.74	234	55	82	150	26	50	24	4	16	38	10	6	1.70	0.040	<0.005	1.74	<1	24	2	24
26-Apr-18	Monthly	Steady flow, clear	7.37	194	2	83	124	<5	43	46	3	5	38	9	5	0.07	0.020	<0.005	0.48	<1	46	<2	20
29-May-18	Monthly	Steady flow, clear	7.55	186	1	98	119	<5	52	46	3	7	35	11	6	0.05	0.010	<0.005	0.37	<1	46	<2	24
19-Jun-18	Discharge Event	High flow	7.54	103	135	96	66	192	22	16	4	<10	21	4	3	2.71	0.090	0.014	3.28	<1	16	3	14
Min			6.6	103	1	4	66	<5	22	16	<1	<1	21	4	3	0.01	0.010	<0.005	0.24		16	<2	14
Avg			7.5	241	19	64	137	48	56	54	4	5	37	12	7	0.45	0.068	0.014	0.80		54	25	
Max			8.1	318	135	98	198	192	82	86	10	16	43	18	9	2.71	0.294	0.014	3.28		86	31	25
Var			0.2	3725	1574	1263	1189	6505	227	452	3	16	32	11	3	0.73	0.006	#DIV/0!	0.78		452	22	
SD			0.5	61	40	36	34	81	15	21	2	4	6	3	2	0.86	0.078	#DIV/0!	0.88		21	5	
*Water Quality Trigger			7.1 - 7.6	370	24	85 - 110%										1.24	0.011						

*Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).

*Gilberts & Associstes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

Site 19 - Karuah River (Washpool Turnoff)

Date	As mg/l	Ba mg/l	Cd mg/l	Cr mg/l	Cu mg/l	Pb mg/l	Mo mg/l	Ni mg/l	Se mg/l	Ag mg/l	U mg/l	B mg/l	Hg mg/l	F mg/l	NH3 (as N) mg/l	NO2 (as N) mg/l	NO3 (as N) mg/l	N mg/l	P mg/l
27-Jul-17	<0.001	0.020	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.05	0.02	<0.01	0.2	<0.01
28-Aug-17	<0.001	0.020	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.02	0.4	0.01
27-Sep-17	<0.001	0.029	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	<0.01	0.2	0.01
27-Oct-17	<0.001	0.030	<0.0001	<0.001	0.001	<0.001	<0.001	0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.01	<0.01	0.11	0.4	0.03
27-Nov-17	<0.001	0.028	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.05	0.4	0.03
27-Dec-17	<0.001	0.026	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.05	<0.01	0.02	0.6	0.05
31-Jan-18	<0.001	0.030	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.03	<0.01	0.03	0.5	0.05
26-Feb-18	0.001	0.029	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.06	0.4	0.02
06-Mar-18	<0.001	0.033	<0.0001	<0.001	0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.10	<0.01	0.38	1.3	0.05
26-Apr-18	<0.001	0.022	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.02	<0.01	0.08	0.3	0.02
29-May-18	<0.001	0.020	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	<0.01	<0.01	0.07	0.2	0.01
19-Jun-18	0.001	0.032	<0.0001	0.002	0.004	0.002	<0.001	0.002	<0.01	<0.001	<0.001	<0.05	<0.0001	<0.1	0.14	<0.01	0.19	1.9	0.30
Min	<0.001	0.020		<0.001	<0.001	<0.001		<0.001			<0.001			0.0	0.01		0.02	0.2	<0.01
Avg		0.027												#####	0.05		0.10	0.6	0.05
Max	0.001	0.033		0.002	0.004	0.002		0.002			0.000			0.0	0.14		0.38	1.9	0.30
Var		0.000												#####	0.00		0.01	0.3	0.01
SD		0.005												#####	0.04		0.11	0.5	0.08
*Water Quality Trigger				0.001	0.0020										0.06			0.8	0.15

*Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).

"Gilberts & Associstes 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

SW3 - Main Water Dam (Major) EPL11701 Point 3

Date	Category	Storage RL	pH	EC uS/cm	Turbidity NTU	TDS mg/l	TSS mg/l	Hardness mg/l	Alkalinity (as CaCO ₃)	Acidity (as CaCO ₃)	SO ₄ mg/l	Cl mg/l	Ca mg/l	Mg mg/l	Al mg/l	Mn mg/l	Zn mg/l	Fe mg/l	CO ₃ (as CaCO ₃) mg/l	Bicarb (as CaCO ₃) mg/l	BOD mg/l	Na mg/l
6-Jul-17	Weekly	RL 70.99	7.9	3090	1.5																	
13-Jul-17	Weekly	RL 71.00	7.9	3090	1.1																	
18-Jul-17	Weekly	RL 71.02	7.9	3100	1.4																	
27-Jul-17	Monthly	RL 71.00	7.0	3050	2.3	1703	5	1020	146	5	1340	238	231	108	0.02	0.26	<0.005	0.06	<1	146	<2	377
2-Aug-17	Weekly	RL 70.99	6.7	3040	2.9																	
8-Aug-17	Weekly	RL 70.97	7.7	3160	5.8																	
14-Aug-17	Weekly	RL 71.00	8.0	3040	1.3																	
25-Aug-17	Weekly	RL 70.99	7.3	3050	2.2																	
28-Aug-17	Monthly	RL 71.08	8.4	3030	1.6	1691	12	1050	144	<1	1140	238	240	109	0.02	0.15	0.01	0.05	<1	144	2	351
8-Sep-17	Weekly	RL 71.02	8.2	3100	10.7																	
11-Sep-17	Weekly	RL 71.00	8.2	3090	8.0																	
18-Sep-17	Weekly	RL 70.98	8.2	2980	3.2																	
27-Sep-17	Monthly	RL 71.03	8.3	3110	9.7	1737	16	986	155	<1	1310	248	207	114	0.14	0.28	<0.005	0.14	<1	155	<2	374
4-Oct-17	Weekly	RL 70.97	8.5	3080	7.1																	
11-Oct-17	Weekly	RL 70.96	8.2	3110	9.0																	
16-Oct-17	Weekly	RL 70.95	8.5	3060	1.9																	
27-Oct-17	Monthly	RL 71.09	8.0	3020	2.3	1686	25	937	119	2	994	220	189	113	<0.01	0.11	<0.005	<0.05	<1	119	<2	350
1-Nov-17	Weekly	RL 71.01	8.5	2990	1.8																	
8-Nov-17	Weekly	RL 71.00	8.4	2950	2.3																	
15-Nov-17	Weekly	RL 71.01	8.0	3070	2.2																	
22-Nov-17	Weekly	RL 70.92	8.3	3040	2.4																	
27-Nov-17	Monthly	RL 70.90	8.5	3060	10	1709	14	1030	124	<1	1330	277	205	126	0.02	0.17	<0.005	<0.05	9	116	<2	367
6-Dec-17	Weekly	RL 70.96	8.0	3060	2																	
11-Dec-17	Weekly	RL 70.96	8.2	3080	9																	
21-Dec-17	Weekly		8.6	2970	2																	
27-Dec-17	Monthly		8.4	3040	5	1697	10	995	97	10	1340	291	189	127	0.01	0.17	<0.005	0.07	<1	97	2	359
3-Jan-18	Weekly		7.9	3120	2																	
8-Jan-18	Weekly	RL 70.98	8.2	3200	3																	
17-Jan-18	Weekly	RL 70.92	8.5	3120	3																	
24-Jan-18	Weekly	RL 70.96	8.3	3150	2																	
31-Jan-18	Monthly	RL 70.98	8.4	3140	2	2010	6	1100	122	3	1400	292	214	137	<0.01	0.10	<0.005	<0.05	<1	122	<2	357
7-Feb-18	Weekly	RL 70.98	8.3	3140	2																	
14-Feb-18	Weekly	RL 70.97	8.2	3180	2																	
23-Feb-18	Weekly	NR	8.1	3060	8																	
26-Feb-18	Monthly	RL 71.07	8.0	3010	3	1926	<5	1010	122	2	1330	281	196	127	0.02	0.10	0.01	0.06	<1	122	<2	358
5-Mar-18	Weekly	RL 71.05	8.1	3210	3																	
6-Mar-18	Discharge Event	RL 71.07	7.9	3160	2	2022	<5	1090	130	4	1440	294	214	136	0.02	0.09	0.01	0.06	<1	130	2	377
16-Mar-18	Weekly	RL 70.96	8.2	3140	2																	
19-Mar-18	Weekly	RL 70.95	8.4	3090	2																	
26-Mar-18	Weekly	RL 71.18	7.7	2790	4																	
3-Apr-18	Weekly																					
4-Apr-18	Weekly	RL 71.126	7.2	2560	3																	
9-Apr-18	Weekly	RL 71.09	7.3	2760	7																	
17-Apr-18	Weekly	RL 71.02	8.3	2950	2																	
26-Apr-18	Monthly	RL 71.06	7.8	2580	4	1651	8	909	129	2	890	254	176	114	0.02	0.14	<0.005	<0.05	<1	129	<2	308
4-May-18	Weekly	RL 70.996	8.3	2270	10																	
11-May-18	Weekly	RL 70.959	8.4	2660	6																	
17-May-18	Weekly	RL 70.966	8.0	2640	2																	
21-May-18	Weekly	RL 70.963	8.0	2970	2																	
29-May-18	Monthly	RL 70.97	7.9	2680	4	1715	<5	964	148	6	1270	264	188	120	<0.01	0.38	<0.005	<0.05	<1	148	<2	328
4-Jun-18	Weekly	RL 71.02	7.5	2850	2																	
12-Jun-18	Weekly	RL 71.05	7.8	2930	5																	
18-Jun-18	Weekly	RL 71.02	7.8	2910	4																	
19-Jun-18	Discharge Event	RL 71.07	7.7	2800	5	1792	8	946	154	7	956	259	191	114	0.04	0.25	<0.005	0.09	<1	154	<2	314
26-Jun-18	Weekly	RL 71.05	7.8	2774	2																	
Mn			6.7	2270	1	1651	<5		97	<1	890	220	176	108	0.01	0.09	<0.005	<0.05		97	<2	308
Avg			8.0	2987	4	1778	12		133	5	1228	263	203	120	0.03	0.18		0.08		132		352
Max			8.6	3210	11	2022	25		155	10	1440	294	240	137	0.14	0.38		0.14		155	2	377
Var			0.2	35404	7	17293	39		298	8	34513	593	359	100	0.00	0.01		0.00		316		548
SD			0.4	188	3	132	6		17	3	186	24	19	10	0.04	0.09		0.03		18		23
*Water Quality Trigger			N/A	N/A	N/A	N/A	N/A							N/A		N/A						

*Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).

Gilberts & Associates 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project.

SW3 - Main Water Dam (Major)

Date	As mg/l	Ba mg/l	Cd mg/l	Cr mg/l	Cu mg/l	Pb mg/l	Mo mg/l	Ni mg/l	Se mg/l	Ag mg/l	U mg/l	B mg/l	Hg mg/l	F mg/l	NH3 (as N) mg/l	NO2 (as N) mg/l	NO3 (as N) mg/l	N mg/l	P mg/l
27-Jul-17	<0.001	0.033	<0.0001	<0.001	<0.001	<0.001	0.007	0.008	<0.01	<0.001	<0.001	0.05	<0.0001	0.4	0.22	0.02	1.1	1.7	<0.01
28-Aug-17	<0.001	0.031	<0.0001	<0.001	<0.001	<0.001	0.006	0.007	<0.01	<0.001	<0.001	0.05	<0.0001	0.3	0.07	0.02	1.01	1.5	0.01
27-Sep-17	<0.001	0.038	<0.0001	<0.001	<0.001	<0.001	0.007	0.009	<0.01	<0.001	<0.001	0.06	<0.0001	0.3	0.05	0.02	0.9	1.5	<0.01
27-Oct-17	<0.001	0.03	<0.0001	<0.001	<0.001	<0.001	0.005	0.005	<0.01	<0.001	<0.001	<0.05	<0.0001	0.2	0.04	<0.01	0.49	0.8	0.01
27-Nov-17	<0.001	0.03	<0.0001	<0.001	<0.001	<0.001	0.005	0.005	<0.01	<0.001	<0.001	<0.05	<0.0001	0.2	0.02	<0.01	0.08	0.8	0.02
27-Dec-17	<0.001	0.032	<0.0001	<0.001	<0.001	<0.001	0.005	0.005	<0.01	<0.001	<0.001	<0.05	<0.0001	0.2	0.08	<0.01	0.09	0.6	0.01
31-Jan-18	<0.001	0.033	<0.0001	<0.001	0.001	<0.001	0.004	0.003	<0.01	<0.001	<0.001	<0.05	<0.0001	0.2	<0.01	<0.01	0.01	0.4	0.02
26-Feb-18	<0.001	0.033	<0.0001	<0.001	<0.001	<0.001	0.004	0.003	<0.01	<0.001	<0.001	0.06	<0.0001	0.2	0.04	<0.01	0.09	0.4	<0.01
6-Mar-18	<0.001	0.03	<0.0001	<0.001	<0.001	<0.001	0.004	0.003	<0.01	<0.001	<0.001	<0.05	<0.0001	0.3	0.02	<0.01	<0.01	0.3	<0.01
26-Apr-18	<0.001	0.031	<0.0001	<0.001	<0.001	<0.001	0.003	0.003	<0.01	<0.001	<0.001	<0.05	<0.0001	0.2	0.02	<0.01	0.06	0.5	<0.01
29-May-18	<0.001	0.03	<0.0001	<0.001	<0.001	<0.001	0.002	0.005	<0.01	<0.001	<0.001	<0.05	<0.0001	0.3	0.25	<0.01	0.11	0.6	<0.01
19-Jun-18	<0.001	0.028	<0.0001	<0.001	<0.001	<0.001	0.002	0.005	<0.01	<0.001	<0.001	<0.05	<0.0001	0.3	0.28	0.02	0.13	0.8	0.07
Min	0.000	0.028					0.002	0.003			<0.001	0.05		0.2	0.02	0.02	0.01	0.3	<0.01
Avg	#DIV/0!	0.032					0.005	0.005			#DIV/0!	0.06		0.3	0.10	0.02	0.37	0.8	
Max	0.000	0.038					0.007	0.009			0.000	0.06		0.4	0.28	0.02	1.10	1.7	0.07
Var	#DIV/0!	0.000					0.000	0.000			#DIV/0!	0.00		0.0	0.01	0.00	0.18	0.2	
SD	#DIV/0!	0.003					0.002	0.002			#DIV/0!	0.01		0.1	0.10	0.00	0.43	0.5	

Site - Northern Arm of MWD Diversion Drain

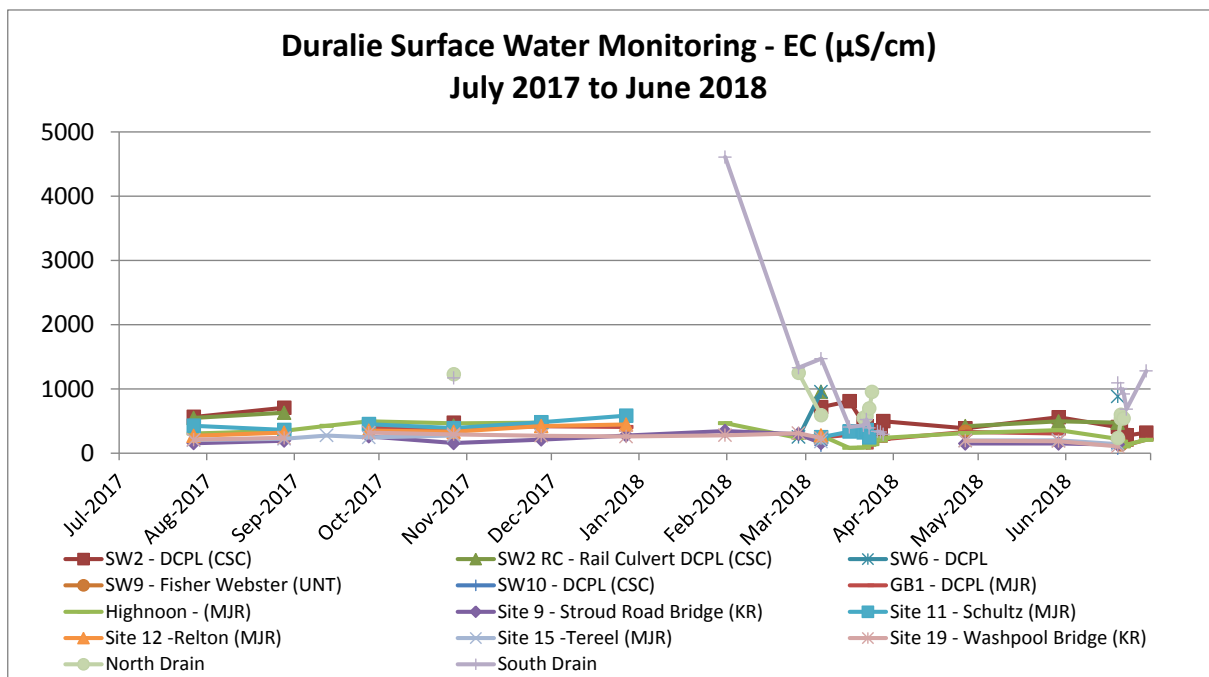
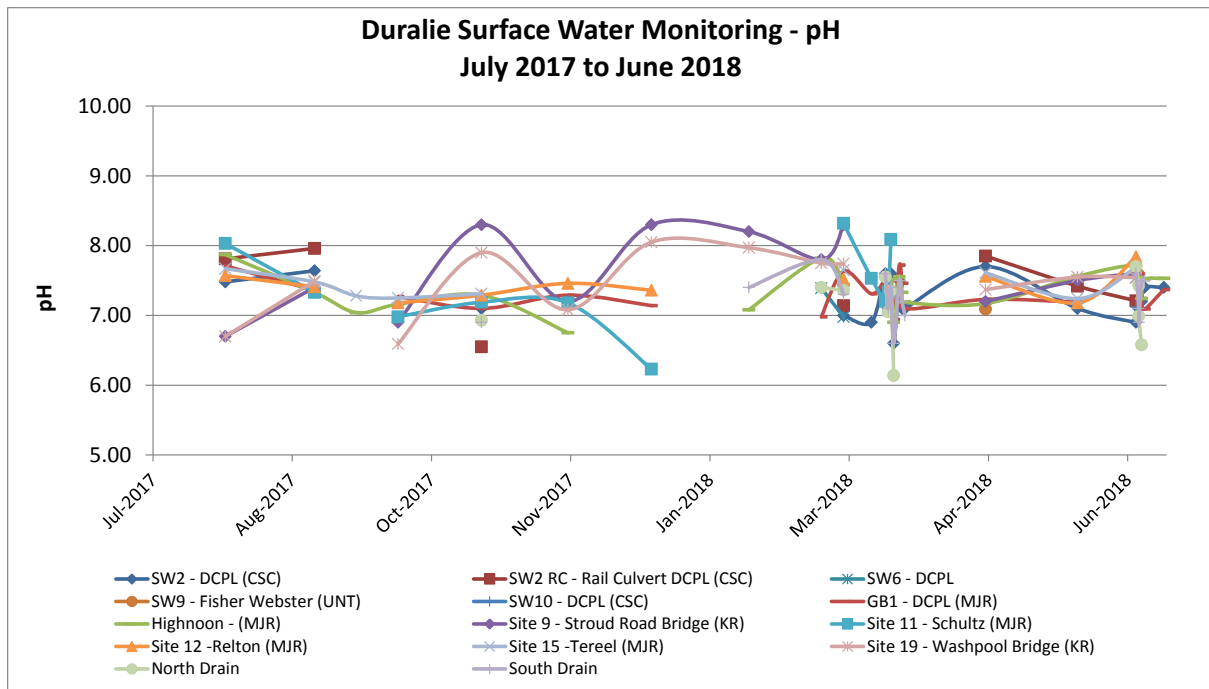
Date	Category	Comment	ph	EC uS/cm	Turbidity NTU	TSS mg/l
27-Jul-17	Monthly	nil flow				
28-Aug-17	Monthly	No water				
27-Sep-17	Monthly	No water				
27-Oct-17	Monthly	diverted to mwd	6.9	1228	18.09	
27-Nov-17	Monthly	nil flow				
27-Dec-17	Monthly	Nil flow				
31-Jan-18	Monthly	nil flow				
26-Feb-18	Monthly	Flow to SW3 dam. No flow at time of sampling	7.4	1246	15.32	
6-Mar-18	Discharge Event	Low flow, clear	7.4	588	59.2	31
21-Mar-18	Discharge	High, brown	7.6	548	206	119
22-Mar-18	Discharge	Fast, clear	7.1	575	19.3	7
23-Mar-18	Discharge	High, brown	7.4	695	22.8	7
24-Mar-18	Discharge	Low, light brown	6.1	953	6.28	<5
26-Mar-18	Discharge	No flow				
27-Mar-18	Discharge	No flow				
28-Mar-18	Discharge	No flow				
26-Apr-18	Monthly	Not running				
29-May-18	Monthly	Dry				
19-Jun-18	Discharge Event	Running over weir 0.1m, brown	7.7	232	160	56
20-Jun-18	Discharge	Slow flow, orange	7.4	535	45.8	16
21-Jun-18	Discharge	Slow flow, orange. 0.1m over notch	7.0	594	35.9	7
22-Jun-18	Discharge	Trickle, clear. 20mm over notch	6.6	541	24.4	6
29-Jun-18	Discharge	nil flow				
Min			6.1	232	6	6
Avg			7.1	703	56	31
Max			7.7	1246	206	119
Var			0.2	97486	4285	1564
SD			0.5	312	65	40
*Water Quality Trigger			7.1 - 7.9	544	119	80

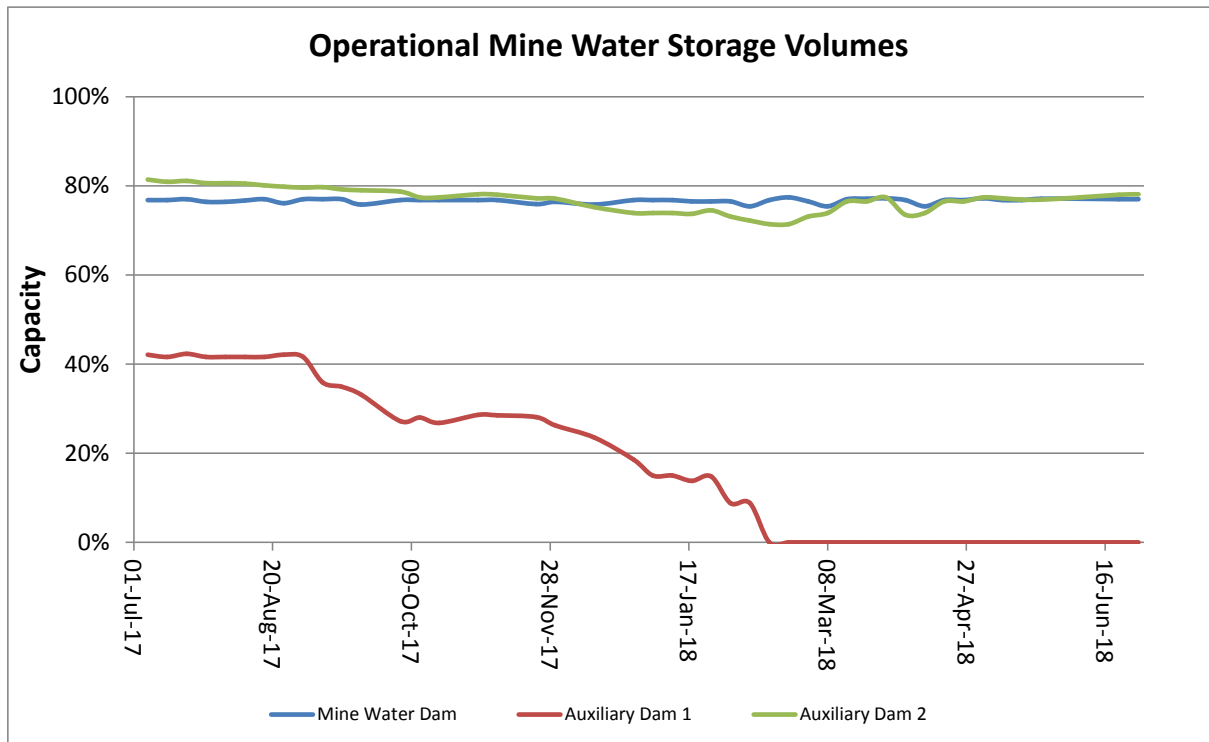
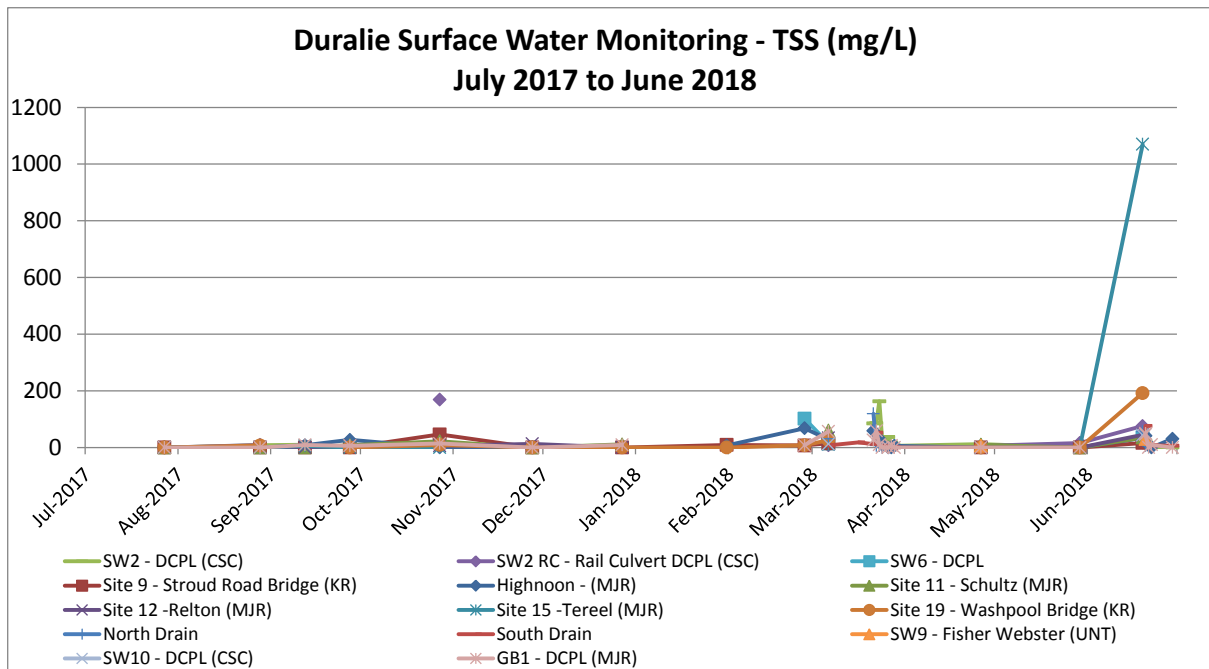
*Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).
"Gilberts & Associates 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project".

Site - Southern Arm of MWD Diversion Drain

Date	Category	Comment	ph	EC uS/cm	Turbidity NTU	TSS mg/l
27-Jul-17	Monthly	Nil flow				
28-Aug-17	Monthly	No water				
27-Sep-17	Monthly	No water				
27-Oct-17	Monthly	diverted to mwd	6.9	1170	29.3	
27-Nov-17	Monthly	Nil flow				
27-Dec-17	Monthly	Nil flow				
31-Jan-18	Monthly	Flowing into SW3 (Minor) - Flow to Dam	7.4	4610	NR	
26-Feb-18	Monthly	Flow to SW3 dam - No flow at time of sample.	7.8	1330	27.2	
6-Mar-18	Discharge Event	Clear. Flow had been diverted to MWD at time of sampling.	7.3	1471	6.89	7
21-Mar-18	Discharge	High, clear	7.6	407	116	18
22-Mar-18	Discharge	Fast, clear	7.1	431	28.4	12
23-Mar-18	Discharge	high flow, brown	7.4	522	49.2	52
24-Mar-18	Discharge	High flow, clear	6.6	392	15.36	5
25-Mar-18		Flow diverted to MWD as nobody onsite to undertake monitoring.				
26-Mar-18	Discharge	high flow, clear, 20L/s	7.5	338	14.99	<5
27-Mar-18	Discharge	mod flow, clear	7.2	327	9.73	<5
28-Mar-18	Discharge	fast, light brown	7.0	294	8.11	<5
26-Apr-18	Monthly	Water going to dam. No Sample. Brown				
29-May-18	Monthly	Dry				
19-Jun-18	Discharge Event	Running over weir 0.3m, brown	7.6	1093	189	76
20-Jun-18	Discharge	Moderate, Orange. 0.2m over notch	7.1	1005	36.7	12
21-Jun-18	Discharge	Moderate, Orange, 0.3m over notch	6.9	921	34.6	8
22-Jun-18	Discharge	Fast, Brown, 0.2m over notch	7.5	684	19.8	8
29-Jun-18	Discharge	Slow, Orange, Flowing into dam	7.5	1279	21.6	6
Min			6.6	294	7	5
Avg			7.3	1017	40	20
Max			7.8	4610	189	76
Var			0.1	1082855	2394	574
SD			0.3	1041	49	24
*Water Quality Trigger			7.1 - 7.9	544	119	80

*Water quality triggers for the Duralie Coal Mine developed in accordance with the methodology in ANZECC/ARMCANZ (2000).
Gilberts & Associates 2011 - Development of Water Quality Trigger Levels for the Duralie Extension Project.





Groundwater

DB1W

Parameter	Units	16-Aug-17	22-Nov-17	21-Feb-18	15-May-18	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	15.79	15.90	16.19	15.82	15.8	15.93	16.19	0.03	0.18
pH		5.5	6.0	6.2	6.3	5.5	6.0	6.3	0.14	0.37
Conductivity @ 25°C	(µS/cm)	3740	4310	4020	4330	3740	4100	4330	77667	279
ORP	(mV)	12	118	43	16	12	47	118	2414	49
Dissolved Oxygen	(%)	26	27	19	8	8	20	27	82	9
TDS	(mg/L)	2200	3550	2900	2850	2200	2875	3550	304167	552
Alkalinity as CaCO3	(mg/L)	94	136	140	130	94	125	140	444	21
Acidity as CaCO3	(mg/L)	86	169	204	240	86	175	240	4341	66
Sulphate	(mg/L)	273	316	383	346	273	330	383	2170	47
Chloride	(mg/L)	905	1140	1090	1140	905	1069	1140	12473	112
Calcium	(mg/L)	211	256	284	266	211	254	284	966	31
Magnesium	(mg/L)	54	65	62	66	54	62	66	30	5
Sodium	(mg/L)	449	563	527	526	449	516	563	2306	48
Aluminium	(mg/L)	2.64	0.60	1.14	1.21	0.60	1.40	2.64	0.76	0.87
Manganese	(mg/L)	0.8	1.1	1.0	0.9	0.8	1.0	1.1	0.02	0.13
Zinc	(mg/L)	0.05	0.04	0.08	0.09	0.04	0.07	0.09	0.00	0.02
Iron	(mg/L)	32.8	42.6	40.8	28.2	28.2	36.1	42.6	45.88	6.77

DB2W

Parameter	Units	16-Aug-17	22-Nov-17	21-Feb-18	14-May-18	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	13.26	13.60	13.79	15.05	13.26	13.93	15.05	0.61	0.78
pH		5.96	6.59	6.56	6.25	6.0	6.3	6.6	0.09	0.30
Conductivity @ 25°C	(µS/cm)	1396	1441	1532	1526	1396	1474	1532	4413.58	66.43
ORP	(mV)	41	69	-3	34	-3	35	69	878.92	29.65
Dissolved Oxygen	(%)	30	33	19	8	8	23	33	127.99	11.31
TDS	(mg/L)	870	964	977	928	870	935	977	2292.92	47.88
Alkalinity as CaCO3	(mg/L)	170	199	199	184	170	188	199	194.00	13.93
Acidity as CaCO3	(mg/L)	72	98	130	126	72	107	130	731.67	27.05
Sulphate	(mg/L)	158	195	174	167	158	174	195	248.33	15.76
Chloride	(mg/L)	236	272	295	299	236	276	299	835.00	28.90
Calcium	(mg/L)	98	87	107	103	87	99	107	74.92	8.66
Magnesium	(mg/L)	24	23	24	24	23	24	24	0.25	0.50
Sodium	(mg/L)	148	164	166	171	148	162	171	98.92	9.95
Aluminium	(mg/L)	<0.01	<0.01	<0.01	<0.01					
Manganese	(mg/L)	0.77	0.88	0.79	0.78	0.77	0.81	0.88	0.00	0.05
Zinc	(mg/L)	<0.005	<0.005	0.02	0.02	0.02	0.02	0.02	0.00	0.00
Iron	(mg/L)	14.1	14.5	13.4	12.3	12.3	13.6	14.5	0.93	0.96

DB3W

Parameter	Units	16-Aug-17	22-Nov-17	21-Feb-18	15-May-18	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	3.39	3.42	3.70	3.80	3.39	3.58	3.80	0.04	0.20
pH		6.0	7.3	7.0	6.6	6.0	6.7	7.3	0.30	0.55
Conductivity @ 25°C	(µS/cm)	136	102	136	305	102	170	305	8386.92	91.58
ORP	(mV)	-3	4	26	48	-3	19	48	532.92	23.08
Dissolved Oxygen	(%)	29	21	80	23	21	38	80		
TDS	(mg/L)	112	163	670	133	112	270	670		
Alkalinity as CaCO3	(mg/L)	38	36	43	42	36	40	43	10.92	3.30
Acidity as CaCO3	(mg/L)	8	17	15	32	8	18	32	102.00	10.10
Sulphate	(mg/L)	5	3	14	4	3	7	14	25.67	5.07
Chloride	(mg/L)	9	10	12	12	9	11	12	2.25	1.50
Calcium	(mg/L)	2	1	2	3	2	2	2	0.00	0.00
Magnesium	(mg/L)	1	<1	1	2	1	1	1	0.00	0.00
Sodium	(mg/L)	19	21	20	22	19	21	22	1.67	1.29
Aluminium	(mg/L)	2	2	16	2	2	6	16	49.00	7.00
Manganese	(mg/L)	0.00	0.03	0.12	0.04	0.00	0.05	0.12	0.00	0.05
Zinc	(mg/L)	0.00	0.02	0.09	0.02	0.00	0.03	0.09	0.00	0.04
Iron	(mg/L)	2.0	2.6	23.6	2.0	2.0	7.6	23.6	114.57	10.70

DB4W

Parameter	Units	16-Aug-17	22-Nov-17	21-Feb-18	14-May-18	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	6.10	6.24	6.52	6.40	6.10	6.32	6.52	0.03	0.18
pH		6.1	7.0	6.7	7.0	6.1	6.7	7.0	0.18	0.43
Conductivity @ 25°C	(µS/cm)	3610	3400	3390	3600	3390	3500	3610	14733.33	121.38
ORP	(mV)	62	103	-189	-165	-189	-47	103	22822.92	151.07
Dissolved Oxygen	(%)	32	31	11	7	7	20	32	167.01	12.92
TDS	(mg/L)	1960	2400	2100	1850	1850	2078	2400	56691.67	238.10
Alkalinity as CaCO3	(mg/L)	311	354	355	344	311	341	355	424.67	20.61
Acidity as CaCO3	(mg/L)	26	17	50	46	17	35	50	250.25	15.82
Sulphate	(mg/L)	61	54	40	45	40	50	61	87.33	9.35
Chloride	(mg/L)	866	941	908	970	866	921	970	1998.25	44.70
Calcium	(mg/L)	140	124	152	148	124	141	152	153.33	12.38
Magnesium	(mg/L)	60	55	54	58	54	57	60	7.58	2.75
Sodium	(mg/L)	494	557	511	539	494	525	557	792.25	28.15
Aluminium	(mg/L)	<0.01	<0.01	<0.01	0.01	0.01	0.01	0.01		
Manganese	(mg/L)	1.0	1.1	1.0	1.0	1.0	1.0	1.1	0.00	0.05
Zinc	(mg/L)	<0.005	<0.005	<0.005	0.01	0.01	0.01	0.01		
Iron	(mg/L)	0.3	0.1	0.2	0.2	0.1	0.2	0.3	0.01	0.08

DB5W

Parameter	Units	16-Aug-17	22-Nov-17	21-Feb-18	14-May-18	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	11.56	11.94	12.25	12.06	11.56	11.95	12.25	0.08	0.29
pH		5.3	5.9	6.1	6.0	5.3	5.8	6.1	0.13	0.36
Conductivity @ 25°C	(µS/cm)	2190	2140	2470	2650	2140	2363	2650	57825.00	240.47
ORP	(mV)	59	71	25	-14	-14	35	71	1457.58	38.18
Dissolved Oxygen	(%)	39	29	20	8	8	24	39	180.71	13.44
TDS	(mg/L)	1230	1360	1540	1490	1230	1405	1540	19366.67	139.16
Alkalinity as CaCO3	(mg/L)	44	58	39	56	39	49	58	84.92	9.22
Acidity as CaCO3	(mg/L)	128	174	216	266	128	196	266	3469.33	58.90
Sulphate	(mg/L)	160	182	257	245	160	211	257	2238.00	47.31
Chloride	(mg/L)	526	568	637	693	526	606	693	5458.00	73.88
Calcium	(mg/L)	32	28	37	35	28	33	37	15.33	3.92
Magnesium	(mg/L)	33	32	40	46	32	38	46	42.92	6.55
Sodium	(mg/L)	313	355	370	405	313	361	405	1452.25	38.11
Aluminium	(mg/L)	0.02	0.02	0.07	0.39	0.02	0.04	0.07		
Manganese	(mg/L)	1.0	1.1	1.3	1.3	1.04	1.19	1.30	0.02	0.13
Zinc	(mg/L)	0.022	0.014	0.071	0.137	0.01	0.06	0.14	0.00	0.06
Iron	(mg/L)	48.9	55.9	69.0	56.2	48.9	57.5	69.0	70.15	8.38

DB6W

Parameter	Units	16-Aug-17	8-Nov-17	23-Feb-18	17-May-18	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	21.08	21.20	21.13	21.25	21.08	21.17	21.25	0.01	0.08
pH		6.0	6.9	6.8	6.6	6.0	6.6	6.9	0.15	0.38
Conductivity @ 25°C	(µS/cm)	5690	5420	5130	5290	5130	5383	5690	56091.67	236.84
ORP	(mV)	17	55	26	-16	-16	21	55	855.00	29.24
Dissolved Oxygen	(%)	36	28	26	12	12	26	36	102.10	10.10
TDS	(mg/L)	3510	3680	3800	3730	3510	3680	3800	15266.67	123.56
Alkalinity as CaCO3	(mg/L)	624	674	672	652	624	656	674	539.67	23.23
Acidity as CaCO3	(mg/L)	94	119	177	106	94	124	177	1352.67	36.78
Sulphate	(mg/L)	79	68	84	106	68	84	106	254.92	15.97
Chloride	(mg/L)	1350	1570	1420	1640	1350	1495	1640	17766.67	133.29
Calcium	(mg/L)	278	276	314	252	252	280	314	653.33	25.56
Magnesium	(mg/L)	190	187	209	186	186	193	209	116.67	10.80
Sodium	(mg/L)	604	609	649	582	582	611	649	779.33	27.92
Aluminium	(mg/L)	0.76	0.18	0.04	0.6	0.04	0.40	0.76	0.12	0.34
Manganese	(mg/L)	0.268	0.300	0.285	0.279	0.268	0.283	0.300	0.000	0.013
Zinc	(mg/L)	0.008	<0.005	0.017	0.026	0.008	0.017	0.026	0.000	0.009
Iron	(mg/L)	4.0	3.8	3.9	3.8	3.8	3.9	4.0	0.01	0.10

DB7W

Parameter	Units	16-Aug-17	22-Nov-17	21-Feb-18	14-May-18	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	10.50	10.90	11.15	10.44	10.44	10.75	11.15	0.11	0.34
pH		6.4	7.1	6.8	7.0	6.4	6.8	7.1	0.08	0.28
Conductivity @ 25°C	(µS/cm)	2730	2490	2650	2860	2490	2683	2860	23958.33	154.78
ORP	(mV)	29	33	-81	-55	-81	-19	33	3382.33	58.16
Dissolved Oxygen	(%)	29	30	45	24	24	32	45	77.28	8.79
TDS	(mg/L)	1540	1770	1520	1530	1520	1590	1770	14466.67	120.28
Alkalinity as CaCO3	(mg/L)	397	424	425	410	397	414	425	175.33	13.24
Acidity as CaCO3	(mg/L)	20	29	46	46	20	35	46	167.58	12.95
Sulphate	(mg/L)	87	73	68	74	68	76	87	65.67	8.10
Chloride	(mg/L)	596	667	634	694	596	648	694	1792.25	42.33
Calcium	(mg/L)	139	122	152	144	122	139	152	160.92	12.69
Magnesium	(mg/L)	51	50	52	54	50	52	54	2.92	1.71
Sodium	(mg/L)	354	398	374	358	354	371	398	398.67	19.97
Aluminium	(mg/L)	1.1	0.1	0.4	0.7	0.1	0.6	1.1	0.18	0.43
Manganese	(mg/L)	0.596	0.677	0.626	0.603	0.596	0.626	0.677	0.001	0.04
Zinc	(mg/L)	0.031	<0.005	0.012	0.024	0.012	0.022	0.031	0.000	0.01
Iron	(mg/L)	2.02	0.3	0.38	1.13	0.30	0.96	2.02	0.64	0.80

DB8W

Parameter	Units	16-Aug-17	22-Nov-17	23-Feb-18	17-May-18	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	19.72	20.06	19.94	19.84	19.89	20.06	0.02	0.14

DB9W

Parameter	Units	16-Aug-17	22-Nov-17	23-Feb-18	17-May-18	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	20.4	20.73	20.93	20.94	20.40	20.75	20.94	0.06	0.25
pH		7.41	7.18	7.32	7.37	7.2	7.3	7.4	0.01	0.10
Conductivity @ 25°C	(µS/cm)	3250	4880	3110	2890	2890	3533	4880	828958.33	910.47
ORP	(mV)	-101	-7	44	45	-101	-5	45	4706.92	68.61
Dissolved Oxygen	(%)	22	57	27	2	2	27	57	514.35	22.68
TDS	(mg/L)	1900	3830	1950	1980	1900	2415	3830	890966.67	943.91
Alkalinity as CaCO3	(mg/L)	165	268	138	136	136	177	268	3875.58	62.25
Acidity as CaCO3	(mg/L)	6	14	10	8	6	10	14	11.67	3.42
Sulphate	(mg/L)	245	256	244	284	244	257	284	347.58	18.64
Chloride	(mg/L)	751	1390	789	884	751	954	1390	87809.67	296.33
Calcium	(mg/L)	148	280	152	128	128	177	280	4825.33	69.46
Magnesium	(mg/L)	16	26	12	9	9	16	26	54.92	7.41
Sodium	(mg/L)	486	885	498	471	471	585	885	40122.00	200.30
Aluminium	(mg/L)	0.08	0.07	0.06	0.04	0.0	0.1	0.1	0.00	0.02
Manganese	(mg/L)	0.21	0.176	0.176	0.173	0.173	0.184	0.210	0.00	0.02
Zinc	(mg/L)	0.019	0.073	0.03	0.02	0.019	0.036	0.073	0.00	0.03
Iron	(mg/L)	0.78	0.7	0.74	0.66	0.66	0.72	0.78	0.00	0.05

DB10W

Parameter	Units	16-Aug-17	22-Nov-17	23-Feb-18	17-May-18	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	11.95	12.36	12.6	12.61	11.95	12.38	12.61	0.10	0.31
pH		5.81	6.12	6.12	5.45	5.5	5.9	6.1	0.10	0.32
Conductivity @ 25°C	(µS/cm)	3920	3810	3710	3610	3610	3763	3920	17691.67	133.01
ORP	(mV)	27	47	68	80	27	56	80	547.00	23.39
Dissolved Oxygen	(%)	24	25	27	18	18	24	27	16.00	4.00
TDS	(mg/L)	2340	2660	1980	2520	1980	2375	2660	86500.00	294.11
Alkalinity as CaCO3	(mg/L)	57	49	31	38	31	44	57	132.92	11.53
Acidity as CaCO3	(mg/L)	83	88	150	102	83	106	150	934.92	30.58
Sulphate	(mg/L)	431	445	416	432	416	431	445	140.67	11.86
Chloride	(mg/L)	906	985	1000	1050	906	985	1050	3563.58	59.70
Calcium	(mg/L)	90	74	78	64	64	77	90	115.67	10.75
Magnesium	(mg/L)	76	77	73	75	73	75	77	2.92	1.71
Sodium	(mg/L)	596	681	608	576	576	615	681	2095.58	45.78
Aluminium	(mg/L)	1.02	0.38	0.25	0.18	0.2	0.5	1.0	0.15	0.38
Manganese	(mg/L)	0.918	0.934	0.867	0.892	0.867	0.903	0.934	0.00	0.03
Zinc	(mg/L)	0.285	0.216	0.223	0.18	0.180	0.226	0.285	0.00	0.04
Iron	(mg/L)	18.4	17.2	15.9	16.3	15.90	16.95	18.40	1.23	1.11

DB11W

Note: Installed 3-Sep-13. E - 399100, N - 6430300

Parameter	Units	16-Aug-17	8-Nov-17	21-Feb-18	14-May-18	Min	Avg	Max	Variance	Std Dev
Depth to standing WL (TOC)	(m)	10.50	10.72	10.80	10.66	10.5	10.67	10.80	0.02	0.13
pH		6.17	7.25	7.1	6.83	6.2	6.84	7.25	0.23	0.48
Conductivity @ 25°C	(µS/cm)	3640	2950	2760	3520	2760.0	3217.50	3640.00	183625.00	428.51
ORP	(mV)	-21	-51	-56	-48	-56.0	-44.00	-21.00	246.00	15.68
Dissolved Oxygen	(%)	41	35	20	15	14.6	27.43	40.60	148.72	12.20
TDS	(mg/L)	2290	2050	1800	1770	1770.0	1977.50	2290.00	59158.33	243.22
Alkalinity as CaCO3	(mg/L)	239	303	301	317	239.0	290.00	317.00	1206.67	34.74
Acidity as CaCO3	(mg/L)	26	6	38	42	6.0	28.00	42.00	261.33	16.17
Sulphate	(mg/L)	233	187	186	169	169.0	193.75	233.00	752.92	27.44
Chloride	(mg/L)	869	732	698	774	698.0	768.25	869.00	5477.58	74.01
Calcium	(mg/L)	262	187	198	210	187.0	214.25	262.00	1101.58	33.19
Magnesium	(mg/L)	51	33	28	35	28.0	36.75	51.00	98.92	9.95
Sodium	(mg/L)	410	374	370	378	370.0	383.00	410.00	334.67	18.29
Aluminium	(mg/L)	0.09	0.02	0.13	0.06	0.0	0.08	0.13	0.00	0.05
Manganese	(mg/L)	1.170	0.849	0.703	0.791	0.7	0.88	1.17	0.04	0.20
Zinc	(mg/L)	0.153	<0.005	0.008	<0.005	0.0	0.08	0.15	0.01	0.10
Iron	(mg/L)	5.25	3.38	2.64	3.46	2.6	3.68	5.25	1.23	1.11

BH4BW

Parameter	Units	16-Aug-17	22-Nov-17	21-Feb-18	15-May-18	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	4.86	4.99	5.25	4.90	4.9	5.00	5.25	0.03	0.18
pH		6.0	6.8	6.3	6.3	6.0	6.34	6.77	0.10	0.32
Conductivity @ 25°C	(µS/cm)	260	259	241	271	241.0	257.75	271.00	154.25	12.42
ORP	(mV)	24	24	65	56	24.0	42.25	65.00	457.58	21.39
Dissolved Oxygen	(%)	36	30	36	24	24.0	31.50	36.20	34.68	5.89
TDS	(mg/L)	119	281	210	176	119.0	196.50	281.00	4583.00	67.70
Alkalinity as CaCO3	(mg/L)	111	107	103	102	102.0	105.75	111.00	16.92	4.11
Acidity as CaCO3	(mg/L)	14	48	59	55	14.0	44.00	59.00	420.67	20.51
Sulphate	(mg/L)	2	8	3	3	2.0	4.00	8.00	7.33	2.71
Chloride	(mg/L)	21	17	14	20	14.0	18.00	21.00	10.00	3.16
Calcium	(mg/L)	16	9	13	14	9.0	13.00	16.00	8.67	2.94
Magnesium	(mg/L)	12	8	8	9	8.0	9.25	12.00	3.58	1.89
Sodium	(mg/L)	24	30	19	24	19.0	24.25	30.00	20.25	4.50
Aluminium	(mg/L)	1	4	97	21	1.0	30.75	97.00	2028.25	45.04
Manganese	(mg/L)	1.2	0.5	4.4	1.6	0.5	1.93	4.40	2.93	1.71
Zinc	(mg/L)	0.1	0.0	0.5	0.1	0.0	0.19	0.52	0.05	0.23
Iron	(mg/L)	2.8	8.8	155.0	32.7	2.8	49.83	155.00	5083.15	71.30

SI1W

Parameter	Units	16-Aug-17	8-Nov-17	23-Feb-18	15-May-18	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	9.56	9.69	9.90	10.69	9.56	9.96	10.69	0.26	0.51
pH		7.1	6.8	7.3	7.3	6.8	7.1	7.3	0.05	0.22
Conductivity @ 25°C	(µS/cm)	2750	2740	2690	2970	2690	2788	2970	15491.67	124.47
ORP	(mV)	53	-29	125	122	-29	68	125	5266.25	72.57
Dissolved Oxygen	(%)	38	36	39	27	27	35	39	28.65	5.35
TDS	(mg/L)	1810	1810	1990	1790	1790	1850	1990	8800.00	93.81
Alkalinity as CaCO ₃	(mg/L)	457	522	507	488	457	494	522	785.67	28.03
Acidity as CaCO ₃	(mg/L)	19	15	56	56	15	37	56	509.67	22.58
Sulphate	(mg/L)	490	579	662	688	490	605	688	8012.92	89.51
Chloride	(mg/L)	292	313	296	333	292	309	333	349.67	18.70
Calcium	(mg/L)	169	159	188	183	159	175	188	174.92	13.23
Magnesium	(mg/L)	144	141	161	157	141	151	161	94.92	9.74
Sodium	(mg/L)	243	252	257	262	243	254	262	65.67	8.10
Aluminium	(mg/L)	0.32	0.02	0.05	0.29	0.02	0.17	0.32	0.02	0.16
Manganese	(mg/L)	0.005	0.004	0.007	0.010	0.0	0.01	0.01	0.00	0.00
Zinc	(mg/L)	<0.005	<0.005	<0.005	0.014	0.0	0.01	0.01		
Iron	(mg/L)	0.19	<0.05	0.13	0.30	0.13	0.21	0.30	0.01	0.09

SI2W

Parameter	Units	16-Aug-17	8-Nov-17	23-Feb-18	15-May-18	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	18.62	18.88	19.61	19.19	18.6	19.08	19.61	0.18	0.43
pH		7.3	7.5	7.5	7.1	7.1	7.32	7.48	0.03	0.18
Conductivity @ 25°C	(µS/cm)	3060	3020	3000	3190	3000	3068	3190	7292	85
ORP	(mV)	60	211	103	115	60	122	211	4058	64
Dissolved Oxygen	(%)	22	22	24	14	14	20	24	20	4
TDS	(mg/L)	2150	1880	2310	1890	1880	2058	2310	43958	210
Alkalinity as CaCO ₃	(mg/L)	331	373	341	326	326	343	373	446	21
Acidity as CaCO ₃	(mg/L)	13	<1	28	25	13	22	28	63	8
Sulphate	(mg/L)	855	1190	1080	1060	855	1046	1190	19523	140
Chloride	(mg/L)	240	263	264	292	240	265	292	453	21
Calcium	(mg/L)	143	134	154	152	134	146	154	84	9
Magnesium	(mg/L)	162	158	174	170	158	166	174	53	7
Sodium	(mg/L)	348	356	360	369	348	358	369	76	9
Aluminium	(mg/L)	0.03	<0.01	0.02	0.04	0.02	0.03	0.04	0.00	0.01
Manganese	(mg/L)	0.017	0.016	0.013	0.012	0.012	0.015	0.017	0.000	0.002
Zinc	(mg/L)	<0.005	<0.005	0.006	0.009	0.006	0.008	0.009	0.000	0.002
Iron	(mg/L)	0.08	0.07	0.1	0.09	0.07	0.09	0.10	0.00	0.01

SI3W

Parameter	Units	16-Aug-17	8-Nov-17	23-Feb-18	15-May-18	Min	Avg	Max	Variance	Std Dev
Depth to standing WL	(m)	28.00	28.15	28.04	28.58	28.00	28.19	28.58	0.07	0.27
pH		6.9	6.9	7.2	7.0	6.9	7.0	7.2	0.01	0.12
Conductivity @ 25°C	(µS/cm)	6270	6100	5850	6410	5850	6158	6410	58091.67	241.02
ORP	(mV)	68	67	81	123	67	85	123	690.92	26.29
Dissolved Oxygen	(%)	42	51	43	63	42	50	63	100.35	10.02
TDS	(mg/L)	4280	3480	3350	3450	3350	3640	4280	185133.33	430.27
Alkalinity as CaCO ₃	(mg/L)	308	319	322	297	297	312	322	129.67	11.39
Acidity as CaCO ₃	(mg/L)	28	26	46	48	26	37	48	134.67	11.60
Sulphate	(mg/L)	493	66	731	712	66	501	731	95569.67	309.14
Chloride	(mg/L)	1380	1600	1600	1610	1380	1548	1610	12491.67	111.77
Calcium	(mg/L)	438	456	508	539	438	485	539	2164.92	46.53
Magnesium	(mg/L)	130	132	150	144	130	139	150	92.00	9.59
Sodium	(mg/L)	693	709	746	758	693	727	758	933.67	30.56
Aluminium	(mg/L)	3.3	0.15	0.09	0.8	0.09	1.09	3.30	2.28	1.51
Manganese	(mg/L)	1.640	0.274	0.028	0.271	0.028	0.553	1.640	0.54	0.73
Zinc	(mg/L)	0.094	0.041	0.025	0.034	0.025	0.049	0.094	0.00	0.03
Iron	(mg/L)	3.75	0.26	0.16	1.09	0.16	1.32	3.75	2.81	1.68

WR1**Note:** Installed 3-Sep-13. E - 400776, N - 6425804

Waste Emplacement - South

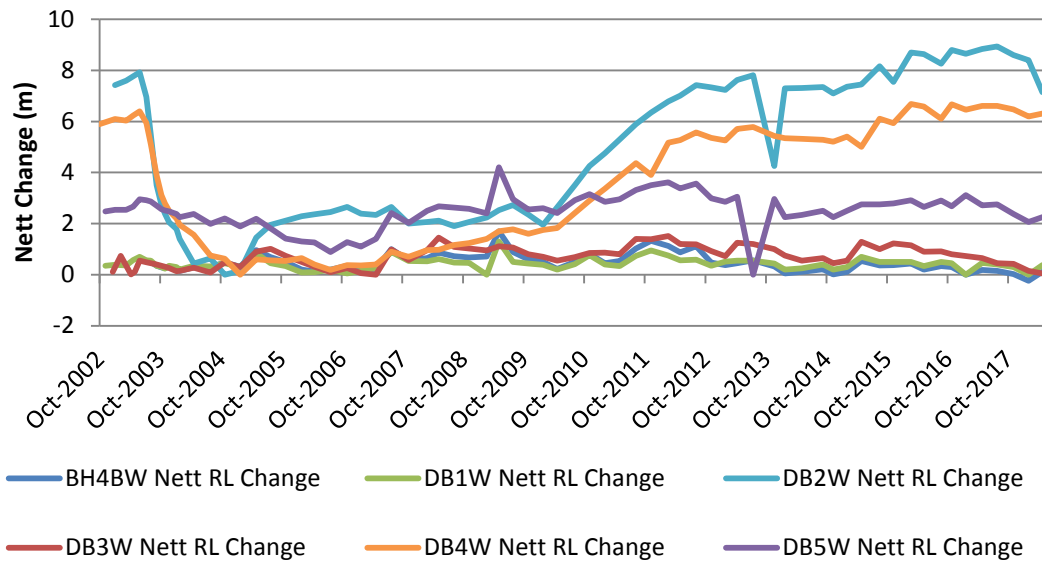
Parameter	Units	16-Aug-17	8-Nov-17	23-Feb-18	17-May-18	Min	Avg	Max	Variance	Std Dev
Depth to standing WL (TOC)	(m)	9.26	9.42	9.69	9.03	9.03	9.35	9.69	0.08	0.28
pH		6.44	7.23	6.69	6.48	6.4	6.7	7.2	0.13	0.36
Conductivity @ 25°C	(µS/cm)	1991	2034	2153	2090	1991	2067	2153	4930.00	70.21
ORP	(mV)	50	90	116	98	50	89	116	777.00	27.87
Dissolved Oxygen	(%)	45		38	73	38	52	73	345.81	18.60
TDS	(mg/L)	1470	1310	1340	1590	1310	1428	1590	16558.33	128.68
Alkalinity as CaCO ₃	(mg/L)	277	310	310	301	277	300	310	243.00	15.59
Acidity as CaCO ₃	(mg/L)	50	86	114	65	50	79	114	770.25	27.75
Sulphate	(mg/L)	330	397	418	451	330	399	451	2610.00	51.09
Chloride	(mg/L)	245	276	304	369	245	299	369	2789.67	52.82
Calcium	(mg/L)	133	121	155	145	121	139	155	217.00	14.73
Magnesium	(mg/L)	25	24	27	30	24	27	30	7.00	2.65
Sodium	(mg/L)	272	279	293	285	272	282	293	79.58	8.92
Aluminium	(mg/L)	6.57	0.82	1.84	3.12	0.8	3.1	6.6	6.28	2.51
Manganese	(mg/L)	0.552	0.638	0.615	0.624	0.552	0.607	0.638	0.00	0.04
Zinc	(mg/L)	0.03	0.016	0.016	0.019	0.016	0.020	0.030	0.00	0.01
Iron	(mg/L)	3.87	1.56	1.98	2.58	1.56	2.50	3.87	1.01	1.01

WR2**Note:** Installed 3-Sep-13. E - 400990, N - 6426582

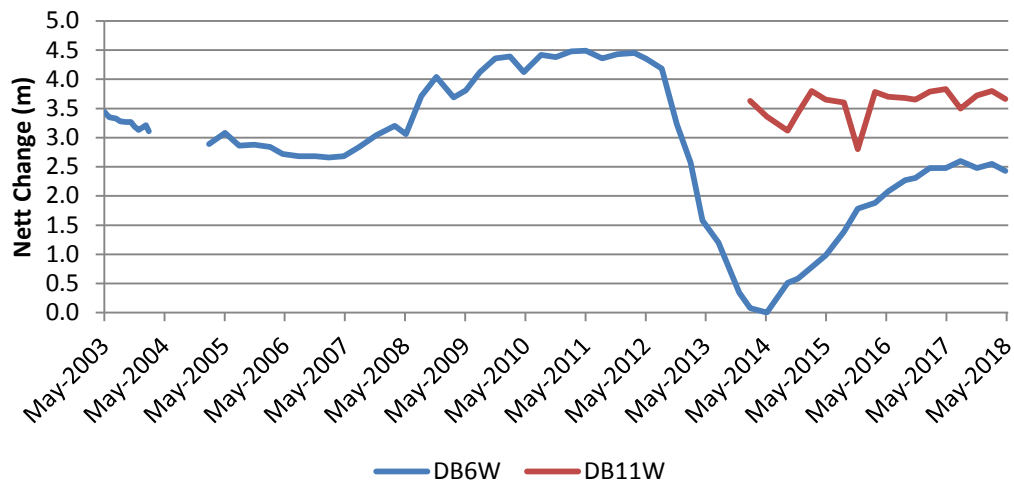
Waste Emplacement - East

Parameter	Units	16-Aug-17	22-Nov-17	23-Feb-18	17-May-18	Min	Avg	Max	Variance	Std Dev
Depth to standing WL (TOC)	(m)	71.68	66.14	67.38	65.98	65.98	67.80	71.68	7.10	2.66
pH		6.96	6.65	7.41	7.15	6.7	7.04	7.41	0.10	0.32
Conductivity @ 25°C	(µS/cm)	5260	5560	5210	4740	4740	5193	5560	114891.67	338.96
ORP	(mV)	-37	28	114	52	-37	39	114	3896.92	62.43
Dissolved Oxygen	(%)	64	40	48	36	36	47	64	160.15	12.66
TDS	(mg/L)	4050	5690	4910	4720	4050	4843	5690	455291.67	674.75
Alkalinity as CaCO ₃	(mg/L)	168	198	185	181	168	183	198	152.67	12.36
Acidity as CaCO ₃	(mg/L)	22	29	34	27	22	28	34	24.67	4.97
Sulphate	(mg/L)	907	1340	1320	1340	907	1227	1340	45528.92	213.38
Chloride	(mg/L)	1010	1200	1220	1360	1010	1198	1360	20691.67	143.85
Calcium	(mg/L)	851	948	1010	1080	851	972	1080	9441.58	97.17
Magnesium	(mg/L)	26	26	27	27	26	27	27	0.33	0.58
Sodium	(mg/L)	311	367	349	321	311	337	367	658.67	25.66
Aluminium	(mg/L)	3.48	4.98	2.08	7.55	2.08	4.52	7.55	5.48	2.34
Manganese	(mg/L)	2.3	2.53	2.79	2.34	2.30	2.49	2.79	0.05	0.22
Zinc	(mg/L)	0.157	0.152	0.137	0.302	0.137	0.187	0.302	0.01	0.08
Iron	(mg/L)	9.64	13.8	5.43	14.6	5.43	10.87	14.60	17.87	4.23

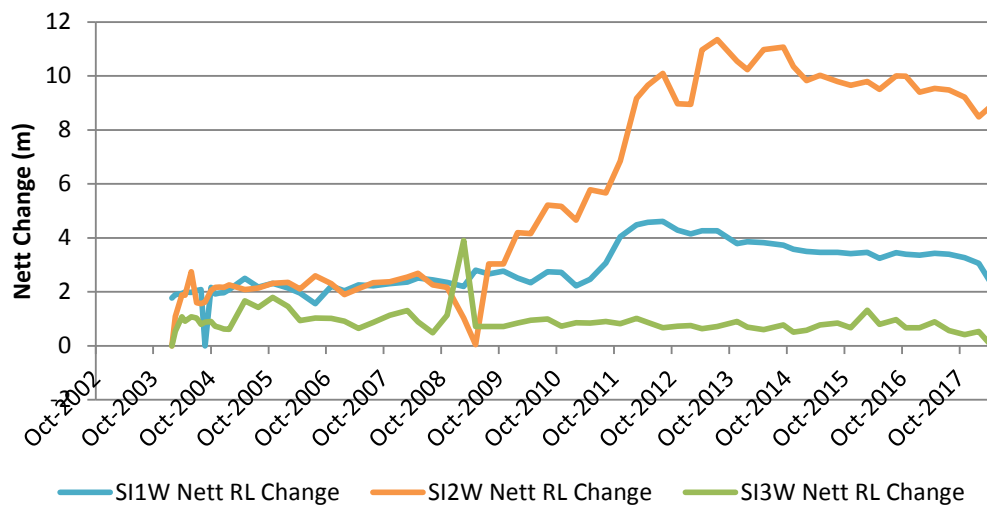
Groundwater Nett RL Change - Pit to River



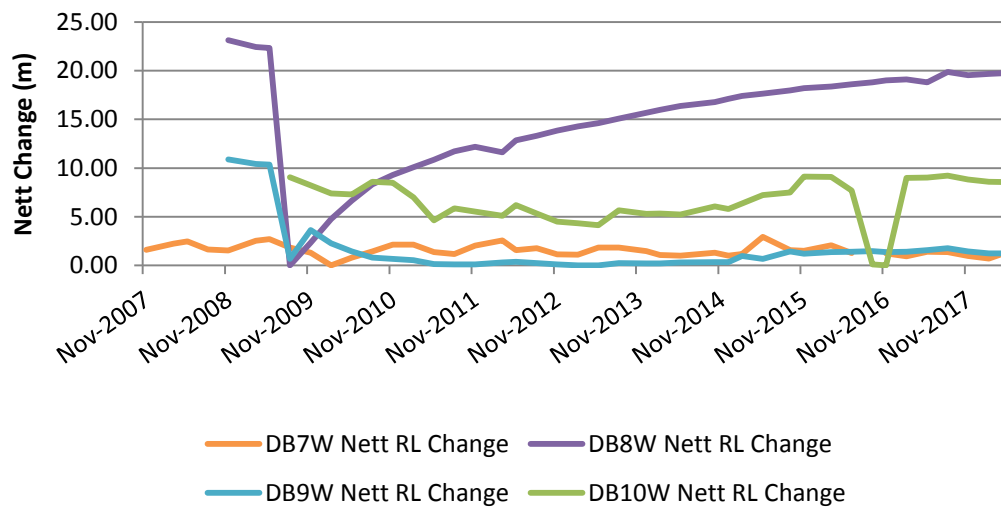
Groundwater Nett RL Change - DB6W & DB11W



Groundwater Nett RL Change - Western Irrigation Area



Groundwater Nett RL Change - Pit to River



Appendix 5:

Blast Monitoring

Duralie Coal Mine Blast Monitoring Results

Location	Date	Time	Schultz (AB1)		Fisher-Webster (AAAB3)		Moylan (AAAB4)		Weismantel Inn		Overpressure Site Exceedance ¹	Overpressure "Cumulative Exceedance" ¹	Ground Vibration Site Exceedance ¹	Ground Vibration "Cumulative Exceedance" ¹	Monitored Blasts ¹	Fume Rating
		24hr	mm/s	dBL	mm/s	dBL	mm/s	dBL	mm/s	dBL	%		%			
Clareval Block 7	07-Jul-17	14:22:00	<0.22	<110.0	<0.22	<110.0	0.52	107.8	1.05	104.5	0.0%	0	0.0%	0	1	Nil
Clareval Block 7	12-Jul-17	15:25:00	<0.22	<110.0	<0.22	<110.0	0.27	100.0	0.45	104.5	0.0%	0	0.0%	0	2	Nil
Clareval Block 7	14-Jul-17	13:05:00	<0.22	<110.0	<0.22	<110.0	<0.22	<110.0	0.48	100.0	0.0%	0	0.0%	0	3	Nil
Clareval Block 7	19-Jul-17	11:36:00	<0.22	<110.0	<0.22	<110.0	0.51	100.0	0.94	110.2	0.0%	0	0.0%	0	4	Nil
Clareval Block 7	20-Jul-17	12:29:00	<0.22	<110.0	<0.22	<110.0	<0.22	<110.0	0.34	104.5	0.0%	0	0.0%	0	5	Nil
Clareval Block 7	24-Jul-17	11:36:00	<0.22	<110.0	<0.22	<110.0	<0.22	<110.0	0.37	96.9	0.0%	0	0.0%	0	6	Nil
Clareval Block 7	25-Jul-17	16:41:00	<0.22	<110.0	<0.22	<110.0	<0.22	<110.0	0.26	104.9	0.0%	0	0.0%	0	7	Nil
Clareval Block 7	27-Jul-17	11:38:00	<0.22	<110.0	<0.22	<110.0	0.35	104.6	<0.22	<110.0	0.0%	0	0.0%	0	8	Nil
Weismantel Strip 16	04-Aug-17	11:45:00	<0.22	<110.0	0.46	102.1	0.29	101.5	0.66	113.6	0.0%	0	0.0%	0	9	Nil
Clareval Block 7	11-Aug-17	15:30:00	<0.22	<110.0	<0.22	<110.0	0.34	97.5	0.66	104.9	0.0%	0	0.0%	0	10	Nil
Weismantel Strip 16	17-Aug-17	11:31:00	<0.22	<110.0	0.37	105.3	0.29	103.5	0.4	114.7	0.0%	0	0.0%	0	11	Nil
Clareval Block 7	18-Aug-17	15:10:00	<0.22	<110.0	<0.22	<110.0	0.3	103.5	0.89	103.8	0.0%	0	0.0%	0	12	Nil
Weismantel Strip 16	23-Aug-17	12:01:00	<0.22	<110.0	<0.22	<110.0	<0.22	<110.0	0.54	99.2	0.0%	0	0.0%	0	13	Nil
Weismantel Strip 16	01-Sep-17	11:38:00	<0.22	<110.0	0.57	105.7	0.3	102.8	1.01	109.2	0.0%	0	0.0%	0	14	Nil
Weismantel Strip 16	08-Sep-17	12:11:00	<0.22	<110.0	0.43	105.7	0.26	98.9	0.71	108.1	0.0%	0	0.0%	0	15	Nil
Clareval Ramp 2	14-Sep-17	11:40:00	<0.22	<110.0	<0.22	<110.0	<0.22	<110.0	<0.22	<110.0	0.0%	0	0.0%	0	16	Nil
Weismantel Strip 16	15-Sep-17	12:09:00	<0.22	<110.0	0.39	112.3	0.28	98.2	0.78	111.3	0.0%	0	0.0%	0	17	Nil
Weismantel Strip 16	28-Sep-17	11:27:00	<0.22	<110.0	0.47	108.3	<0.22	<110.0	0.49	112.5	0.0%	0	0.0%	0	18	Nil
Weismantel Strip 16	06-Oct-17	11:34:00	<0.22	<110.0	0.56	109.5	<0.22	<110.0	0.87	114.3	0.0%	0	0.0%	0	19	Nil
Weismantel Strip 16	12-Oct-17	12:05:00	<0.22	<110.0	0.53	111.5	<0.22	<110.0	0.82	109.8	0.0%	0	0.0%	0	20	Nil
Weismantel Strip 16	18-Oct-17	14:59:00	<0.22	<110.0	<0.22	<110.0	<0.22	<110.0	0.52	110.0	0.0%	0	0.0%	0	21	Nil
Weismantel Strip 16	26-Oct-17	12:03:00	<0.22	<110.0	<0.22	<110.0	<0.22	<110.0	0.72	106.2	0.0%	0	0.0%	0	22	Nil
Weismantel Strip 16	10-Nov-17	11:22:00	<0.22	<110.0	0.54	104.6	<0.22	<110.0	0.75	114.9	0.0%	0	0.0%	0	23	Nil
Weismantel Strip 16	16-Nov-17	11:46:00	<0.22	<110.0	0.5	97.0	<0.22	<110.0	0.83	108.3	0.0%	0	0.0%	0	24	Nil
Weismantel Strip 16	23-Nov-17	11:35:00	<0.22	<110.0	0.31	105.7	<0.22	<110.0	0.38	109.6	0.0%	0	0.0%	0	25	Nil
Weismantel Strip 16	08-Dec-17	11:47:00	<0.22	<110.0	<0.22	<110.0	<0.22	<110.0	0.45	110.5	0.0%	0	0.0%	0	26	Nil
Weismantel Strip 16	21-Dec-17	11:03:00	<0.22	<110.0	0.37	108.3	<0.22	<110.0	0.49	111.0	0.0%	0	0.0%	0	27	Nil

Duralie Coal Mine Blast Monitoring Results

Weismantel Strip 16	11-Jan-18	14:52:00	<0.22	<110.0	<0.22	<110.0	<0.22	<110.0	0.57	108.9	0.0%	0	0.0%	0	28	Nil
Weismantel Strip 16	17-Jan-18	11:05:00	<0.22	<110.0	<0.22	<110.0	<0.22	<110.0	<0.22	<110.0	0.0%	0	0.0%	0	29	Nil
Weismantel Strip 16	25-Jan-18	11:47:00	<0.22	<110.0	0.46	106.3	<0.22	<110.0	0.77	108.4	0.0%	0	0.0%	0	30	Nil
Weismantel Strip 16	01-Feb-18	16:11:00	<0.22	<110.0	<0.22	<110.0	<0.22	<110.0	0.56	112.0	0.0%	0	0.0%	0	31	Nil
Weismantel Strip 16	09-Feb-18	11:40:00	<0.22	<110.0	0.39	103.9	<0.22	<110.0	0.7	108.9	0.0%	0	0.0%	0	32	Nil
Weismantel Strip 16	22-Feb-18	14:36:00	<0.22	<110.0	0.7	102.7	<0.22	<110.0	1.32	112.7	0.0%	0	0.0%	0	33	Nil
Weismantel Strip 16	02-Mar-18	10:38:00	<0.22	<110.0	0.54	105.0	<0.22	<110.0	0.85	111.6	0.0%	0	0.0%	0	34	2A
Weismantel Strip 16	09-Mar-18	11:39:00	<0.22	<110.0	0.59	103.9	<0.22	<110.0	1.2	110.2	0.0%	0	0.0%	0	35	Nil
Weismantel Strip 16	21-Mar-18	14:21:00	<0.22	<110.0	<0.22	<110.0	<0.22	<110.0	0.45	110.5	0.0%	0	0.0%	0	36	Nil
Weismantel Strip 16	12-Apr-18	14:43:00	<0.22	<110.0	0.5	105.0	<0.22	<110.0	0.89	109.8	0.0%	0	0.0%	0	37	Nil
Weismantel Strip 16	24-Apr-18	11:20:00	<0.22	<110.0	0.49	107.1	<0.22	<110.0	0.66	110.2	0.0%	0	0.0%	0	38	Nil
Weismantel Strip 16	03-May-18	14:36:00	<0.22	<110.0	0.44	102.7	<0.22	<110.0	0.93	109.2	0.0%	0	0.0%	0	39	Nil
Weismantel Strip 16	10-May-18	11:25:00	<0.22	<110.0	<0.22	<110.0	<0.22	<110.0	0.44	102.4	0.0%	0	0.0%	0	40	Nil
Weismantel Strip 16	17-May-18	11:40:00	<0.22	<110.0	0.67	103.2	<0.22	<110.0	0.73	104.9	0.0%	0	0.0%	0	41	Nil
Weismantel Strip 16	13-Jun-18	12:02:00	<0.22	<110.0	0.83	103.2	<0.22	<110.0	0.63	109.0	0.0%	0	0.0%	0	42	Nil
Weismantel Strip 16	22-Jun-18	10:36:00	<0.22	<110.0	<0.22	<110.0	<0.22	<110.0	0.36	109.0	0.0%	0	0.0%	0	43	Nil

Note 1

Note 2

Note 3

**Note: Blast compliance,*

- *No more than 5% of total blasts for annual monitoring period to exceed an overpressure of 115dB(L) or ground vibration of 5mm/s.*
- *No blast is to exceed an overpressure of 120dB(L) or ground vibration of 10mm/s.*
- *Weismantel's Inn – No blast is to exceed 10 mm/s ground vibration. No limit on overpressure.*
- *Mammy Johnson's Grave - No blast is to exceed 5 mm/s ground vibration. No limit on overpressure.*

Appendix 6:

Shuttle Train Performance Summary

DURALIE SHUTTLE TRAIN PERFORMANCE SUMMARY

Notes:

1 - The number of trains is considered to be a full site.

2- Includes the date/time of each train received by midnight.

3 - Includes instances when the shuttle train is open and 1 am in exceptional circumstances.

Day / Date	Number of Trains 1	Trains Received after 10pm ²
Saturday, 1 July 2017	0	
Sunday, 2 July 2017	0	
Monday, 3 July 2017	2	
Tuesday, 4 July 2017	2	
Wednesday, 5 July 2017	4	23:00
Thursday, 6 July 2017	2	
Friday, 7 July 2017	3	
Saturday, 8 July 2017	0	
Sunday, 9 July 2017	0	
Monday, 10 July 2017	4	22:30
Tuesday, 11 July 2017	3	
Wednesday, 12 July 2017	3	23:55
Thursday, 13 July 2017	2	
Friday, 14 July 2017	3	
Saturday, 15 July 2017	0	
Sunday, 16 July 2017	0	
Monday, 17 July 2017	3	
Tuesday, 18 July 2017	3	
Wednesday, 19 July 2017	3	
Thursday, 20 July 2017	3	
Friday, 21 July 2017	3	
Saturday, 22 July 2017	0	
Sunday, 23 July 2017	0	
Monday, 24 July 2017	3	
Tuesday, 25 July 2017	3	
Wednesday, 26 July 2017	3	
Thursday, 27 July 2017	3	
Friday, 28 July 2017	2	
Saturday, 29 July 2017	0	
Sunday, 30 July 2017	0	
Monday, 31 July 2017	1	
Tuesday, 1 August 2017	2	
Wednesday, 2 August 2017	3	
Thursday, 3 August 2017	3	
Friday, 4 August 2017	2	
Saturday, 5 August 2017	0	
Sunday, 6 August 2017	0	
Monday, 7 August 2017	3	

Tuesday, 8 August 2017	3	
Wednesday, 9 August 2017	3	
Thursday, 10 August 2017	3	
Friday, 11 August 2017	3	
Saturday, 12 August 2017	0	
Sunday, 13 August 2017	0	
Monday, 14 August 2017	2	
Tuesday, 15 August 2017	2	
Wednesday, 16 August 2017	3	
Thursday, 17 August 2017	0	
Friday, 18 August 2017	0	
Saturday, 19 August 2017	0	
Sunday, 20 August 2017	0	
Monday, 21 August 2017	3	22:20
Tuesday, 22 August 2017	2	
Wednesday, 23 August 2017	1	
Thursday, 24 August 2017	2	
Friday, 25 August 2017	1	
Saturday, 26 August 2017	0	
Sunday, 27 August 2017	0	
Monday, 28 August 2017	1	
Tuesday, 29 August 2017	2	
Wednesday, 30 August 2017	3	
Thursday, 31 August 2017	2	
Friday, 1 September 2017	0	
Saturday, 2 September 2017	0	
Sunday, 3 September 2017	0	
Monday, 4 September 2017	0	
Tuesday, 5 September 2017	0	
Wednesday, 6 September 2017	0	
Thursday, 7 September 2017	0	
Friday, 8 September 2017	0	
Saturday, 9 September 2017	0	
Sunday, 10 September 2017	0	
Monday, 11 September 2017	0	
Tuesday, 12 September 2017	0	
Wednesday, 13 September 2017	0	
Thursday, 14 September 2017	0	
Friday, 15 September 2017	0	
Saturday, 16 September 2017	0	
Sunday, 17 September 2017	0	
Monday, 18 September 2017	0	
Tuesday, 19 September 2017	0	
Wednesday, 20 September 2017	1	22:11
Thursday, 21 September 2017	3	
Friday, 22 September 2017	3	
Saturday, 23 September 2017	0	
Sunday, 24 September 2017	0	
Monday, 25 September 2017	3	23:25
Tuesday, 26 September 2017	3	

Wednesday, 27 September 2017	3	
Thursday, 28 September 2017	3	
Friday, 29 September 2017	2	
Saturday, 30 September 2017	0	
Sunday, 1 October 2017	0	
Monday, 2 October 2017	0	
Tuesday, 3 October 2017	0	
Wednesday, 4 October 2017	0	
Thursday, 5 October 2017	0	
Friday, 6 October 2017	0	
Saturday, 7 October 2017	0	
Sunday, 8 October 2017	0	
Monday, 9 October 2017	2	
Tuesday, 10 October 2017	3	
Wednesday, 11 October 2017	3	22:05
Thursday, 12 October 2017	3	
Friday, 13 October 2017	3	
Saturday, 14 October 2017	0	
Sunday, 15 October 2017	0	
Monday, 16 October 2017	3	
Tuesday, 17 October 2017	3	
Wednesday, 18 October 2017	3	
Thursday, 19 October 2017	3	
Friday, 20 October 2017	2	
Saturday, 21 October 2017	0	
Sunday, 22 October 2017	0	
Monday, 23 October 2017	0	
Tuesday, 24 October 2017	0	
Wednesday, 25 October 2017	0	
Thursday, 26 October 2017	0	
Friday, 27 October 2017	0	
Saturday, 28 October 2017	0	
Sunday, 29 October 2017	0	
Monday, 30 October 2017	0	
Tuesday, 31 October 2017	0	
Wednesday, 1 November 2017	0	
Thursday, 2 November 2017	0	
Friday, 3 November 2017	0	
Saturday, 4 November 2017	0	
Sunday, 5 November 2017	0	
Monday, 6 November 2017	2	
Tuesday, 7 November 2017	3	
Wednesday, 8 November 2017	3	
Thursday, 9 November 2017	3	
Friday, 10 November 2017	1	
Saturday, 11 November 2017	0	
Sunday, 12 November 2017	0	
Monday, 13 November 2017	3	
Tuesday, 14 November 2017	3	
Wednesday, 15 November 2017	3	

Thursday, 16 November 2017	1	
Friday, 17 November 2017	0	
Saturday, 18 November 2017	0	
Sunday, 19 November 2017	0	
Monday, 20 November 2017	2	
Tuesday, 21 November 2017	0	
Wednesday, 22 November 2017	0	
Thursday, 23 November 2017	0	
Friday, 24 November 2017	0	
Saturday, 25 November 2017	0	
Sunday, 26 November 2017	0	
Monday, 27 November 2017	0	
Tuesday, 28 November 2017	0	
Wednesday, 29 November 2017	0	
Thursday, 30 November 2017	0	
Friday, 1 December 2017	0	
Saturday, 2 December 2017	0	
Sunday, 3 December 2017	0	
Monday, 4 December 2017	2	22:40
Tuesday, 5 December 2017	3	
Wednesday, 6 December 2017	2	
Thursday, 7 December 2017	2	
Friday, 8 December 2017	2	
Saturday, 9 December 2017	0	
Sunday, 10 December 2017	0	
Monday, 11 December 2017	4	23:10
Tuesday, 12 December 2017	3	
Wednesday, 13 December 2017	3	
Thursday, 14 December 2017	3	
Friday, 15 December 2017	2	
Saturday, 16 December 2017	0	
Sunday, 17 December 2017	0	
Monday, 18 December 2017	0	
Tuesday, 19 December 2017	0	
Wednesday, 20 December 2017	0	
Thursday, 21 December 2017	0	
Friday, 22 December 2017	0	
Saturday, 23 December 2017	0	
Sunday, 24 December 2017	0	
Monday, 25 December 2017	0	
Tuesday, 26 December 2017	0	
Wednesday, 27 December 2017	0	
Thursday, 28 December 2017	0	
Friday, 29 December 2017	0	
Saturday, 30 December 2017	0	
Sunday, 31 December 2017	0	
Monday, 1 January 2018	0	
Tuesday, 2 January 2018	0	
Wednesday, 3 January 2018	0	
Thursday, 4 January 2018	0	

Friday, 5 January 2018	0	
Saturday, 6 January 2018	0	
Sunday, 7 January 2018	0	
Monday, 8 January 2018	0	
Tuesday, 9 January 2018	0	
Wednesday, 10 January 2018	0	
Thursday, 11 January 2018	0	
Friday, 12 January 2018	0	
Saturday, 13 January 2018	0	
Sunday, 14 January 2018	0	
Monday, 15 January 2018	0	
Tuesday, 16 January 2018	0	
Wednesday, 17 January 2018	0	
Thursday, 18 January 2018	0	
Friday, 19 January 2018	2	
Saturday, 20 January 2018	0	
Sunday, 21 January 2018	0	
Monday, 22 January 2018	3	22:05
Tuesday, 23 January 2018	3	
Wednesday, 24 January 2018	3	
Thursday, 25 January 2018	3	
Friday, 26 January 2018	0	
Saturday, 27 January 2018	0	
Sunday, 28 January 2018	0	
Monday, 29 January 2018	0	
Tuesday, 30 January 2018	0	
Wednesday, 31 January 2018	0	
Thursday, 1 February 2018	0	
Friday, 2 February 2018	0	
Saturday, 3 February 2018	0	
Sunday, 4 February 2018	0	
Monday, 5 February 2018	0	
Tuesday, 6 February 2018	0	
Wednesday, 7 February 2018	0	
Thursday, 8 February 2018	0	
Friday, 9 February 2018	0	
Saturday, 10 February 2018	0	
Sunday, 11 February 2018	0	
Monday, 12 February 2018	2	
Tuesday, 13 February 2018	3	
Wednesday, 14 February 2018	3	
Thursday, 15 February 2018	3	
Friday, 16 February 2018	1	
Saturday, 17 February 2018	0	
Sunday, 18 February 2018	0	
Monday, 19 February 2018	3	
Tuesday, 20 February 2018	3	
Wednesday, 21 February 2018	0	
Thursday, 22 February 2018	0	
Friday, 23 February 2018	0	

Saturday, 24 February 2018	0	
Sunday, 25 February 2018	0	
Monday, 26 February 2018	0	
Tuesday, 27 February 2018	0	
Wednesday, 28 February 2018	0	
Thursday, 1 March 2018	0	
Friday, 2 March 2018	0	
Saturday, 3 March 2018	0	
Sunday, 4 March 2018	0	
Monday, 5 March 2018	0	
Tuesday, 6 March 2018	0	
Wednesday, 7 March 2018	0	
Thursday, 8 March 2018	0	
Friday, 9 March 2018	0	
Saturday, 10 March 2018	0	
Sunday, 11 March 2018	0	
Monday, 12 March 2018	0	
Tuesday, 13 March 2018	2	23:05
Wednesday, 14 March 2018	3	
Thursday, 15 March 2018	2	
Friday, 16 March 2018	2	
Saturday, 17 March 2018	0	
Sunday, 18 March 2018	0	
Monday, 19 March 2018	3	
Tuesday, 20 March 2018	3	
Wednesday, 21 March 2018	1	
Thursday, 22 March 2018	3	
Friday, 23 March 2018	1	
Saturday, 24 March 2018	0	
Sunday, 25 March 2018	0	
Monday, 26 March 2018	0	
Tuesday, 27 March 2018	0	
Wednesday, 28 March 2018	0	
Thursday, 29 March 2018	0	
Friday, 30 March 2018	0	
Saturday, 31 March 2018	0	
Sunday, 1 April 2018	0	
Monday, 2 April 2018	0	
Tuesday, 3 April 2018	0	
Wednesday, 4 April 2018	0	
Thursday, 5 April 2018	0	
Friday, 6 April 2018	0	
Saturday, 7 April 2018	0	
Sunday, 8 April 2018	0	
Monday, 9 April 2018	0	
Tuesday, 10 April 2018	0	
Wednesday, 11 April 2018	0	
Thursday, 12 April 2018	0	
Friday, 13 April 2018	0	
Saturday, 14 April 2018	0	

Sunday, 15 April 2018	0	
Monday, 16 April 2018	0	
Tuesday, 17 April 2018	2	22:15
Wednesday, 18 April 2018	3	
Thursday, 19 April 2018	3	
Friday, 20 April 2018	1	
Saturday, 21 April 2018	0	
Sunday, 22 April 2018	0	
Monday, 23 April 2018	3	
Tuesday, 24 April 2018	3	
Wednesday, 25 April 2018	0	
Thursday, 26 April 2018	2	
Friday, 27 April 2018	0	
Saturday, 28 April 2018	0	
Sunday, 29 April 2018	0	
Monday, 30 April 2018	0	
Tuesday, 1 May 2018	0	
Wednesday, 2 May 2018	0	
Thursday, 3 May 2018	0	
Friday, 4 May 2018	0	
Saturday, 5 May 2018	0	
Sunday, 6 May 2018	0	
Monday, 7 May 2018	0	
Tuesday, 8 May 2018	0	
Wednesday, 9 May 2018	0	
Thursday, 10 May 2018	0	
Friday, 11 May 2018	0	
Saturday, 12 May 2018	0	
Sunday, 13 May 2018	0	
Monday, 14 May 2018	0	
Tuesday, 15 May 2018	0	
Wednesday, 16 May 2018	0	
Thursday, 17 May 2018	0	
Friday, 18 May 2018	0	
Saturday, 19 May 2018	0	
Sunday, 20 May 2018	0	
Monday, 21 May 2018	0	
Tuesday, 22 May 2018	2	23:45
Wednesday, 23 May 2018	4	
Thursday, 24 May 2018	3	
Friday, 25 May 2018	2	
Saturday, 26 May 2018	0	
Sunday, 27 May 2018	0	
Monday, 28 May 2018	3	23:25
Tuesday, 29 May 2018	3	
Wednesday, 30 May 2018	3	
Thursday, 31 May 2018	3	
Friday, 1 June 2018	0	
Saturday, 2 June 2018	0	
Sunday, 3 June 2018	0	

Monday, 4 June 2018	0	
Tuesday, 5 June 2018	0	
Wednesday, 6 June 2018	0	
Thursday, 7 June 2018	0	
Friday, 8 June 2018	0	
Saturday, 9 June 2018	0	
Sunday, 10 June 2018	0	
Monday, 11 June 2018	0	
Tuesday, 12 June 2018	0	
Wednesday, 13 June 2018	0	
Thursday, 14 June 2018	0	
Friday, 15 June 2018	0	
Saturday, 16 June 2018	0	
Sunday, 17 June 2018	0	
Monday, 18 June 2018	0	
Tuesday, 19 June 2018	0	
Wednesday, 20 June 2018	0	
Thursday, 21 June 2018	0	
Friday, 22 June 2018	0	
Saturday, 23 June 2018	0	
Sunday, 24 June 2018	0	
Monday, 25 June 2018	0	
Tuesday, 26 June 2018	0	
Wednesday, 27 June 2018	0	
Thursday, 28 June 2018	0	
Friday, 29 June 2018	0	
Saturday, 30 June 2018	0	

Appendix 7:

Complaints



Duralie Complaint Summary

Period: 12 Months to June 2018

Total No. of Complaints: 1 (0 noise, 0 blasting, 1 air quality (inc. odour), 0 other)

Total No. of Complainants: 1

Date/Time of Complaint	Complainant Location	Method of Complaint	Nature of Complaint	Investigation/Outcome
28/07/2017 13:10hrs	4km North of Mine	Community hotline	Odour from mine	<p>Complaint, Stated: Very large cloud of gas gone through house, feeling sick.</p> <ul style="list-style-type: none"> • DCPL representative called back at 10:30am 31/7/17. Complainant explained they had seen a steam cloud from Duralie during the morning driving south. At their house at 12:30pm they could smell strong odours which appeared to be from the mine. • DCPL discussed the pumping of water on to PAF rock prior to rehandling which contributed to the steam. There had been a southerly change at approximately 12:30pm which may have contributed to the odour. The complainant advised the odour had generally improved although it was bad at this time. • The complainant asked if there was value in lodging complaints. DCPL advised they would encourage them to continue contacting the mine so they can be aware of any issues and take appropriate follow-up actions.

Appendix 8:

Duralie Coal Mine Annual Biodiversity Report 2018



Duralie Coal Mine Annual Biodiversity Report

FOR THE YEAR ENDING 30 JUNE 2018

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1 INTRODUCTION

The Duralie Coal Mine (**DCM**), located in the Southern part of the Gloucester Basin NSW, is approximately 30 kilometres south of Gloucester and is owned and operated by Duralie Coal Pty Ltd (**DCPL**), a fully owned subsidiary of Yancoal Australia Limited (**YAL**).

1.1 Scope

In accordance with the Duralie Extension Project, Project Approval 08_0203 (as modified December 2014), the proponent (DCPL) is required in accordance with *Schedule 2, condition 43* to prepare and implement a Biodiversity Management Plan (BMP). This Plan must include a:

“a program to monitor and report on the effectiveness of the measures in the Biodiversity Management Plan and conditions 33-43 of this approval, and the performance of the Offset Strategy, with summary reporting to be carried out annually and comprehensive reporting every three years following the independent environmental audit”.

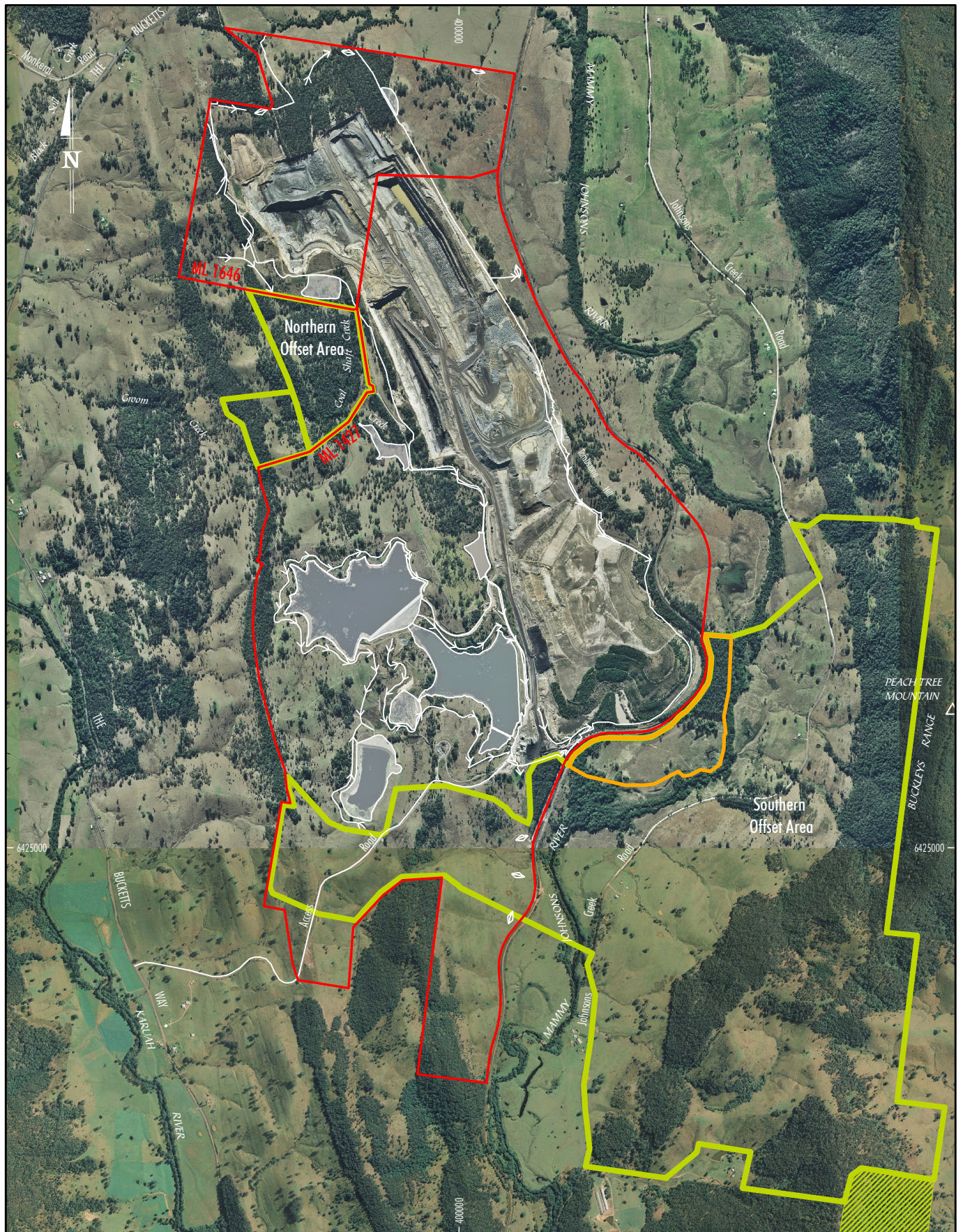
This DCM Annual Biodiversity Report provides a review of the effectiveness of measures in the BMP for the annual year ending 30 June 2018 in accordance with Section 7.2 of the BMP. The scope of the review includes the Mining Lease area ML1427 and ML1646 and Biodiversity Offset areas as indicated on Plan A

This report (and associated Appendices) is included as an Appendix of the DCM Annual Review which is available on the Duralie Coal website www.duraliecoal.com.au.

During the reporting period a revised BMP was submitted to the NSW Department of Planning and Environment (D&PE) and approved on **5 September 2017 (Appendix A)** Following the DCM Independent Environmental Audit undertaken in **December 2017** a revision of the BMP is currently being prepared and will be lodged in the next reporting period.

2 STATUS OF BMP PERFORMANCE CRITERIA

Performance criteria as prescribed in the BMP is presented in **Tables 1 to 10**. The performance criteria have been developed to meet the specific objectives for the areas described in Section 2 of the BMP. All performance criteria are linked to the management specifications listed in the BMP Section 6, and monitoring/reporting specifications in the BMP Section 7. The status of BMP performance criteria is provided in the subsequent sections of this report.



LEGEND

- Mining Lease Boundary
- Approximate Extent of Project Major Surface
- Offset Area
- Bowens Road North Offset Area
- Private Land Under Conservation Agreement

0 1000
Metres
GRID DATUM MGA 94 ZONE 56

Source: DCPL (2014); AAHatch - Aerial Photography flown April 2009 and July 2013

BIODIVERSITY MANAGEMENT PLAN

FIGURE 3

Location of the Offset Areas



3 VEGETATION CLEARANCE REPORT

Vegetation clearance is undertaken in accordance with the BMP (Section 5.4 Vegetation Clearance Plan). Prior to any clearance operations a Clearing Plan Checklist is completed, and vegetation pre-clearance surveys are undertaken. During 2017/2018 reporting period, no vegetation clearance was undertaken. Vegetation clearance for the Duralie Extension Project has now been completed.

Information obtained during vegetation clearance (habitat features cleared and any fauna observed) is used to determine the requirements for nest box replacement in the biodiversity offset areas (refer Section 8).

4 SALVAGED AND REUSED MATERIAL FOR HABITAT ENHANCEMENT

Section 5.8 of the BMP requires salvaged material from vegetation clearance activities to be used for habitat enhancement within the revegetation areas. As there was no vegetation clearance undertaken during the reporting period, no habitat materials were salvaged.

During previous reporting periods cleared vegetation was managed as follows:

- Suitable trees and stumps salvaged and stockpiled for reuse.
- Mulched vegetation stored in stockpiles and used on the rehabilitation and incorporated into topsoil.

5 NEST BOX PROGRAMME

Table 1: Nest Box Program Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Year 1 (2013) PC Restoration Preparation Phase	Year 2 (2014) PC Preliminary Restoration Phase	Year 3 (2015) PC VMU Installation Establishment	Annually from Year 3 onwards (2016 onwards) PC Maintenance Phase	CC
Nest box strategy including target species, habitat trees/feature, nest box designs maintenance and monitoring	Nest box plan developed following habitat assessment and pre-clearance surveys (Section 5.4).				
Nest box installation includes installation of 18 Squirrel Glider boxes, however may be expanded as required.	Hollow bearing habitat features (nest boxes) installed (Section 6.4).				Nest boxes installed.
Maintenance and monitoring of installed net boxes. Including monitoring for European Bee invasion and repair/replacement		Monitoring in autumn and spring completed. Maintenance undertaken where required (Sections 6.4 and 7.1).	Annual nest box monitoring and maintenance (Sections 6.4 and 7.1).	Annual nest box monitoring and maintenance (Sections 6.4 and 7.1).	Nest boxes monitored and maintained, being replaced where required.

Legend	Not commenced	In progress	Completed
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AMBS Ecology & Heritage (AMBS) was commissioned to implement the nest box programme as described in the BMP Section 5.4.2 and Section 6.4. The nest box programme consists of two main components:

- Replacing 18 boxes specifically targeting the Squirrel Glider; and
- Replacing boxes on a like for like basis for any hollow bearing trees cleared during vegetation clearance operations (refer Section 3).

The installation of nest boxes has occurred over four periods with the final installation in **September 2016**. An annual nest box monitoring report was completed by AMBS in **September 2017** (Appendix B) No further nest box installations were required during the next reporting period. The next monitoring is scheduled for September 2018.

The current program involves:

- 18 nest boxes targeting the Squirrel Glider (*Petaurus norfolcensis*), installed between 4 February 2013 and 8 February 2013;
- 106 nest boxes targeting a variety of hollow-dependent species, installed between 21 August 2013 and 30 August 2013;
- 45 nest boxes targeting a variety of hollow-dependent species, installed between 9 September 2014 and 12 September 2014; and
- 42 nest boxes targeting a variety of hollow-dependent species, installed between 19 September 2016 and 23 September 2016.

*The 2016 - 2017 Nest Box Programme for the Duralie Offset Area (AMBS June 2018) report summarises the performance in relation to the Nest Box Programme for the Duralie Offset Area between **October 2016** and **September 2017**, in accordance with the Duralie Coal Mine Biodiversity Management Plan (BMP). Works undertaken and other milestones that took place during this period included yearly monitoring of 18 Squirrel Glider nest boxes installed in February 2013, 106 nest boxes (Variation 1) installed in August 2013 and 45 nest boxes (Variation 2) installed in September 2014. Quarterly monitoring of 41 nest boxes (Variation 3) installed in September 2016 was undertaken from December 2016 to June 2017, with annual monitoring in September 2017. No additional nest boxes were installed in September 2017.*

A summary of results from the 2016-2017 report is provided below.

*"During the monitoring of the Squirrel Glider nest boxes, the target species was recorded within one nest box (one dead juvenile). Other vertebrate species recorded included the Sugar Glider (*Petaurus breviceps*) and signs of the Brush-tailed Phascogale (*Phascogale tapoatafa*). All 18 Squirrel Glider nest boxes have been occupied or showed signs of previous occupancy at some stage since their installation."*

"Eighty of the 106 nest boxes installed during August 2013 were occupied or shown signs of occupation at some stage since their installation. This is an occupancy rate of approximately 76%, 48 months after installation. Five species were recorded in the nest boxes or shown signs of previous occupation, during the period relevant to this report. Signs of the Brush-tailed Phascogale were higher than any previous surveys for the Nest Box Programme."

*"Forty-one of the 45 additional nest boxes installed in September 2014 were occupied or shown signs of occupation at some stage since their installation. This is an occupancy rate of approximately 91%, 36 months after installation. Four species were recorded in the nest boxes or shown signs of previous occupation, during the period relevant to this report. One threatened species, the Masked Owl (*Tyto novaehollandiae*), has not previously been recorded within the nest boxes during the Nest Box Programme."*

"Thirty-one of the 41 additional nest boxes installed in September 2016 were occupied or shown signs of occupation at some stage since their installation. This is an occupancy rate of approximately 61%, 12 months after installation."

"Thirteen species were recorded in the nest boxes or shown signs of previous occupation, during the period relevant to this report. Four different microbat species were recorded in a new nest box design, the highest since the commencement of the Nest Box Programme. One microbat species, the Free-tailed Bat (Mormopterus sp.) has not previously been recorded in a nest box."

"Twenty-two vertebrate species have now been recorded within nest boxes during the Nest Box Programme. This includes eleven species of mammal (Brown Antechinus, Bush Rat [probable], Brush-tailed Phascogale, Common Brushtail Possum, Common Ringtail Possum, Feathertail Glider, Gould's Wattled Bat, Lesser Long-eared Bat, Gould's Long-eared Bat, a Free-tailed Bat, Sugar Glider and Squirrel Glider), five species of bird (Australian King-Parrot, Eastern Rosella, Australian Owlet-nightjar, Australian Wood Duck, White-throated Treecreeper, Masked Owl), one frog species (Peron's Tree Frog) and three species of reptile (Lace Monitor, Common Tree Snake and Diamond/Carpet Python)."

"The majority of nest boxes were in good condition and no maintenance was required. Two nest boxes are in poor condition and will require repair or replacement during the next monitoring survey. Signs of the European Honey Bee (Apis mellifera) were recorded at nine nest boxes and for eight of these, no bees were present at the time of the survey. The entrance hole of the nest box with bees present was blocked with tape. Management of this nest box was successful with no live bees observed 3 months later."



Plate 1 - Sugar Gliders (*Petaurus breviceps*)



Plate 2 – Masked Owl at B18 nestbox (*Tyto novaehollandiae*)

6 WEED CONTROL AND MONITORING

Table 2: Weed Control Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Year 1 (2013) PC Restoration Preparation Phase	Year 2 (2014) PC Preliminary Restoration Phase	Year 3 onwards (2015) PC VMU Installation Establishment	Annually from Year 3 onwards (2016 onwards) PC Maintenance Phase	CC
Weed Control/treatment program in remnant enhancement and regrowth management VMUs	Primary woody weed control undertaken using methods specified in Appendix E (Sections 5.9 and 6.5). Primary control of priority target weeds described in Sections 5.9 and 6.5 commenced, using method described in Appendix E.	Follow-up woody and priority weed control undertaken as per Appendix E and Sections 5.9 and 6.5.	Follow-up woody and priority weed control undertaken as per Appendix E and Sections 5.9 and 6.5. Target/ priority weed coverage in Offset reduced by 90% (Section 6.7).	Follow-up woody and priority weed control undertaken as per Appendix E and Sections 5.9 and 6.5. Target/ priority weed coverage in Offset reduced by 90% (Section 6.7).	Target/priority weed coverage within offset VMUs reduced by 90%.
Weed control/management in Installation (revegetation) VMUs	Pre-cultivation spraying in all installation VMUs undertaken including control of exotic Sporobolus and fireweed (Figure 7 and Section 6.11).	Second cultivation spray in all installation VMUs undertaken including control of exotic Sporobolus and fireweed where necessary (Section 6.11). Control of competitive plants within revegetation areas as detailed in Section 6.11.	Additional pre-planting weed treatment in all installation VMUs undertaken if required (Section 6.11). Control of competitive plants within revegetation areas as detailed in Section 6.11.	Additional pre-planting weed treatment in all installation VMUs undertaken if required (Section 6.11). Control of competitive plants within revegetation areas as detailed in Section 6.11.	Control of competitive plants within revegetation areas until maintenance phase (detailed in Section 6.11) is complete i.e. 90% of canopy and shrub species have survived 12 months after planting including replanting of lost species.
Monitoring and reporting		Monitoring and documentation of weed species, occurrence and densities as per Section 7.1.	Monitoring and documentation of weed species, occurrence and densities as per Section 7.1.	Monitoring and documentation of weed species, occurrence and densities as per Section 7.1.	Monitoring and reporting undertaken.

Greening Australia were contracted to undertake an initial weed assessment of the offset area in August 2013. The aim of the weed assessment was to assist in setting priorities and developing on-ground actions for weed control and is presented in the form of a mapping survey. The mapping survey provides reference to individual weed infestations within each Vegetation Management Unit (VMU) for the biodiversity offset area. Each weed occurrence was allocated a priority ranking based on the species status i.e. noxious or agricultural, and the size and density of the infestation. The survey information contributed to the development of a strategic approach to the control of priority weeds and allow contractors to locate infestations using the mapping files. Additionally, it will continue to assist in tracking weeds to gauge the effectiveness of control measures and the potential spread and future distribution.

Follow-up weed treatment of all remnant enhancement and regrowth management VMUs recommenced in **October 2017** and continued through to **April 2018**. Additional weed management activities within the Mining Lease areas recommenced in **September 2017**. The key species targeted included blackberry, lantana, privet, wild tobacco and Giant Parramatta grass. This is the fifth round of weed control activities in the offset areas. Re-vegetation works continued during **Spring 2017** with pre-cultivation spraying undertaken in preparation for the re-vegetation works.

During 2017/2018, the removal of privet and wild tobacco adjacent to Mammy Johnsons River in the Biodiversity Offset areas continued using mechanical removal (slashing), and chemical spraying in accordance with previous advice from the MidCoast Council (MCC) Weeds Officer.

Success of weed management has been monitored and documented in the Duralie Coal Mine Biodiversity Offsets Monitoring of Landscape Function and Vegetation Structure, October 2017 (Appendix E).

Monitoring of the VMUs including the effectiveness of weed control will continue to be undertaken in conjunction with the Landscape Function Analysis (LFA) and vegetation monitoring. The 2017 monitoring report indicates that:

“The number and density of weed species was generally very low with only Lantana camara (Lantana) being wide spread within the VMUs themselves. Ligustrum sinense (Small-leaved Privet) was recorded in VMUs B and E. Other weeds observed along access tracks included Ageratina adenophora (Crofton Weed), Andropogon virginicus (Whisky Grass) and Sporobolus fertilis (Giant Parramatta Grass).”

7 FERAL ANIMAL CONTROL AND MONITORING

Table 3: Feral Animal Management Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Year 1 (2013) PC Restoration Preparation Phase	Year 2 (2014) PC Preliminary Restoration Phase	Year 3 onwards (2015) PC VMU Installation Establishment	Annually from Year 3 onwards (2016 onwards) PC Maintenance Phase	CC
Feral animal control program	Initial feral animal study undertaken.	Feral animal control as required.	Feral animal control as required.	Feral animal control as required.	Feral animal numbers within offset areas minimised as evidenced through monitoring data
Monitoring and reporting	Monitoring and documentation of feral animal species undertaken.		Monitoring undertaken.		Monitoring and reporting undertaken.

AMBS was commissioned to undertake the initial invasive animal survey, in accordance with Section 5.10 of the BMP in 2013. The objective of the study was to determine the range of invasive animals that occur or are likely to occur within the DCM and offset areas and provide recommendations for invasive animal control.

During the reporting period DCPL engaged MDP Vertebrate Pest Management to implement a wild dog and fox control program. The program was undertaken between **September 2017** to **October 2017** and covered the Biodiversity Offset area, the Duralie and Stratford Mining Leases and surrounding mine owned properties. The program involved a combination of trapping and shooting. A total of 11 dogs and foxes were caught during the program. This program continued the work undertaken during 2016 where 41 dogs and foxes were caught.



Plate 4 – Wild Dog and Litter

In accordance with the BMP Section 5.10 a follow-up feral animal monitoring survey was undertaken by AMBS Ecology & Heritage during **April 2017** to monitor the success of control programs and determine priorities for ongoing control measures.

An extracted summary of the survey results from the *Invasive animal study of the Duralie Coal Mining Lease and offset areas, Gloucester Valley* (September 2017) is provided below (Appendix C).

The results of the current invasive animal survey were similar to those from the initial invasive animal survey in 2013. A total of 14 invasive species have been recorded in the study area in the past or during recent surveys or are considered to have potential to occur. Eleven of these species were either not recorded or were recorded in very low numbers during the current surveys and are of little concern at the current time. These include the Common Starling, House Sparrow, Mallard, Rock Dove, Spotted Turtle-Dove, House Mouse, Black Rat, Brown Hare and Deer. In accordance with the BMP the abundance of these species should be monitored every two years to determine if future controls are necessary.

Four species of invasive animal were repeatedly recorded in the study area and are a potential threat to native biodiversity. These are the Fox, Feral Cat, Rabbit and the Common Myna. Wild Dogs were also recorded in the study area. Wild Dogs are mostly seen as an agricultural threat, preying on sheep, calves and other livestock (Fleming et al. 2001). They are not generally considered to have severe negative impacts on biodiversity, although this topic has not been well studied.

In summary:

- *Foxes and Feral Cats may represent a threat to biodiversity within the study area;*
- *Wild Dogs are present in the study area, and while they may or may not be a threat to biodiversity, are currently a declared pest species;*
- *The European Rabbit is present at low densities, but its abundance can increase rapidly, particularly if dog, fox and cat numbers decrease, and it is also a declared pest species;*
- *The abundances of all of the above species within the study area are likely to be inter-related.*

It is therefore recommended that if control measures for Wild Dogs and/or European Rabbits are implemented in order to comply with the Pest Control Order, that any such control measures should be implemented together with control measures for Foxes and Feral Cats, in a co-ordinated manner, and the impacts monitored. Pest control in the study area should be considered in the context that the study area represents a small part of a much broader region. Pest control in the study area alone is likely to be of only temporary and limited benefit, unless carried out in a broader area in conjunction with other landholders, and carried out over the medium to long term.

8 CONTROLLING ACCESS AND MANAGING GRAZING

Table 4: Managing Grazing and Agriculture Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Year 1 (2013) PC Restoration Preparation Phase	Year 2 (2014) PC Preliminary Restoration Phase	Year 3 onwards (2015) PC VMU Installation Establishment	Annually from Year 3 onwards (2016 onwards) PC Maintenance Phase	CC
Managing grazing and agriculture	Livestock excluded from the Offset through installation of gates and fencing illustrated in Figure 9 (Section 6.7).				Livestock excluded from the offset.
Monitoring and maintenance of fencing and gate infrastructure		Monitoring of gates and fencing to exclude livestock. Where required, maintenance undertaken and documented (Section 7.1).	Monitoring of gates and fencing to exclude livestock. Where required, maintenance undertaken and documented (Section 7.1).	Monitoring of gates and fencing to exclude livestock. Where required, maintenance undertaken and documented (Section 7.1).	Gates and fencing monitored and maintained.

Table 5: Controlling Access Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Year 1 (2013) PC Restoration Preparation Phase	Year 2 (2014) PC Preliminary Restoration Phase	Year 3 onwards (2015) PC VMU Installation Establishment	Annually from Year 3 onwards (2016 onwards) PC Maintenance Phase	CC
Operational Review to facilitate site access for offset management activities including installation, inspection and bushfire management	Operational Review developed. Review includes road, fire trail and culvert construction and requirements for fencing and revegetation cultivation/site preparation ² . Maintenance activities, particularly track maintenance and slashing have been considered (Section 6.7, plus related Sections 6.9 and 6.5)				Operational Review undertaken and outcomes implemented.
Community and stakeholder engagement	Assessment of surrounding landholders and the local community to evaluate opportunities for participation in implementation of this Biodiversity Management Plan undertaken. Local council consultation has commenced regarding placement of signage on the Johnson's Creek Road bisect area of the Offset (See Figure 9 for location) (Section 6.7).	Signage has been installed on the Johnson's Creek Road bisect area of the Offset to alert drivers of potential fauna on the roads.			Opportunities for landholder and community participation in the BMP identified. Local council consulting regarding signage. Signage installed on Johnsons Creek Road
Infrastructure including access tracks, fencing, fire trails and culverts	Access tracks, fire trails, firebreaks, fencing and culverts have been completed as per Figure 9 and the Operational Review ² (Section 6.7).				Access related infrastructure identified in the Operational Review
Monitoring and maintenance of infrastructure including tracks, fire trails, culverts and fences.		Monitoring and maintenance of all access tracks and fire trails has been undertaken ² (Sections 6.7, 6.9 and 7.1).	Monitoring and maintenance of all access tracks and fire trails has been undertaken ² (Sections 6.7, 6.9 and 7.1).	Monitoring and maintenance of all access tracks and fire trails has been undertaken ² (Sections 6.7, 6.9 and 7.1).	Regular monitoring and maintenance program for roads, tracks, fire trails, fences and culverts.

Installation works to control access and manage grazing in the offset areas was completed in 2014. During the reporting period contractors were engaged to undertake maintenance activities on access tracks, culverts, gates and fences. The works included slashing of tracks, firebreaks and repairs to damaged gates and culverts. Livestock continue to be excluded from the Biodiversity Offset areas with the exception of 'crash grazing' programs in preparation for revegetation activities following a field assessment by a qualified consultant. However, during inspections of the Biodiversity Offset area, cattle were identified to have entered through damaged fencing on the eastern and northern boundaries. The cattle were removed and maintenance work was undertaken to repair the fencing.

Roadside Flora and Fauna signage has been installed in accordance with advice from Great Lakes Council and with regard to Australian Standard AS1742.2. Further correspondence was held with GLC Ecologist in 2015 regarding future requirements for traffic controls within the offset areas. This has been completed with reassessment in a further three years (2018).

9 BUSHFIRE MANAGEMENT

Table 6: Bushfire Management Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Year 1 (2013) PC Restoration Preparation Phase	Year 2 (2014) PC Preliminary Restoration Phase	Year 3 onwards (2015) PC VMU Installation Establishment	Annually from Year 3 onwards (2016 onwards) PC Maintenance Phase	CC
Operational Review to facilitate site access for offset management activities including installation, inspection and bushfire management.	Operational Review completed ² . Areas addressed within the review include road, fire trail and culvert construction along with maintenance activities, particularly track slashing (Sections 5.12 and 6.7)				
Fire excluded from the offset for initial 3 years (2012 – 2015)	Fire excluded from offset prior to 2015 (Section 6.9).	Fire excluded from offset prior to 2015.	Fire excluded from offset prior to 2015.		Fire excluded from offset prior to 2015
Bushfire Management activities through hazard reduction actions installation and maintenance of relevant access infrastructure.	Access tracks, fire trails, firebreaks, fencing and culverts have been completed as per Figure 9 and the Operational Review ² (Sections 6.7 and 6.9).	Fire management activities have been undertaken as required, including yearly access trail inspection, maintenance and repair of inaccessible tracks within one month of identification ² (Sections 5.12, 6.7 and 6.9).	Fire management activities have been undertaken as required, including yearly access trail inspection, maintenance and repair of inaccessible tracks within one month of identification ² (Sections 5.12, 6.7 and 6.9).	Fire management activities have been undertaken as required, including yearly access trail inspection, maintenance and repair of inaccessible tracks within one month of identification ² (Sections 5.12, 6.7 and 6.9).	Regular bushfire management measures in place

Management Action	Year 1 (2013) PC Restoration Preparation Phase	Year 2 (2014) PC Preliminary Restoration Phase	Year 3 onwards (2015) PC VMU Installation Establishment	Annually from Year 3 onwards (2016 onwards) PC Maintenance Phase	CC
Monitoring and maintenance		Fuel loads monitored and documented (Sections 6.9 and 7.1). Identified issues incorporated into future management planning	Fuel loads monitored and documented (Sections 6.9 and 7.1). Identified issues incorporated into future management planning.	Fuel loads monitored and documented (Sections 6.9 and 7.1). Identified issues incorporated into future management planning.	Fuel loads monitored and maintained. Risks identified and managed as part of part of hazard reduction actions.

Where possible, fire was excluded from the Biodiversity Offset area during the first three years (up to 2015). To assist with bushfire management, access tracks and firebreaks have been constructed and maintained as shown in the BMP Figure 9.

DCPL engaged the NSW Rural Fire Service (RFS) in **August 2015** to assist in the development of a burn plan for hazard reduction burning in select areas of the Biodiversity Offset areas and surrounding mine owned properties. The burn plan considered areas where fire was to be excluded for bush regeneration in the Biodiversity Offset areas and areas where burning was required for hazard reduction prior to revegetation activities. Following delays in 2015 and 2016, a hazard reduction burn was undertaken by the RFS along Johnsons Creek Road on **13 August 2017**.

Continued discussions have been held with the RFS to conduct fire management activities and any such activities will be assessed and implemented to ensure the most appropriate period for ecological burn activities whilst also giving due consideration to personnel and asset safety.



Plate 5 – RFS hazard reduction burning in August 2017



Plate 6 – RFS hazard reduction burning in August 2017

10 SEED COLLECTION AND PROPOGATION

Table 7: Seed Collection and Tubestock Supply Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Year 1 (2013) PC Restoration Preparation Phase	Year 2 (2014) PC Preliminary Restoration Phase	Year 3 (2015) PC VMU Installation Establishment	Annually from Year 3 onwards (2016 onwards) PC Maintenance Phase	CC
Collecting and propagating seed	Seed collection (of required species as specified in Section 6.10 and Appendix F) has commenced during vegetation clearance or an alternate seed source has been obtained. (Sections 5.7 and 6.10).	Seed collection from cleared vegetation finalised (Section 5.7). Seed collection to obtain required quantities and species for future revegetation continued (Section 6.10, Appendix F).	Seed collections to obtain required quantities and species for future revegetation continued (Section 6.10, Appendix F).		Seed collection necessary to obtain required quantities and species for future revegetation completed.
Plant propagation/tubestock supply		Propagation of species required for revegetation work in Offsets commenced. Species and quantity as per guidelines in Sections 5.7 and 6.10 and Appendix F.	Propagation of species required for revegetation work in Offsets undertaken. Species and quantity as per guidelines in Section 5.7, 6.10 and Appendix F or adjusted based on additional literature/field trial results.	Propagation of species required for revegetation/supplementary infill planting work in Offsets undertaken as per guidelines in Sections 5.7 and 6.10 and Appendix F.	Plant propagation necessary to obtain quantities and species required for revegetation completed.

Where possible, seed required for revegetation activities has been collected from within the Biodiversity Offset area and surrounds. Specific tree and shrub species which have not been available for collection have been sourced through external third-party suppliers. Further seed collection may be undertaken if found necessary to meet the completion criteria of the BMP offset revegetation and mine site rehabilitation.

Kleinfelder and Cumberland Plain Seed have been engaged to assist in the propagation of native plant species with tubestock grown under controlled nursery conditions and delivered to site as required for revegetation works.



Plate 7 - Native tree seed from Duralie Offset Area

11 REVEGETATION MANAGEMENT

Table 8: Revegetation Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Year 1 (2013) PC Restoration Preparation Phase	Year 2 (2014) PC Preliminary Restoration Phase	Year 3 (2015) PC VMU Installation Establishment	Annually from Year 3 onwards (2016 onwards) PC Maintenance Phase	CC
Operational Review	Operational review including access, tracks and cultivation requirements for implementing revegetation completed (Section 6.7).				Operational Review completed and implemented.
Implementing Revegetation - Weed management and maintenance	Pre-cultivation spraying in all installation VMUs including control of exotic Sporobolus and fireweed undertaken (Sections 6.5 and 6.11).	Second cultivation spray in all installation VMUs undertaken including control of exotic Sporobolus and fireweed where necessary (Section 6.5 and 6.11).	Pre-plant weed treatment in all installation VMUs as per Figure 7 undertaken as required (Sections 6.5 and 6.11). Control of competitive plants within revegetation areas as detailed in Section 6.11. Maintenance including watering and herbivory controls, undertaken as required (Section 6.11).	Pre-plant weed treatment in all installation VMUs as per Figure 7 undertaken as required (Sections 6.5 and 6.11). Control of competitive plants within revegetation areas as detailed in Section 6.11. Maintenance including watering and herbivory controls, undertaken as required (Section 6.11).	Pre-planting weed control undertaken, including control of threatening weeds Sporobolus and Fireweed. Competitive plants controlled during revegetation establishment.
Implementing revegetation		Initial cultivation of all proposed trial installation VMUs commenced (Vegetation Management Units I, S, U and AB.) according to guidelines in Section 6.11.	Propagation of species required for revegetation work in Offsets commenced. Species and quantity as per guidelines in Sections 5.7 and 6.10 and Appendix F.	Revegetation planting finalised. All plants prescribed in Appendix F have been installed. (Section 6.11).	Species type and quantities planted according to threshold guidelines in the species palette or as guided by on site trials. 90% survival of shrub-layer plants 12 months after installation, replacement of lost plants to above threshold levels.
Implementing revegetation (Cont.)			Trial revegetation for VMUs I, S, U and AB completed. Key treatments to trial may include gapped mounding in floodplain areas, performance of proposed species and direct seeding methods. Results from this trial should be to guide the installation area using the adaptive management process (Section 6.11). Plant palettes adjusted where field trials or research demonstrate alternative species/density (Section 6.10).	Based on learnings from the revegetation trials, planting of tubestock/direct seeding in installation VMUs according to species palette and quantity guidelines in Appendix F and Section 6.1 has been completed	90% survival of canopy-layer plants 12 months after installation, including replacement of lost plants to above threshold levels. Revegetation areas have met Assessment Criteria and Completion criteria described in Table 14, Section 8 (e.g. 90% of all initial canopy species rates

Management Action	Year 1 (2013) PC Restoration Preparation Phase	Year 2 (2014) PC Preliminary Restoration Phase	Year 3 (2015) PC VMU Installation Establishment	Annually from Year 3 onwards (2016 onwards) PC Maintenance Phase	CC
					are present within VMUs).
Monitoring and reporting			Monitoring and reporting of trial revegetation results, changes to plant palette, plant health, establishment success and maintenance activities. (Section 7.1).	Monitoring and reporting of trial revegetation results, changes to plant palette, plant health, establishment success and maintenance activities. (Section 7.1).	Monitoring and reporting completed.

Pre-cultivation weed spraying was undertaken in Summer to Autumn 2016 in preparation for the trial revegetation works. Initial revegetation works for VMUs I, S and U commenced in Autumn of 2016. Preparation works were completed including seed collection, inoculation, growing of tube-stock and ground preparations including weed spraying. The trial revegetation program included methods involving both tube-stocking, and direct seeding. Ground preparation was site specific and included weed spraying, crash grazing and back burning as required.

Revegetation works in VMUs AF, AE, AA and Z were undertaken during **December 2016** and included ground preparation and direct seeding of approximately 80 hectares. Due to the inability to undertake controlled burning, slashing was undertaken as an alternative option prior to direct and broadcast seeding.



Plate 8 - Loading seed for revegetation works.



Plate 9 - Spreading native tree and shrub seed.

Tubestock was propagated during Summer 2016/2017 in preparation for Autumn planting in 2017. VMUs Y, AD and S, (approximately 40 hectares), located on alluvial flats near Mammy Johnsons River were prepared for planting by slashing, spraying for weeds and ripping. This was followed by the planting of approximately 7,200 tube-stock in **April 2017**. The results of the re-vegetation activities are reported in the *DCM Biodiversity Offsets Revegetation Program Report Spring 2016 - Autumn 2017*.



Plate 10: Tube-stock being prepared for the biodiversity offset.



Plate 11: Planted tube-stock.

Following the hazard reduction burning in **August 2017**, revegetation works in VMUs Z, AB and AC were undertaken. In **September 2017**, direct seeding of approximately 52 hectares was completed, followed by harrowing.

Tube-stock planting of VMUs F, V, W and X was proposed for Autumn 2018 including approximately 16,000 plants over 61 hectares. The native tree seed was propagated over the Summer of 2017/2018 by Cumberland Plain Seeds. However, due to the slower than expected establishment of the tubestock, planting has been postponed until **September 2018**.



Plate 12: *Angophora floribunda*.



Plate 13: *Callistemon saligna*.

Following the initial re-vegetation works 2015, annual vegetation monitoring (including LFA and vegetation dynamics) was undertaken in **January 2017**. The results from the biodiversity offset monitoring are shown in Section 12. Recommendations from the report will be used to continue developing the revegetation program and maintenance activities.

12 BIODIVERSITY OFFSET MONITORING AND REPORTING

Table 9: Monitoring and Reporting Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Year 1 (2013) PC Restoration Preparation Phase	Year 2 (2014) PC Preliminary Restoration Phase	Year 3 (2015) PC VMU Installation Establishment	Annually from Year 3 onwards (2016 onwards) PC Maintenance Phase	CC
Monitoring and reporting	Baseline Landscape Function Analysis Report has been undertaken for the Offset area (Section 7.1). Monitoring and reporting has been undertaken ³ as per requirements in Sections 7.1 and 7.2.	Monitoring and reporting has been undertaken ³ as per requirements in Sections 7.1 and 7.2)	Monitoring and reporting has been undertaken ³ as per requirements in Sections 7.1 and 7.2. Independent Environmental Audit has been supplied to the NSW Secretary of the DP&E for review.	Monitoring and reporting has been undertaken ³ as per requirements in Sections 7.1 and 7.2.	Monitoring requirements completed when all completion criteria are achieved in accordance with Section 8 (e.g. 357.5 ha of revegetated woodland/open woodland habitat areas and 36 ha of revegetated forest habitat areas are a self-sustaining ecosystem).

As described in the Section 7 of the BMP an annual report reviewing DCPL's environmental performance and progress against the requirements of the BMP including monitoring and reporting is prepared annually and appended to the *Duralie Coal Mine Annual Review*. The annual report, reports on monitoring for:

- Effectiveness of revegetation in the offset area VMU's;
- Usage of the offset by fauna;
- Effectiveness of weed control;
- Effectiveness of feral animal control;
- Nest box monitoring program.

To monitor the effectiveness of revegetation in the Biodiversity Offset areas Greening Australia was commissioned to undertake the baseline monitoring of LFA and vegetation structure within the Biodiversity Offset areas in **February 2013**. The baseline monitoring provides information to track the progression towards meeting the completion criteria of the BMP.

The annual vegetation and landscape function monitoring was repeated in **January 2017** and the results are provided in the *DCM Biodiversity Offset Monitoring of Landscape Function and Vegetation Structure 2017* (Appendix E). An extracted summary is reproduced below. The next round of monitoring is scheduled for early 2019.

Kleinfelder Australia was engaged to conduct Landscape Function Analysis (LFA) and Vegetation Structure Dynamics in the Duralie Coal Mine (DCM) Biodiversity Offset Areas as required by the Biodiversity Management Plan (2016). Monitoring is required to demonstrate the effectiveness of revegetation in the Offset Areas and progression towards achieving the BMP completion criteria. A subset of six Vegetation Management Units (VMUs) were selected representing various vegetation communities and their relative LFA index scores from the 2013 survey recorded in the Offsets Areas. This survey was conducted to provide recent baseline data for comparison to woodland/forest revegetation in the offset areas and rehabilitation areas on the Duralie Coal Mine waste emplacement. The surveys were undertaken during January 2017.

Landscape Function Analysis

"For the LFA, three indices and two patch dynamics characteristics were assessed. The average Stability Index recorded a non-significant increase from the 2014 survey, with individual VMUs recording considerably greater variation. VMU E recorded a significant increase, but the result was regarded as anomalous given that the 2014 result was below the theoretical limits as stated in LFA literature. Other VMUs recorded non-significant increases and

decreases in this index. Average Infiltration and Nutrient Cycling Indices recorded substantial increases from the previous survey, with all individual VMUs also increasing. These changes were attributed to a recovery after fire in three of the VMUs (VMU, K, P and R) with the remaining VMUs being regarded as more mature vegetation communities that have not been greatly affected by disturbance.”

Patch Dynamics

“Patch dynamics included for the assessment were the number of patches per 10m and the average distance between patches. Both are used to indicate the propensity of the system to accumulate or shed water and nutrients. All areas were assessed to be “all patch”, with only the patch type changing down transects. The average number of patches per 10m recorded a non-significant decrease from the 2014 survey, while average distance between patches reduced to 0. Both these changes were attributed to increases in litter accumulation and/or ground and shrub cover and recovery from a major fire in 2012 that affected three of the VMUs.”

Vegetation Structure

“Vegetation Structure data suffered from inconsistent application of the methods resulting in data that was inconsistent across the three surveys with only cautious interpretations of any changes or trends offered. This included the interpretation that VMU AG represented a mature or non-disturbed example of the Spotted-Gum – Grey Ironbark Forest (Ironbark Variant) vegetation community (the most common community in the Offsets Areas) with little midstorey and an increasing shrub layer, while VMUs K and R were examples of advanced re-growth with a considerable portion of vegetation structure contained in the midstorey. This is expected to trend towards the structure found in VMU AG over time. VMUs B and E, while different vegetation communities, had a similar structure that has not changed significantly over the course of the surveys indicating a stable structure indicative of communities found on the alluvial flats and along water courses in the Offsets Areas”.

Weeds and Erosion

“Observations of weeds, erosion and other factors affecting the successful revegetation/ regrowth of the Offsets areas were made transiting the Offsets Areas and in the immediate area of transects. Evidence of “feral” cattle observed in VMU K included tracks, damage to vegetation and scats. The number of weed species was generally very low with only Lantana camara (Lantana) being wide spread within the VMUs themselves, and formed dense thickets in some areas. Ligustrum sinense (Small-leaved Privet) was recorded in VMUs B and E. Other weeds observed along access tracks included Ageratina adenophora (Crofton Weed), Andropogon virginicus (Whisky Grass) and Sporobolus fertilis (Giant Parramatta Grass). Erosion was confined to the steeper access tracks servicing the offsets areas with the track on the north-west slope of VMU R requiring repair work, which at the time of writing was being undertaken. The fuel load was considered to be high in several of the VMUs with thick native grasses and/or dense shrub and midstorey species regenerating after the last fire event and the removal of the majority of the cattle”.

Summary

“Overall the remnant and regrowth VMU areas are showing good signs of natural recruitment and enhanced biodiversity. Management recommendations include:

- regular slashing of tracks to slow the spread of exotic grasses,
- continued weed control of Lantana;
- instigation of further monitoring to ascertain the extent and location of lantana infestations possibly through the use of drones;
- inclusion of infra-red camera on the drone to locate cattle and any other feral animals; and,
- a professional bush fire assessor to determine the bushfire risk and determine if and where controlled burns could be used for weed control and risk mitigation.
- Furthermore, future monitoring should focus on consistent application of the methodology and improved marking of transects to ensure more reliable data is collected to provide accurate results”.

Monitoring of fauna usage within the Biodiversity Offset areas is conducted every three years to assess the performance of the Biodiversity Offsets in providing habitat for a range of vertebrate fauna. The surveys include an assessment of habitat complexity, species richness and abundance. AMBS was engaged to undertake fauna monitoring within the Biodiversity Offset areas and mine rehabilitation areas during February 2018. The results are provided in the *DCM Fauna Surveys of the Offset and Mine Rehabilitation Areas, February 2018* (Appendix D). An extracted summary is provided below.

“Targeted fauna surveys were undertaken at five sites within the Duralie Offset Area and two sites in the Duralie Mine Rehabilitation Area during February 2018. At most sites survey techniques included pitfall traps, funnel traps, Elliott A traps, harp traps, ultrasonic call recording, spotlighting, diurnal bird surveys and reptile searches. Opportunistic observations of signs of fauna were noted throughout the field survey period, including during transit between surveys sites”.

*“A total of 124 species of vertebrate were recorded, comprising 8 frogs, 10 reptiles, 56 birds and 30 mammals..., most of which were native. With the exception of reptiles, a similar number of frog, mammal and bird species were recorded at Mine Rehabilitation Area sites compared with Offset Area sites. Five introduced species were recorded during the surveys, including Cattle (*Bos taurus*), House Mouse (*Mus musculus*), European Rabbit (*Oryctolagus cuniculus*), Black Rat (*Rattus rattus*) and Red Fox (*Vulpes vulpes*). Fifteen of the species detected are listed as threatened or migratory on the schedules of the Biodiversity Conservation Act 2016 (NSW) and/or the Environment Protection Biodiversity Conservation Act 1999 (Cth).*



Plate 14: Koala (*Phascolarctos cinereus*)



Plate 15: Long-nosed Potoroo (*Potorous tridactylus*)

13 MAMMY JOHNSONS RIVER STABILISATION

In accordance with Section 6.8 of the BMP a detailed design for the in-stream rehabilitation of a severely eroded section of Mammy Johnsons River (MJR) has been prepared by Alluvium (2013) (Appendix F). No works on the MJR bank stabilisation have commenced during the reporting period. Further planning will be undertaken during the next reporting period.

Table 10: Mammy Johnsons River Bank Stabilisation Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Year 1 (January to December 2013) PC Restoration Preparation Phase	Year 2 (January to December 2014) PC Preliminary Restoration Phase	Year 3 onwards (January to December 2015) PC VMU Installation Establishment	Annually from Year 3 onwards (January 2016 onwards) PC Maintenance Phase	CC
River bank stabilisation design	Design for the in-stream rehabilitation of a severely eroded section of Mammy Johnsons River has been prepared. Office of Water engaged regarding plan approval ¹ (Section 6.8).				Design of stabilisation plan completed and approved by the Office of Water
River bank in-stream rehabilitation			In-stream rehabilitation works undertaken ¹ (Section 6.8).	In-stream rehabilitation been completed ¹ (Section 6.8).	Rehabilitation of severely eroded section of Mammy Johnsons River completed.

14 LONG TERM SECURITY AND CONSERVATION BOND

Long-term Security

Public Positive Covenants and Restrictions on the Use of Land for Biodiversity Offsets have been registered on title with NSW Land and Property Information (LPI) in **May 2015**.

Conservation Bond

The conservation bond for Biodiversity Offset areas was calculated by Greening Australia and verified by Rider Levett Bucknell in December 2013. The terms of the conservation bond in the form of a Bank Guarantee were approved by NSW Department of Planning & Environment (DP&E) on **12 December 2013**. The Bank Guarantee has been subsequently provided to DP&E.

In December 2017 an Independent Environmental Audit of the DCM was undertaken in accordance with PA 08_0203. A revision of the BMP is currently being prepared in accordance with PA 08_0203 Schedule 5 Condition 4. Following this, a revision of the conservation bond will be prepared and lodged with DP&E in accordance with Schedule 3 Condition 45. The revised conservation bond will be lodged in the next reporting period.

15 COMMONWEALTH APPROVAL COMPLIANCE REPORTS

In accordance with the Commonwealth Approval [EPBC 2010/5396], during the reporting period DCPL submitted to the Department of Environment and Energy (DoEE) the following compliance report:

- *Duralie Coal Extension Project Annual Compliance Report 2018, submitted on 12 April 2018 (Condition 20).*

Additionally, the following reports were submitted annually for the first five years following the commencement of the operation:

- *DCM Implementation of the Giant Barred Frog Management Plan Annual Reports (Condition 10);*
- *DCM Implementation of the Biodiversity Management Plan Annual Reports (Condition 14(i)).*

These reports are now required to be submitted every **fifth** (5) year before the anniversary of the commencement of the operations.

16 APPENDICIES

Appendix A: DPE approval of BMP.

Appendix B: AMBS Ecology & Heritage - Nest Box Programme for the Duralie Offset Area, Annual Report for 2017.

Appendix C: AMBS Ecology & Heritage - Invasive animal study, Duralie Coal Mining Lease and offset areas, 2017.

Appendix D: AMBS Ecology & Heritage - DCM Fauna Surveys of the Offset and Mine Rehabilitation Areas, 2018.

Appendix E: Kleinfelder - DCM Biodiversity Offset Monitoring of Landscape Function and Vegetation Structure 2017.

Appendix F: Alluvium - Mammy Johnson's River – Bank Stabilisation Detailed Design, 2013.

(Appendices available on request)

Appendix 9:

Status Update on DCM Independent Environmental Audit 2017 Responses to Recommendations and Responses

Duralie Coal Mine - Independent Environmental Audit 2017

Recommendations and Responses

Audit Recommendations				Stratford Coal Response	Due Date	Status Update July 2018
Audit Reference	Condition	Management Area	Recommendation			
Previous Audit Recommendations						
1	Table 2	Administrative	Recommend a summary report following analysis of the inversion data is forwarded to EPA/OEH for consideration in any EPL variation.	DCPL accepts the recommendation.		
PA 08-0203 Non-compliance Recommendations						
2	Sch 3, Con 9	Blasting	Written approval should be obtained from the Secretary for any blasts outside approved hours.	DCPL accepts the recommendation.	Ongoing	No further action at this time.
3	Sch 3, Con 17	Geochemistry	Strict PAF management must be continued to ensure odour events are minimised.	DCPL accepts the recommendation. PAF management measures have been implemented and are ongoing.	Ongoing	Implementation of PAF and odour management procedures are ongoing.
4	Sch 3, Con 43	Biodiversity	The BMP should be updated to outline how measures relating to rehabilitation of creeks and drainage lines seek to ensure no net loss of stream length and aquatic habitat.	DCPL accepts the recommendation. Update with next BMP revision.	Q2 2018	The Duralie BMP has been revised during Q2 2018 and resubmitted to DPE on 29 August 2018.
5	Sch 3, Con 48	Administrative	Times should be recorded and screenshots taken in the future for updating the website on a fortnightly basis to confirm compliance with this condition and request amendment of condition at next modification.	DCPL accepts the recommendation.	Q2 2018	A function has been added to the Duralie website content management system which records the revision history for each page on the website.
PA 08-0203 Continual Improvement Recommendations						
6	Sch 2, Con 8	Trains	Scheduling of trains should be reviewed to ensure all scheduled train movements occur within the Conditions of Consent. A train was scheduled at 5.50am but did not depart until 6am.	DCPL accepts the recommendation.	Q2 2018	A new shuttle train contract has been established with Genesee Wyoming. Training and familiarisation on the shuttle train conditions and requirements was undertaken in September 2017.
7	Sch 2, Con 8A	Administrative	Recommend that times are recorded in the future with screenshot taken for updating the website within 12 hours of operating shuttle trains on the North Coast railway between midnight and 1am in exceptional circumstances to confirm compliance with this condition.	DCPL accepts the recommendation.	Q2 2018	A function has been added to the Duralie website content management system which records the revision history for each page on the website.
8	Sch 3, Con 2	Noise	A review of the NMP is required to ensure that it clearly stipulates internal monitoring sites or where a private Agreement to exceed relevant criteria as advised to DP&E applies; and those sites which are representative of private receivers and as such consent criteria does apply. It needs to be confirmed which noise monitoring sites apply to each closest private receiver. Where noise monitoring sites are representative of private receivers, but the noise monitoring is on mine owned land, the relevant criteria the private house should be stipulated (derived from modelling)	DCPL accepts the recommendation. Revised noise monitoring locations would be proposed in consultation with DP&E to represent private receivers. Update with next NMP revision.	Q2 2018	A revision of the Duralie NMP has been prepared during May 2018. The revised plan includes updated monitoring requirements and locations to reflect landownership and private agreements. The plan has also been updated to reflect the reduced hours of operation at Duralie. The NMP was approved by DPE on 9/05/2018 and is available on the Duralie website.
9	Sch 3, Con 7	Noise	Consultation with the EPA should be undertaken for future updates of the NMP or DP&E approval, particularly where plans are being updated for closure status.	DCPL accepts the recommendation.	Q2 2018	The EPA advised in correspondence dated 08/03/2018, it supports the development of Environmental Management Plans, however the EPA does not review or provide comment on these documents. This advice has been noted in the EMPs and provided to DPE.
10	Sch 3, Con 29	Water	Any future updates to the SWMP include additional details on the final void design, Coal Shaft Creek reconstruction, closure objectives and specific performance criteria.	DCPL accepts the recommendation. Update with next WMP revision.		
11	Sch 3, Con 32	Administrative	Revision status register in the GBFMP to be updated to indicate if the current version is approved by DP&E and evidence of such approval included within the plan.	DCPL accepts the recommendation. Update with next GBFMP revision.	Q3 2018	The GBFMP revision table has been updated with the approval dates included.
12	Sch 3, Con 39	Biodiversity	Hollow bearing habitat features should be introduced into revegetated areas.	Action included in the BMP. Hollow bearing habitat features would be installed following the establishment of vegetation in the biodiversity offset revegetation areas.	Q2 2018	The Duralie BMP has been revised during Q2 2018 and resubmitted to DPE on 29 August 2018.
13	Sch 3, Con 43	Biodiversity	The BMP should be updated to outline how measures relating to rehabilitation of creeks and drainage lines seek to ensure no net loss of stream length and aquatic habitat.	DCPL accepts the recommendation. Update with next BMP revision.	Q2 2018	The Duralie BMP has been revised during Q2 2018 and resubmitted to DPE on 29 August 2018.
14	Sch 3, Con 44	Biodiversity	Conservation bond is reviewed and revised as required, due to update of BMP in 2017.	DCPL accepts the recommendation. The BMP would be revised and the conservation bond reviewed during 2018.	Q4 2018	A revision of the conservation bond is currently being prepared.
15	Sch 3, Con 48	Administrative	The audit has no means of determining whether the records of exceptional circumstances have been made available on a fortnightly basis on DCPL's website. It is recommended that times and dates are recorded or screenshot taken to demonstrate compliance with this condition.	DCPL accepts the recommendation.	Q2 2018	A function has been added to the Duralie website content management system which records the revision history for each page on the website.
16	Sch 3, Con 55	Rehabilitation	Recommend Annual Reviews discuss the Rehabilitation objectives in Table 12 of this condition and discuss how each is being met or worked towards.	DCPL accepts the recommendation. Include in next Annual Review.	Q3 2018	A discussion progress towards meeting the DCM rehabilitation objectives has been included in the 2018 DCM Annual Review.
EPL 11701 Continual Improvement Recommendations						
17	P1	Air Quality	Recommend considering justifying and removal of dust gauges and modify commensurate with closure status. AQMP would also require update for consistency.	DCPL accepts the recommendation. EPL variation to be considered during closure phase.	Next EPL variation	No change.

18	L4.2	Noise	A discussion with the EPA is recommended with the aim of modifying this condition to permit acoustically equivalent locations to be adopted for the noise compliance measurements to minimise disturbance to residents. NMP would also required update.	DCPL accepts the recommendation. Revised noise monitoring locations would be proposed in consultation with DP&E and EPA to represent private receivers. Update with next NMP revision.	Q2 2018	A revision of the Duralie NMP has been prepared during May 2018. The NMP was approved by DPE on 9/05/2018 and is available on the Duralie website.
19	O5.1	Administrative	Recommend the last sentence of this condition is removed at next variation request, relating to the development of an emergency response plan as the date has been superseded and is no longer relevant.	DCPL accepts the recommendation. Revise with next EPL variation.	Next EPL variation	No change.
20	M9	Noise	Recommend this condition is removed. Condition relates to submitting a noise compliance report within 30 days of the completion of quarterly monitoring.	DCPL accepts the recommendation. Revise with next EPL variation.	Next EPL variation	No change.
ML 1646 Non-compliance Recommendations						
21	5	Administrative	Recommend that any incidents that meet the definition under this condition are reported to DRG in the future	DCPL accepts the recommendation.	Ongoing	No further action at this time.
General Recommendations						
22		Administration	All approval and consultation letters are appended to management plans appendices in the future.	DCPL accepts the recommendation.	Ongoing	No further action at this time.
23		Administration	It is recommended that consultation is undertaken for any future revisions to management plans or approval from DP&E sought not to consult.	DCPL accepts the recommendation. DCPL will undertake consultation on all management plans and revisions as required by the Development Consent conditions.	Ongoing	No further action at this time.
24		Air	Amend sentence in the AQGGMP Section 3.1.1 that states no PM2.5 criteria in NSW to reflect recent legislative changes at next update.	DCPL accepts the recommendation. Update with next AQGGMP revision.	Next AQMP revision	
25		Consultation	Recommend that consultation with regulatory departments is undertaken for updates of management plans or approval from DP&E is sought to not consult.	DCPL accepts the recommendation. DCPL will undertake consultation on all management plans and revisions as required by the Development Consent conditions.	Ongoing	No further action at this time.
26		Ecology	Table 7 of the BMP contains an incorrect reference to Section 6.13 for a discussion on canopy bridges. This should be updated to Section 6.14 when BMP next revised.	DCPL accepts the recommendation. Update with next BMP revision.	Q2 2018	The Duralie BMP has been revised during Q2 2018 and resubmitted to DPE on 29 August 2018.
27		Ecology	It is recommended that the BMP is updated with the following changes when next revised as suggested by KW: <ul style="list-style-type: none"> Table 10 of the BMP is updated to include details for the Varied Sittella for consistency. Additionally, given that the BMP addresses multiple offsetting requirements, it is recommended that the BMP includes a summary table indicating the list of threatened fauna species recorded within the surface development area and the areas of habitat (current and future) within each of the different offset areas; allowance for installation of hollow-bearing habitat features within revegetation areas; Include clear short, medium and long term measures for the offset areas, or indicate that medium and long term measures have been amalgamated; and Include the requirement for the submission of records of captured individuals of Threatened species. 	DCPL accepts the recommendation. Update with next BMP revision.	Q2 2018	The Duralie BMP has been revised during Q2 2018 and resubmitted to DPE on 29 August 2018.
28		Rehabilitation	The following recommendations were made by CR: <ul style="list-style-type: none"> Continue rehabilitation techniques along eastern edge of mine area and apply upon the final shaping of the overburden emplacements. Continue to monitor and manage weed species as required; Continue to monitor and manage weed species and species diversity as required in the mine rehabilitation to forest community; and Continue same process of rehabilitation as per previous efforts in shaped and topsoiled areas to ensure consistent results (CR, 2018). 	DCPL accepts the recommendation.	Ongoing	DCPL will continue to implement rehabilitation procedures described in the Duralie MOP which have been proven to be successful.
29		Spontaneous Combustion	Outcomes from the actions in the DCPL response letter (dated 23/09/16) to the Spontaneous Combustion incident on 29 July 2016 should be included in the next Annual Review.	DCPL accepts the recommendation. Include in next Annual Review.	Q3 2018	Comments on spontaneous combustion have been included in the 2018 DCM Annual Review.
30		Training	Induction (and log on induction) is improved by adding additional detail such as the general management processes used for dust, noise, water, odour and heritage on site as well as identifying any of the sensitive areas in relation to these.	SCPL accepts the recommendation. Review of the Stratford Coal inductions packages commenced in February 2018.	Q4 2018	Stratford Coal generic induction revised.
31		Training	Recommend that the induction package includes PIRMP (list of inclusions in Section 11) and an assessment of competency.	SCPL accepts the recommendation. Review of the Stratford Coal inductions packages commenced in February 2018.	Q4 2018	Stratford Coal generic induction revised.
32		Waste	Recommend update contractor to JR Richards in Section 5 of the WaMP.	DCPL accepts the recommendation.	Q2 2018	The Duralie Waste Management Plan has been updated during Q2 2018.
33		Waste	Section 7 of the WaMP references a Community Management and separate Coordinator. Recommend this is updated to current.	DCPL accepts the recommendation.	Q2 2018	The Duralie Waste Management Plan has been updated during Q2 2018.
34		Water	Actions should be taken to ensure any outstanding actions from the dams compliance audit are addressed.	DCPL accepts the recommendation.	Q2 2018	Follow-up on the Dams Compliance Audit actions has been undertaken with the individual departments (EPA, DPE, DIRR). Refer separately to the audit responses to recommendations and action tracking in Intellex.