AshtonCoal
PART OF THE YANCOAL AUSTRALIA GROUP

YANCOAL
兖煤澳大利亚有限公司

Annual Review

Ashton Coal Project

1 January 2019 – 31 December 2019

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ASHTON COAL

PTY LTD

ABN: 22 078 556 500

Annual Review

for the

Ashton Coal Project

1 January 2019 – 31 December 2019

Compiled for:

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Ref No. 737/23c

March 2020

AshtonCoal
PART OF THE YANCOAL AUSTRALIA GROUP

TITLE BLOCK

Name of Operation	Ashton Coal Project
Name of Operator	Ashton Coal Operations Pty Limited
Development consent / project approval #	309-11-2001-i
Name of holder of development consent / project approval	Ashton Coal Operations Pty Limited
Mining Lease #	ML 1529, ML 1533 and ML 1623
Name of holder of mining lease	White Mining (NSW) Pty Limited
Water licence #	Multiple - see Section 3
Name of holder of water licence	Ashton Coal Mines Limited
MOP/RMP start date	01/07/2018
MOP/RMP end date	26/02/2024
Annual Review start date	01/01/2019
Annual Review end date	31/12/2019

I, Aaron McGuigan, certify that, to the best of my knowledge, this report is a true and accurate record of the compliance status of the Ashton Coal Project for the period 1 January 2019 to 31 December 2019 and that I am authorised to make this statement of behalf of Ashton Coal Operations Pty Limited.

Note.

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

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

Name of authorised reporting officer	Aaron McGuigan
Title of authorised reporting officer	Operations Manager
Signature of authorised reporting officer	
Date	31 March 2020

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1. STATEMENT OF COMPLIANCE

The compliance status of relevant approvals was reviewed for the reporting period and is summarised in **Table 1.1**. It was determined that there were no non-compliances during the reporting period.

Table 1.1
Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	Yes / No
Development Consent 309-11-2001-i	Yes
Mining Lease 1529	Yes
Mining Lease 1533	Yes
Mining Lease 1623	Yes
Water Access Licences 1358, 15583, 8404, 997, 1120, 1121, 6346, 23912, 984, 19510, 36702, 36703, 29566, 41501, 41552, 41553	Yes

2. INTRODUCTION

2.1 OVERVIEW OF OPERATIONS

The Ashton Coal Project (ACP) is located approximately 14km northwest of Singleton, New South Wales (see **Figure 2.1**). The ACP includes the decommissioned North-east Open Cut (NEOC), an underground coal mine, a Coal Handling and Preparation Plant (CHPP) and a rail siding. The ACP was granted Development Consent DA 309-11-2001-i in October 2002 by the (then) Minister for Planning. DA 309-11-2001-i has been modified a total of ten times, with the most recent modification (MOD 5) being granted on 20 June 2016.

Ashton Coal Operations Pty Limited (ACOL) also holds Project Approval (PA) 08_0182, issued on 17 April 2015, for open cut mining within the South East Open Cut (SEOC) (see **Figure 2.1**). The granting of MOD 5 permitted the integration of the existing ACP and the SEOC project, with the combined development referred to as the Ashton Mine Complex. As operations at the SEOC project have not yet commenced, this Annual Review reports only upon the operations associated with the ACP.

A brief summary of the operations at the ACP are provided as follows.

North-east Open Cut

The NEOC was mined between January 2004 and September 2011 at which point coal extraction ceased and, with approval, placement of coarse reject within the NEOC void commenced. The NEOC will continue to provide for coarse reject storage prior to the ultimate final landform rehabilitation, and may be used for coal fines emplacement, if needed.

Ashton Underground Coal Mine

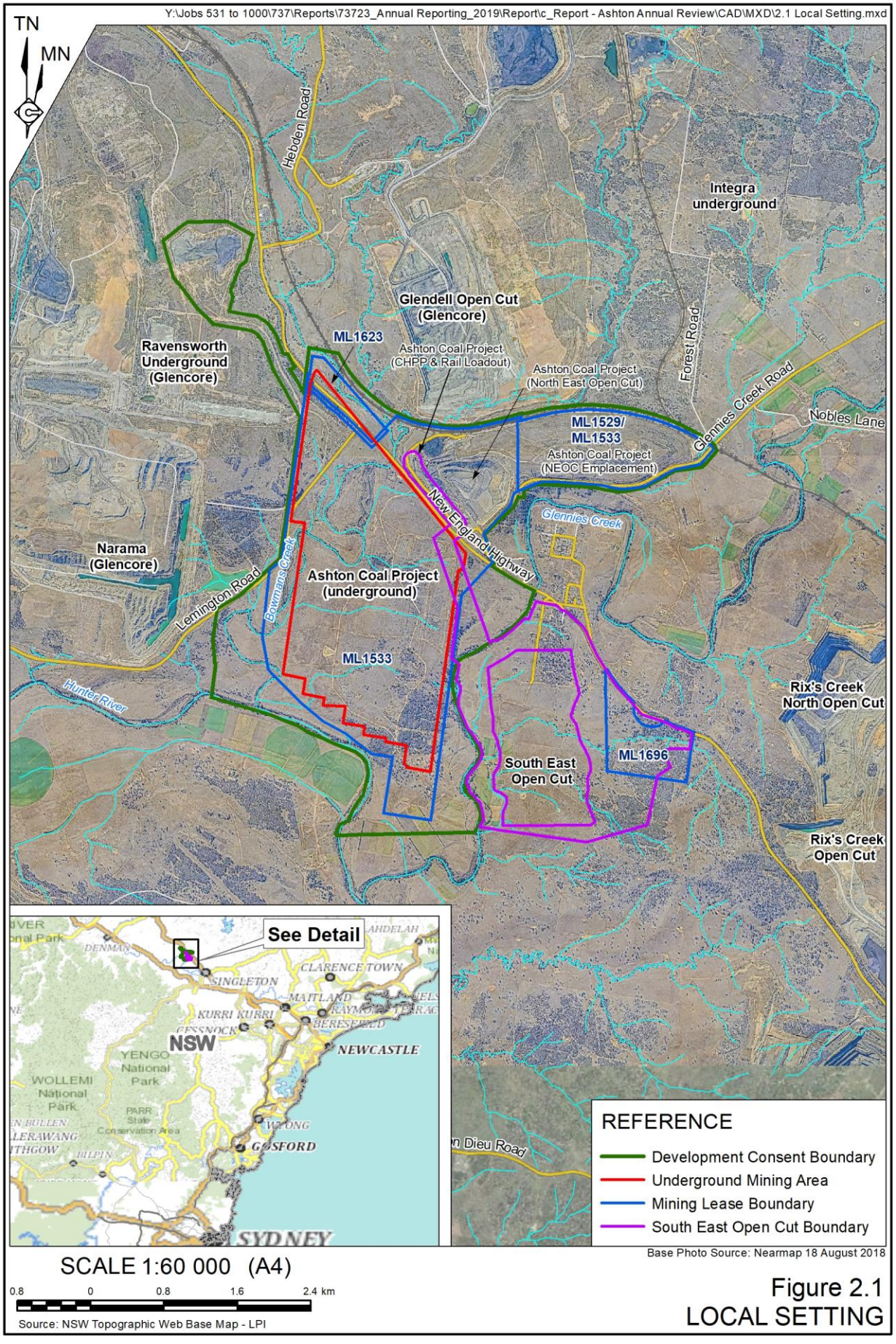
The Ashton underground operations commenced in December 2005 with the first longwall coal extracted within the Pikes Gully Seam in March 2007. Construction of the Bowmans Creek Diversion was completed in November 2012 allowing extraction of coal from beneath those excised sections of Bowmans Creek. Coal extraction operations within the underground operations remain ongoing with an approved maximum production of 5.45Mtpa.

Coal Handling and Preparation Plant

The CHPP was commissioned in April 2004 and expanded during 2006/2007 increasing its capacity from 400t/hr to 1,000t/hr. The CHPP continues to process coal from the Ashton underground operations for export through the Port of Newcastle, NSW.

2.2 SCOPE AND FORMAT

This Annual Review for the Ashton Coal Project has been compiled by R.W. Corkery & Co. Pty. Limited on behalf of Ashton Coal Operations Pty Limited (the "Company"). Ashton Coal Operations Pty Limited became part of Yancoal Australia Limited in July 2009.


Y:\Jobs 531 to 1000\737\Reports\73723_Annual Reporting_2019\Report\c_Report - Ashton Annual Review\CAD\MXD\2.1 Local Setting.mxd
TN
MN
Hebden Road
Integra underground
Glendell Open Cut (Glencore)
ML1623
Ashton Coal Project (CHPP & Rail Loadout)
Ashton Coal Project (North East Open Cut)
Forest Road
Ravensworth Underground (Glencore)
Glennies Creek Road
Nobles Lane
ML1529/ ML1533
Ashton Coal Project (NEOC Emplacement)
New England Highway
Glennies Creek
Narama (Glencore)
Lemington Road
Bowmans Creek
Ashton Coal Project (underground)
ML1533
Hunter River
Rix's Creek North Open Cut
ML1696
South East Open Cut
Rix's Creek Open Cut
See Detail
CLARENCE TOWN
SINGLETON
MAITLAND
KURRI KURRI
BERESFIELD
NEWCASTLE
NSW
YENGO National Park
WOLLEMI National Park
PARR State Conservation Area
GOSFORD
SYDNEY
REFERENCE
Development Consent Boundary
Underground Mining Area
Mining Lease Boundary
South East Open Cut Boundary
SCALE 1:60 000 (A4)
0.8 0 0.8 1.6 2.4 km
Source: NSW Topographic Web Base Map - LPI
Base Photo Source: Nearmap 18 August 2018
Figure 2.1
LOCAL SETTING

This is the fourth Annual Review submitted for the ACP, following eleven Annual Environmental Management Reports, and is applicable for the period 1 January to 31 December 2019 ("the reporting period"). The information presented within this Annual Review has been compiled based on information and advice provided by ACOL.

This Annual Review has been prepared in accordance with the requirements of *Schedule 5 Condition 10* of DA No. 309-11-2001-I (Mod 5), the annual reporting requirements of Mining Leases 1529, 1533 and 1623, and the commitments outlined in the MOP. This Annual Review generally follows the format and content requirements identified in the Department of Planning and Environment's (DPE) *Annual Review Guideline* dated October 2015.

2.3 KEY PERSONNEL CONTACT DETAILS

The Operations Manager, Mr Aaron McGuigan is the primary mine contact (Tel: 02 6570 9104). Mr McGuigan is currently the Manager Mining Engineering for legislative purposes and as such, is responsible for the environmental management of the mine and ensuring compliance with all relevant legislative obligations. Mr Phillip Brown (Tel: 0439 909 952) is the nominated Environment & Community Relations Superintendent and is also responsible for the environmental management of the mine. The contact details for the mine office are as follows.

Postal Address:	Ashton Coal Operations Pty Limited PO Box 699 SINGLETON NSW 2330	Tel: 02 6576 1111 Fax: 02 6576 1122
Email:	Ashton.environment&community@yancoal.com.au	
Physical Address:	Ashton Coal Operations Glennies Creek Road CAMBERWELL NSW 2330	

A 24-hour Environmental Hotline (Tel: 1800 657 639) is maintained by ACOL. Details of calls taken on this number are forwarded to the Environment & Community Relations Superintendent for further actioning, if required.

3. APPROVALS

ACOL has operated the ACP under the key approvals listed in **Table 3.1**.

Table 3.1
Ashton Coal Project – Consents, Leases and Licences

Consent/Lease/Licence	Issue Date	Expiry Date	Details / Comments
Development Approvals			
Development Consent DA 309-11-2001-i	11 October 2002	26 February 2024[1]	Granted by the (then) Minister for Planning and last modified on 20 June 2016 (MOD 5).
Mining Authorities			
Mining Lease ML 1529[2]	10 September 2003	11 November 2021	Granted by the (then) Minister for Mineral Resources. Incorporates 128.7ha of surface area.
Mining Lease ML 1533[2]	26 February 2003	25 February 2024	Granted by the (then) Minister for Mineral Resources. Incorporates 883.4ha of surface area.
Mining Lease ML 1623[2]	30 October 2008	30 October 2029	Granted by (then) Minister for Mineral Resources. Incorporates 26.17ha of surface area.
Other Licences			
Environment Protection Licence No. 11879	2 September 2003	Not applicable	Issued by the (then) Department of Environment and Climate Change (EPA). Current licence version dated 21 November 2019.
Water Access Licence (WAL) 1358	Continuing		Hunter Regulated River Water Source. Supplementary water. Share component: 4ML.
Water Access Licence (WAL) 15583	Continuing		Hunter Regulated River Water Source. General security. Share component: 354ML.
Water Access Licence (WAL) 8404	Continuing		Hunter Regulated River Water Source. High security. Share component: 80ML.
Water Access Licence (WAL) 997	Continuing		Hunter Regulated River Water Source. High security. Share component: 11ML.
Water Access Licence (WAL) 1120	Continuing		Hunter Regulated River Water Source. High security. Share component: 3ML.
Water Access Licence (WAL) 1121	Continuing		Hunter Regulated River Water Source. General security. Share component: 335ML.
Water Access Licence (WAL) 6346	Continuing		Hunter Regulated River Water Source. Supplementary water. Share component: 15.5ML.
Water Access Licence (WAL) 23912	Continuing		Jerrys Water Source. Share component: 14ML.
Water Access Licence (WAL) 984	Continuing		Hunter Regulated River Water Source. General security. Share component: 9ML.
Water Access Licence (WAL) 19510	Continuing		Hunter Regulated River Water Source. High security. Share component: 130ML.
Water Access Licence (WAL) 36702	Continuing		Jerrys Water Source. Share component: 116ML.
Water Access Licence (WAL) 36703	Continuing		Jerrys Water Source. Share component: 150ML.

Table 3.1 (Cont'd)
Ashton Coal Project – Consents, Leases and Licences

Consent/Lease/Licence	Issue Date	Expiry Date	Details / Comments
Other Licences (Cont'd)			
Water Access Licence (WAL) 29566	Continuing		Jerrys Water Source. Aquifer. Share component: 358ML.
Water Access Licence (WAL) 41501	Continuing		Sydney Basin-North Coast Groundwater Source. Share component: 100ML.
Water Access Licence (WAL) 41552	Continuing		Sydney Basin-North Coast Groundwater Source. Share component: 511ML.
Water Access Licence (WAL) 41553	Continuing		Sydney Basin-North Coast Groundwater Source. Share component: 81ML.
Note 1: Mining operations approved until 26 February 2024 or for a period of 12 years following recommencement of open cut mining operations (including overburden removal) at the Ashton Mine Complex, whichever is longer.			
Note 2: See **Figure 2.1**.			

It is noted that this Annual Review has been prepared to fulfil the annual reporting requirements of DA 309-11-2001-i, ML 1529, ML 1533, ML1623 and the various Water Access Licences listed in **Table 3.1**. A separate Annual Return has continued to be submitted to the NSW EPA in accordance with the requirements of Environment Protection Licence 11879. Reporting requirements under the approved Extraction Plan for LW201-204 and 2009 Conservation Agreement (for Southern Voluntary Conservation Area) are also included in the scope of this report.

ACOL also holds a range of additional licences, approvals and permits which are reported upon separately. This includes Exploration Licence 4918, granted on 18 December 1995 with a current expiry date of 17 December 2015 (renewal pending), and Exploration Licence 5860, granted on 22 May 2001 with a current expiry date of 21 May 2020 (renewal pending) (see **Figure 2.1**).

4. OPERATIONS SUMMARY

4.1 MINING OPERATIONS

Open cut coal mining activities ceased in September 2011 and open cut rehabilitation works were completed between 2011 and 2012 with the exception of the Open Cut Void which is used as a reject emplacement.

Approval for underground mining operations includes the extraction of coal from the Pikes Gully (PG), Upper Liddell (ULD), Upper Lower Liddell (ULLD and Lower Barrett (LB) coal seams. Underground mining relies upon the longwall extraction method following continuous miner development of main headings and twin heading gate-roads.

During the reporting period coal was mined from Longwall (LW) 202 and LW 203 within the ULLD seam with road development principally between Panels LW204 and LW205 and the 200 Mains (see **Figure 4.1**). **Table 4.1** presents a summary of the production statistics for the previous, current and next reporting periods.

In summary, a total of 2,035,229t of Run of Mine (ROM) coal was mined from underground operations during the reporting period and a total of approximately 843,414t of product coal was transported to the Port of Newcastle by rail.

Table 4.1
Production Summary

Material	Approved limit (specify source)	Previous reporting period (actual)	This reporting period (actual)	Next reporting period (forecast)
Topsoil Stripped	None specified	0	0	0
Waste Rock / Overburden (m^3)	None specified	0	0	0
ROM Coal / Ore (t)[2]	5 450 000[1]	1 947 167	2 035 229	2 869 969
Coarse Reject (t)	None specified	897 797	996 098	1 254 813
Fine Reject (Tailings) (t)	None specified	252 503	217 750	315 697
Saleable Product (t)	None specified	807 482	843 414	1 299 459

Note 1: For underground operations as specified by DA 309-11-2001-i, Schedule 2, Condition 6(a). A maximum of 3 600 000t from open cut mining operations is also provided by MP 08_0182, however, this approval has not yet been enacted.

Note 2: ROM coal does not equate to the sum of rejects and saleable product due to slight variance in the timing between extraction, stockpiling, processing and transport of coal off site.

Based on current resource estimates and extraction rates, it is anticipated that the underground mine life is approximately eight years (i.e. until 2027).

4.2 GAS MANAGEMENT

Construction of two gas drainage boreholes, located above LW 203, commenced during the reporting period. Works associated with the installation of gas drainage pipelines were ongoing at the end of the reporting period. The gas drainage plant functioned throughout the reporting period, although flaring[1] was sporadically unable to be undertaken due to low methane concentrations. Greenhouse gas emissions continued to be reported as required by the National Greenhouse Gas and Energy Reporting (NGER) requirements.

[1] Flaring is a process of combusting, principally methane, to produce gases with a lower global warming potential.

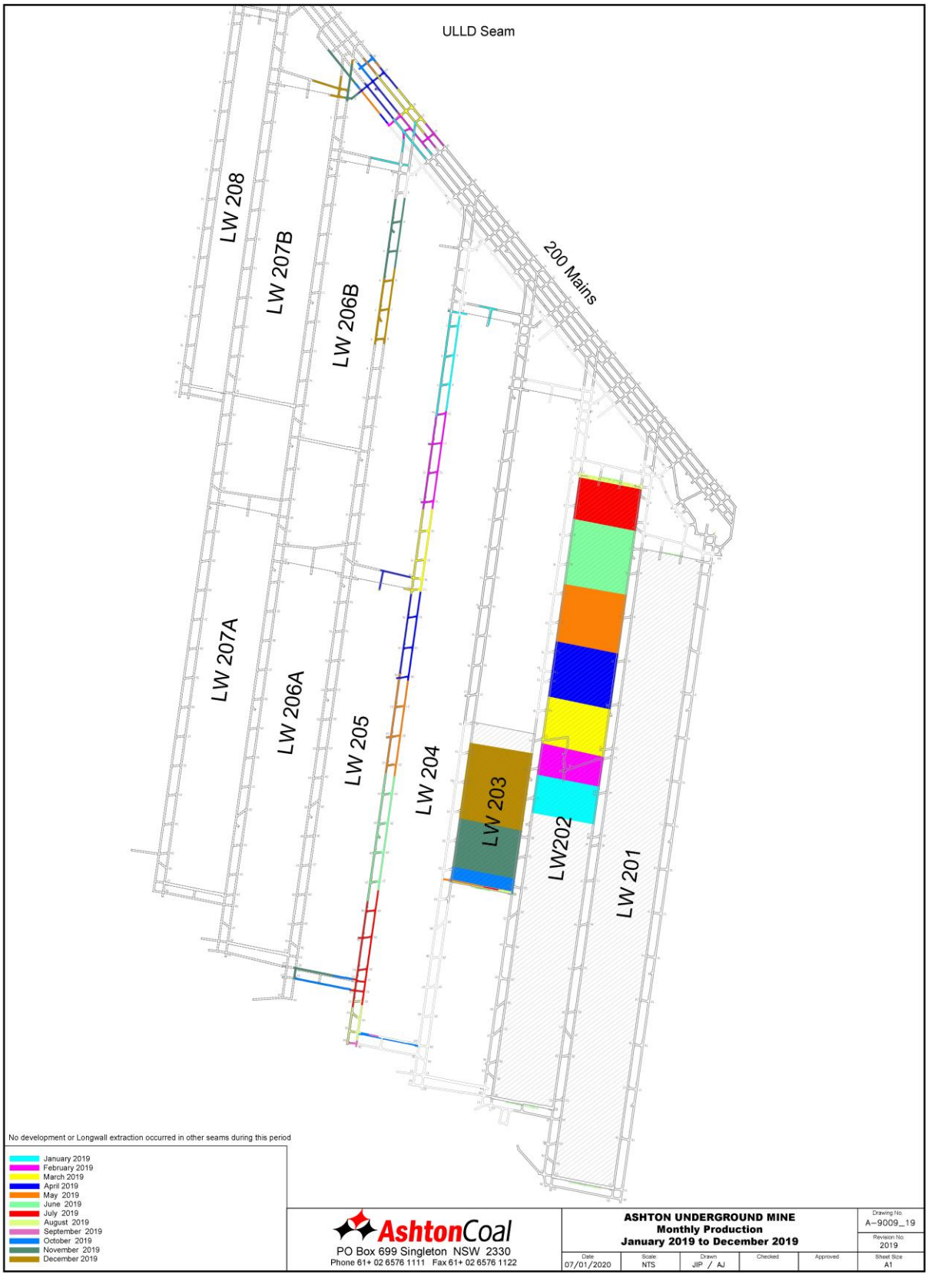


Figure 4.1 Mining Operations (1 January – 31 December 2019)

4.3 OTHER OPERATIONS DURING THE REPORTING PERIOD

A total of six internal Ground Disturbance Permits (GDPs) were applicable during the reporting period (see **Table 4.2**).

Table 4.2
Ground Disturbance Permits - 2019

Ground Disturbance Permit No.	Purpose	Permitted Disturbance (m^2)	Rehabilitation Status
151	Upgrade to Bowmans Creek Diversion light vehicle crossing.	220	Area of existing disturbance – no rehabilitation required.
152	Installation of four 'Private Property' signs around the site boundary.	>1	Area of existing disturbance – no rehabilitation required.
153	Two geotechnical drill holes, one located either side of Bowman's Creek near its confluence with Bettys Creek.	>1	Drill holes backfilled.
154	Seven exploration drill holes across the underground mine surface area.	11 000	Six drill holes completed and five pads rehabilitated to date. Permit remains open.
156	Archaeological subsurface investigation in area of proposed fault delineation holes.	275	All disturbance rehabilitated.
157	Gas drainage borehole drilling above LW203.	7 300	Disturbed areas partially rehabilitated. Permit remains open.
Source: Ashton Coal Operations Pty Limited.			

The six exploration drill holes during the 2019 reporting period were drilled within ML1533 in the central underground mining area (see **Figure 4.1**). All holes were 4C gauge (139.7mm diameter holes for 101.6mm diameter core) and were drilled to depths of between 74m and 140m to core the Lemington 1-19 Seams, through the worked out Pikes Gully Seam longwall gate road chain pillars to below the Arties Seam. All seams intersected were sampled, except the Pikes Gully Seam, for coal quality raw ply and washability testing as well as roof/floor dilution. The holes were grouted to the surface on completion.

No other exploration, land preparation or construction activities were undertaken during the reporting period.

Environmental monitoring activities continued throughout the reporting period including air quality, surface water, groundwater, flora and fauna and subsidence monitoring. Results of this monitoring is summarised in Sections 6 and 7.

4.4 NEXT REPORTING PERIOD

The activities proposed for 2020 will principally involve a continuation of activities undertaken during the previous twelve months. The following provides a summary of the planned activities.

Exploration

It is planned to drill one HQ gauge borehole within ML1533 above the underground mining area and near two existing boreholes and adjacent the southern bank of Bowman's Creek (see **Figure 4.2**). The drill hole will commence from surface and through the Lemington and Pikes Gully Seam to be below the Arties Seam. Seam gas test samples will be taken from all coal seams and sample roof/floor/stone band seam splits for geotechnical testing.

Mining

During the next reporting period, mining will focus upon continued longwall mining within Panels LW203 and LW204. The planned mining activities are shown in **Figure 4.2**. It is estimated that in the order of 2,870,000t of ROM coal will be extracted during the next reporting period.

Rehabilitation

Rehabilitation activities planned for the 2020 reporting period include rehabilitation of new exploration holes and the rehabilitation of any subsidence impacts. Ongoing remedial treatment of subsidence surface cracking and maintenance of existing disturbance, principally erosion and sediment control, will also be undertaken as necessary.

Monitoring

Environmental, meteorological and subsidence monitoring will continue to be undertaken during the next reporting period in accordance with the approved management plans. It is noted that some monitoring programs will be reviewed to improve monitoring data capture and consistency with the recent variation to the Environment Protection Licence, and outcomes of the 2019 Independent Environmental Audit (see Section 10).

Community Consultation and Liaison

The community consultative committee will continue to be convened during the next reporting period. It is expected that meetings will be held once every four months unless otherwise agreed with the committee. The 24hr environmental hotline will be maintained and a register retained of any complaints received.

Mining Operations Plan (MOP) and Management Plans

The current MOP, prepared for the period ending 26 February 2024, is planned to be further amended during the next reporting period to reflect updated rehabilitation / biodiversity completion and performance criteria as developed through the ecological monitoring undertaken during the 2019 reporting period and planned changes to rehabilitation of the NEOC emplacement. All management plans will be reviewed following the 2019 Independent Environmental Audit and updates made as required. Currently minor updates are expected to the Air Quality and Greenhouse Gas Management Plan, Flora and Fauna Management Plan, Water Management Plan, and Environmental Management Strategy.

5. ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

The 2018 Annual Review was forwarded to the Resources Regulator within the (then) Department of Planning and Environment (DPE) and the DPE compliance unit on 29 March 2019. Feedback was received from the DPE compliance unit dated 16 May 2019 and from the Resources Regulator dated 19 September 2019. In both cases, the Annual Review was considered to generally satisfy the conditions of the approval. **Table 5.1** summarises the actions arising from the 2018 Annual Review.

Table 5.1
Actions from the Previous Annual Review

Action required from previous Annual Review	Requested by	Action taken by the Operator	Where discussed in Annual Review
Mine Subsidence – please incorporate Section 8 '*Mine Subsidence*' as a subsection of Section 6 '*Environmental Performance*' in order to maintain Section numbering as per the Department's *Annual review Guideline* (October 2015).	DPE Compliance Unit	Subsidence has been incorporated into Section 6 of this Annual Review.	Section 6.8
Incidents and Non-compliances During the Reporting Period – as per the Department's *Annual Review Guideline* (October 2015), Section 12 (to be renumbered Section 11 as per point 1) should expand upon any non-compliances noted in Section 1 '*Statement of Compliance*'.	DPE Compliance Unit	No non-compliances were reported for this reporting period. However, Section 11 of future Annual Reviews will expand upon any non-compliances noted in Section 1.	Section 11
Future AEMR submissions must include the correct Titleholder(s) in the Title Block.	Resources Regulator	All relevant titles are held by White Mining (NSW) Pty Limited. The Title Block of this Annual Review has been updated accordingly.	Title Block

6. ENVIRONMENTAL PERFORMANCE

6.1 SUMMARY OF ENVIRONMENTAL PERFORMANCE

A summary of environmental performance for the principal environmental aspects is provided in **Table 6.1**. Further detail regarding specific environmental aspects is also provided in the following subsections.

Table 6.1
Environmental Performance

Aspect	Approval criteria / EIS prediction	Performance during the reporting period	Trend/key management implications	Implemented/proposed management actions
Noise	No exceedance of applicable noise criteria.	No exceedances. Three complaints – two confirmed not to be related to the ACP (See Section 9.1).	Monitoring implies management measures are currently adequate.	No additional management action required. Continue proactive management approach.
Blasting	No exceedance of applicable blast criteria.	No blasting during reporting period.	Not applicable – no blasting	As no blasting planned for the next reporting period, no specific actions are required.
Air Quality	No exceedances of applicable air quality criteria.	No exceedances attributable to the ACP and no complaints.	Implies management measures are currently adequate.	No additional management action required.
Biodiversity	No significant impacts upon flora, fauna species, populations, communities or habitat.	No adverse impacts upon flora, fauna species, populations, communities or habitat attributable to the ACP were recorded. Notwithstanding actions to improve biodiversity management have been recommended.	Current mining design and safeguards are currently adequate. However, further proactive land management actions can be taken to improve biodiversity outcomes.	Within Bowmans Creek Riparian area, proposed habitat enhancement, livestock exclusion and erosion control works to be investigated. Ongoing pest and weed control.
Heritage	Management in accordance with approved Aboriginal Heritage Management Plan, including salvage.	Salvage of artefacts in accordance with management plan and in consultation with Aboriginal Community. No complaints or issues raised.	Implies management actions are currently adequate.	No additional management action currently required.
Subsidence	Subsidence management in accordance with approved Subsidence Management Plan / Extraction Plan.	Two Level 1 (non-reportable) TARPs implemented during reporting period relating to minor (<15%) exceedance of predicted subsidence levels and surface cracking.	Implies management measures and action responses are currently adequate and predictions sufficiently accurate.	Continued monitoring and review of results. Continue remediation as required in accordance with approved Extraction Plans.

6.2 METEOROLOGICAL MONITORING

Meteorological data is used by ACOL to interpret environmental impacts and to understand air quality and noise management outcomes. The ACP has two meteorological monitoring stations, namely Monitoring Site 1 (predominantly used to monitor for noise and air quality impacts in adverse weather conditions and determine temperature inversion stability class) and the Repeater Station (the main monitoring site) (see **Figure 6.1**).

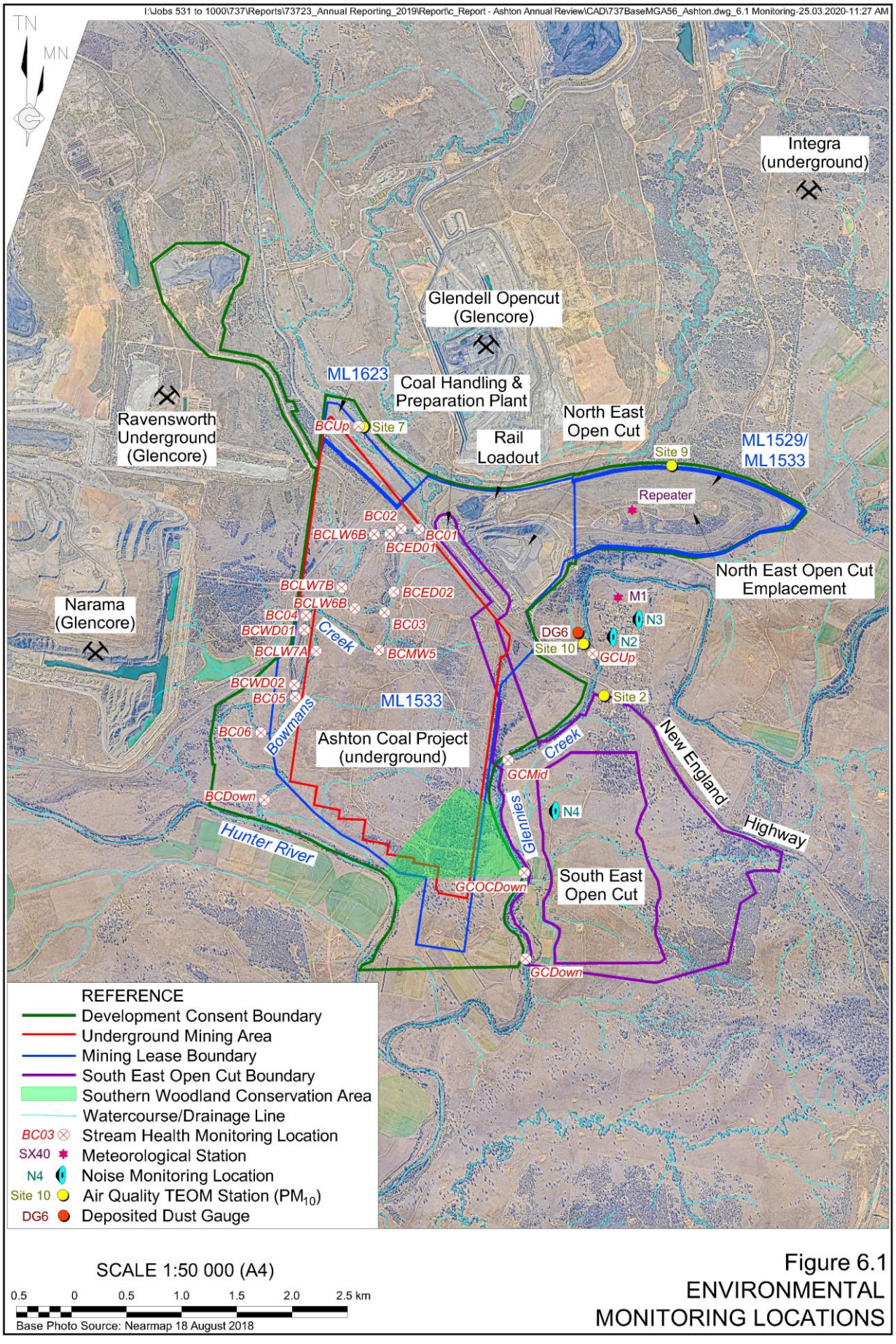


Figure 6.1
ENVIRONMENTAL MONITORING LOCATIONS

A summary of rainfall data since the commencement of operations is presented in **Table 6.2** and seasonal wind roses for the reporting period are presented in **Figures 6.2** and **6.3**. Total rainfall during the 2019 calendar year was 403.2mm, significantly below the average rainfall of 638.0mm.

Table 6.2
Monthly Rainfall Records

Period	Average Monthly Rainfall (mm)												
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Total**
2004	81.2	145.6	47.8	23.0	22.6	2.1	1.5	7.0	36.2	61.8	42.8	81.6	546.2
2005	56.6	116.8	79.2	8.5	43.4	87.0	12.0	7.0	41.4	107.6	86.0	15.2	660.7
2006	57.2	47.3	37.6	25.4	1.8	30.8	37.4	13.4	116.8	2.8	62.0	39.0	471.5
2007	30.0	32.6	83.0	27.8	30.4	270.5	14.8	73.7	9.0	15.4	124.2	58.2	769.6
2008	52.6	134.6	44.4	103.2	1.6	72.6	19.4	63.2	73.8	60.0	51.6	50.0	727
2009	3.6	161.6	84.8	47.6	42.8	27.4	20.9	0.4e	27.6	47.0	28.4	67.6	559.7
2010	51.0	66.6	69.8	24.8	70.2	40.2	64.8	24.5	24.6	58.6	92.2	33.6	620.9
2011	25.0	35.6	90.2	54.0	78.6	132.4	17.4	43.8	79.4	101.6	155.2	43.4	856.6
2012	45.8	142.6	76.6	28.8	12.2	55.8	35.2	7.2	4.8	3.2	27.4	53.4	493.0
2013	131.6	100.0	100.4	21.2	33.6	57.8	10.8	5.0	27.4	4.8	175.2	22.6	690.4
2014	6.8	136.6	119.2	76.4	10.6	21.0	42.6	58.2	33.8	21.2	16.2	157.4	700.0
2015	142.8	17.4	15.6	269.6	73.2	27.0	18.4	59.6	15.0	31.0	119.4	113.0	902.0
2016	218.2	9.6	13.6	11.0	20.2	113.6	47.2	35.2	75.8	46.4	50.2	112.6	753.6
2017	27.8	31.2	176.8	52.4	28.0	40.4	1.6	9.4	9.0	76.0	20.8	45.0	518.4
2018	13.8	76.6	83.2	16.0	10.0	45.6	2.8	30.4	25.6	57.8	91.8	81.0	534.6
2019	**66.4**	**31.6**	**153.2**	**9.4**	**19.4**	**20.6**	**9.0**	**29.8**	**40.2**	**1.6**	**22.0**	**0.0**	**403.2**
Average	*63.2*	*80.4*	*79.7*	*49.9*	*31.2*	*65.3*	*22.2*	*30.7*	*40.0*	*43.6*	*72.8*	*60.9*	*638.0*

Note: Results relevant to this reporting period are in **bold**.

6.3 NOISE

Environmental Management

Relevant noise impact assessment criteria, noise emission controls and compliance procedures are detailed in the Noise Management Plan for the ACP. The principal noise controls implemented at the ACP site during the reporting period included the maintenance of mobile plant, CHPP and ventilation fans, limiting hours of mobile noise generation (e.g. drilling), permanent noise mitigation controls at the CHPP and pit top facilities located below the natural surface level.

Environmental Performance

Noise monitoring for the ACP consists of the following.

- Continuous noise monitoring – one continuous real time monitoring station located within Camberwell Village (see **Figure 6.1**) which informs proactive management of noise generating activities at the site. Monitoring results are not used for regulatory purposes.
- Attended noise monitoring – monthly night-time monitoring conducted at three attended noise monitoring locations (see **Figure 6.1**).

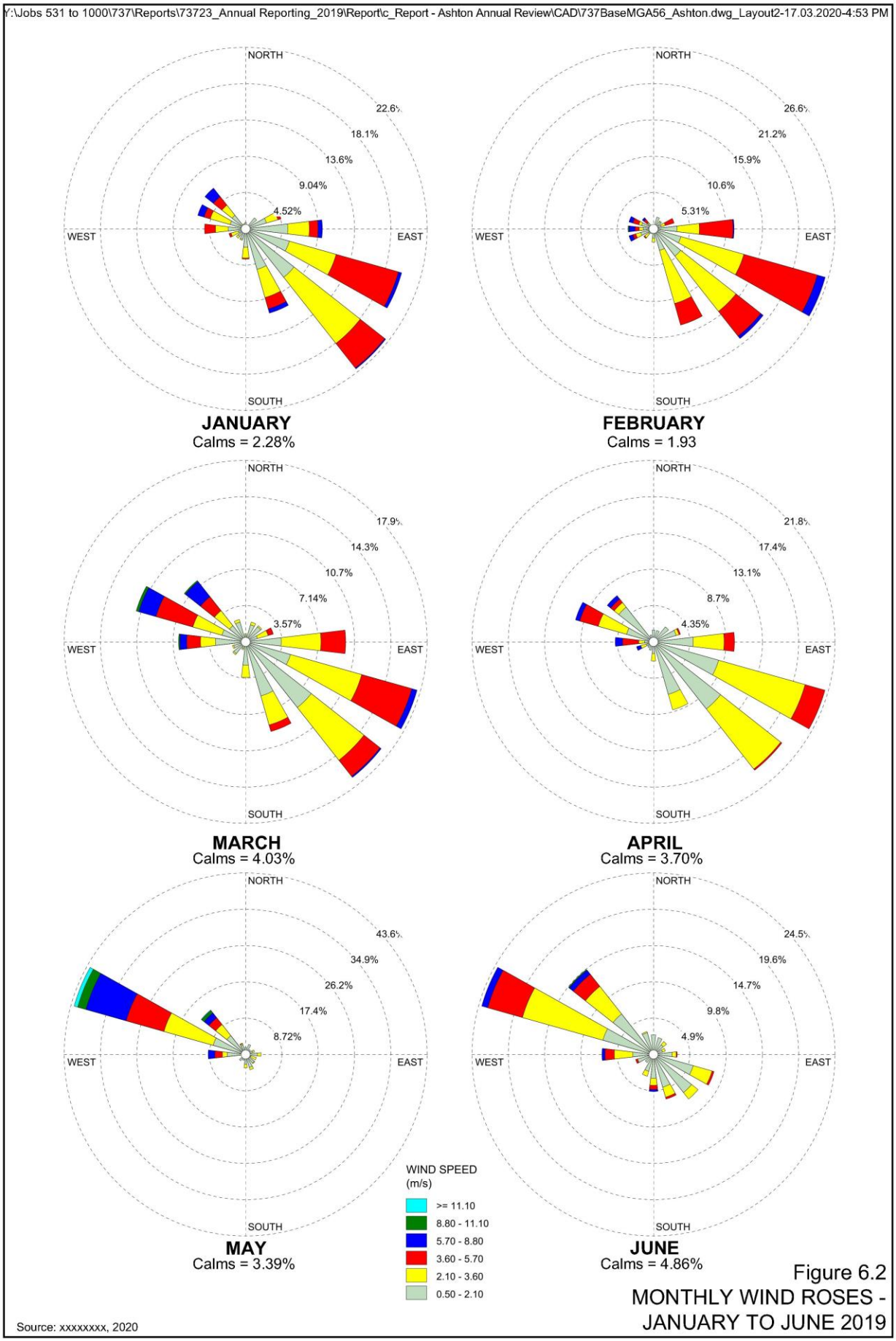


Figure 6.2
MONTHLY WIND ROSES -
JANUARY TO JUNE 2019

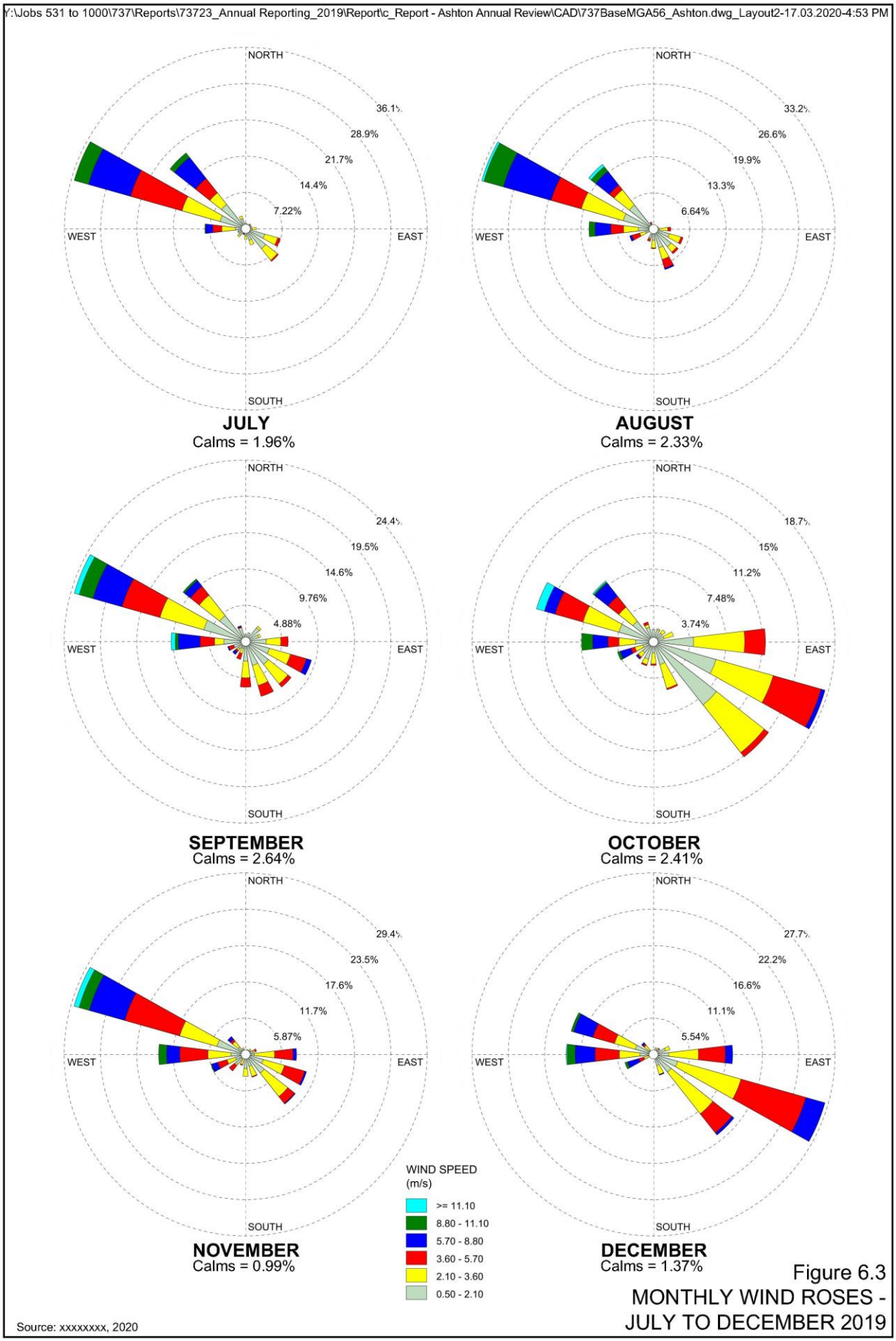


Figure 6.3
MONTHLY WIND ROSES -
JULY TO DECEMBER 2019

- Secondary attended noise monitoring – undertaken within 75 minutes of an attended noise monitoring measurement if results indicate that ACP-related noise exceeds the relevant noise criteria under standard weather conditions (i.e. wind speeds up to 3m/s at 10m above ground level and/or a temperature inversion of up to 3°C).

Monthly noise monitoring results for each of the three attended noise monitoring locations are presented in **Table 6.3** and copies of the attended noise monitoring reports for each month are presented within **Appendix 1**.

Table 6.3
Summary of Attended Noise Monitoring Results – 2019

Month	Criteria (dB)		Location			Exceedance
			N2 (dB)[1]	N3 (dB)[1]	N4 (dB)[1]	
January	LAeq(15 min)	36	IA	IA	IA	No
	LAeq(1 min)	46	IA	IA	IA	No
February	LAeq(15 min)	36	IA	IA	IA	No
	LAeq(1 min)	46	IA	IA	IA	No
March	LAeq(15 min)	36	IA	IA	IA[2]	No
	LAeq(1 min)	46	IA	IA	IA[2]	No
April	LAeq(15 min)	36	IA	IA	IA	No
	LAeq(1 min)	46	IA	IA	IA	No
May	LAeq(15 min)	36	IA	IA	IA	No
	LAeq(1 min)	46	IA	IA	IA	No
June	LAeq(15 min)	36	IA	IA	IA	No
	LAeq(1 min)	46	IA	IA	IA	No
July	LAeq(15 min)	36	≤36	≤36	<25[2]	No
	LAeq(1 min)	46	37	37	35[2]	No
August	LAeq(15 min)	36	IA[2]	IA[2]	IA[2]	No
	LAeq(1 min)	46	IA[2]	IA[2]	IA[2]	No
September	LAeq(15 min)	36	IA	IA	IA	No
	LAeq(1 min)	46	IA	IA	IA	No
October	LAeq(15 min)	36	IA[2]	IA	IA	No
	LAeq(1 min)	46	IA[2]	IA	IA	No
November	LAeq(15 min)	36[2]	35[2]	36[2]	29[2]	No
	LAeq(1 min)	46[2]	36[2]	42[2]	30[2]	No
December	LAeq(15 min)	36	≤36	≤35	≤23	No
	LAeq(1 min)	46	42	38	23	No

IA = Inaudible.

Note 1: Estimated or measured noise attributed to ACP.

Note 2: Criteria not applicable due to non-standard weather conditions (i.e. wind speeds over 3m/s at 10m above ground level and/or a temperature inversion greater than 3°C.

Source: EMM Consulting – 2019.

The results of attended noise monitoring during the reporting period indicate that ACP operations were inaudible at all three monitoring locations during nine of the twelve months, with measured noise levels attributable to non-ACP related road and rail traffic, wildlife, livestock and other mine operations. Operations at ACP were audible during July, November and December 2019, however, noise remained below the applicable criteria, including night-time sleep disturbance criteria ($LA_{eq(1\ min)}$).

When audible, the ACP operations were also determined to be compliant with cumulative noise criteria.

These results are consistent with noise monitoring results for previous years, with ACP operations remaining largely inaudible at the designated noise monitoring locations.

Reportable Incidents

No reportable incidents were recorded during the reporting period.

Further Improvements

Other than ongoing plant maintenance, monthly attended noise monitoring, and proactive management using continuous noise monitoring data, no additional management measures are planned during the next reporting period.

6.4 BLASTING

No surface blasts were undertaken during the reporting period.

6.5 AIR QUALITY

Environmental Management

Relevant air quality impact assessment criteria, air quality management measures and compliance procedures are detailed in the Air Quality and Greenhouse Gas Management Plan (AQGGMP) for the ACP. The principal air quality management measures applicable to the reporting period included:

- large earth berms and tree screens between the operations and the village (previously constructed and trees established);
- clear delineation and maintenance of roads and use of water carts to keep trafficked areas in a damp condition;
- keeping stockpiles damp by the use of fixed or mobile water sprays under dry and windy conditions; and
- proper maintenance of all diesel equipment used on site and fitting equipment with appropriate pollution control devices.

Greenhouse gas management during the reporting period included the flaring of gas from gas drainage bores, where feasible, to reduce greenhouse gas emissions. Additionally, energy efficient equipment is specified for all new or upgraded fixed and mobile plant as required.

Environmental Performance

Air quality monitoring at the ACP site consists of the following.

- Depositional dust monitoring – one sample collected every 30 days (± 2 days) from one depositional dust gauge (see **Figure 6.1**).
- Particulate matter 10 micrometres or less (PM_{10}) – three real-time tapered element oscillating microbalance (TEOM), Sites 2, 9 and 10 (see **Figure 6.1**). One additional TEOM sampler (Site 7) is used for operational management purposes and is not reflective of impacts on sensitive receivers.

It is noted that a previous variation to DA 309-11-2001-i and associated update of the AQGGMP in 2016 provided for Site 10 to replace Site 2. Site 10 was installed in 2017. Following a variation to EPL 11879 during the reporting period to remove the requirement to monitor at Site 2 (EPL Point 12), monitoring at Site 2 subsequently ceased on 31 August 2019. The results of air quality monitoring are provided as follows.

Deposited Dust

Deposited dust monitoring results for Sampling Point D6 during the reporting period are presented in **Table 6.4** with long-term data presented in **Figure 6.4**.

Table 6.4
Deposited Dust Monitoring Results – Sampling Point D6 – 2019

Month	Sampling Period		Dust Deposition Rate (g/m^2/month)			Comments
	Start Date	End Date	Insoluble	Rolling Annual Average	Ash	
January	1/01/2019	31/01/2019	2.5	3.1	1.4	-
February	1/02/2019	28/02/2019	5.4	3.2	2.9	-
March	1/03/2019	31/03/2019	3.5	3.3	2.2	-
April	1/04/2019	30/04/2019	2.3	3.2	1.4	-
May	1/05/2019	31/05/2019	3.1	3.1	2.2	-
June	1/06/2019	30/06/2019	7.4*	3.1	2.0	Contaminated – bird droppings, turbid/grey.
July	1/07/2019	31/07/2019	2.8	3.1	1.9	-
August	1/08/2019	31/08/2019	6.3*	3.1	3.2	Contaminated – bird droppings, turbid/grey.
September	1/09/2019	30/09/2019	2.8	3.0	1.9	-
October	1/10/2019	31/10/2019	2.6	3.0	1.9	-
November	1/11/2019	30/11/2019	4.7	3.2	3.3	-
December	1/12/2019	31/12/2019	4.3	3.4	3.0	-
Minimum			**2.3**	**3.0**	**1.4**	**-**
Maximum			**7.4**	**3.4**	**3.3**	**-**
* Contaminated sample determined by an independent monitoring contractor or a NATA accredited laboratory and not included in average.						
Source: Ashton Coal Operations Pty Limited						

The highest insoluble solids measurements recorded during the reporting period were $7.4g/m^2$/month in June 2019 and $6.3g/m^2$/month in August 2019. Comments recorded during sample collection indicate that both of these samples were contaminated with bird droppings. The corresponding ash contents were more consistent with other months and confirm that a substantial portion of the insoluble solids was organic matter.

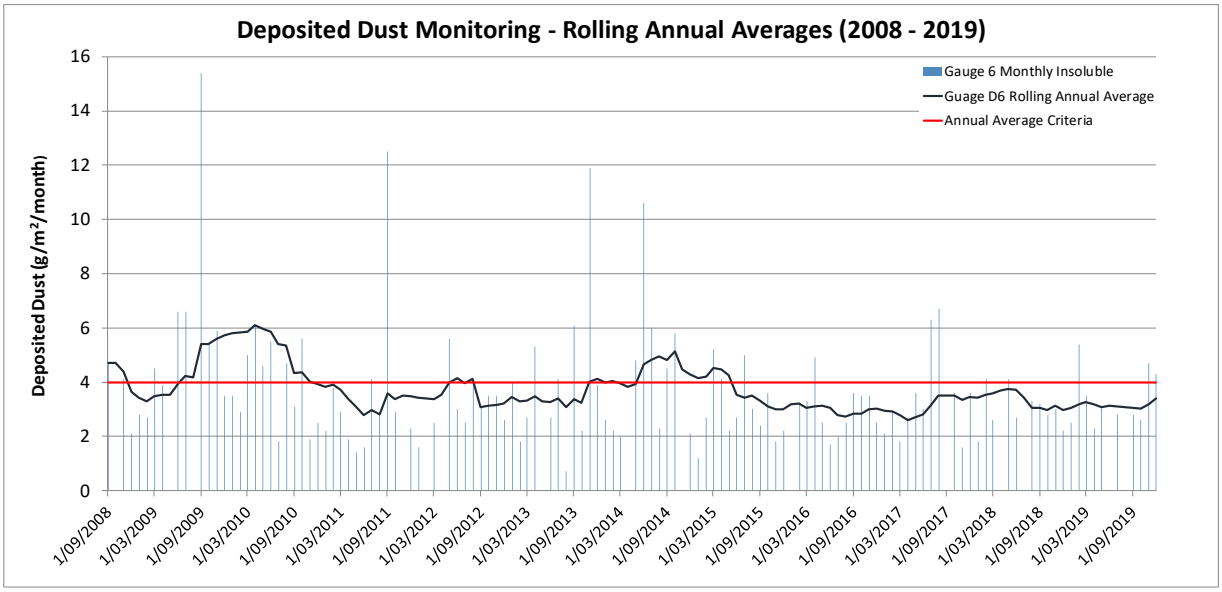


Figure 6.4 Deposited Monitoring Results

The rolling annual average deposited dust levels recorded throughout the reporting period remained below the criteria of 4g/m^2/month, indicating good air quality with respect to dust deposition.

Long term deposited dust monitoring results indicate that the rolling annual average has remained below criteria since 2015 following two significant exceedances due to regional dust storms.

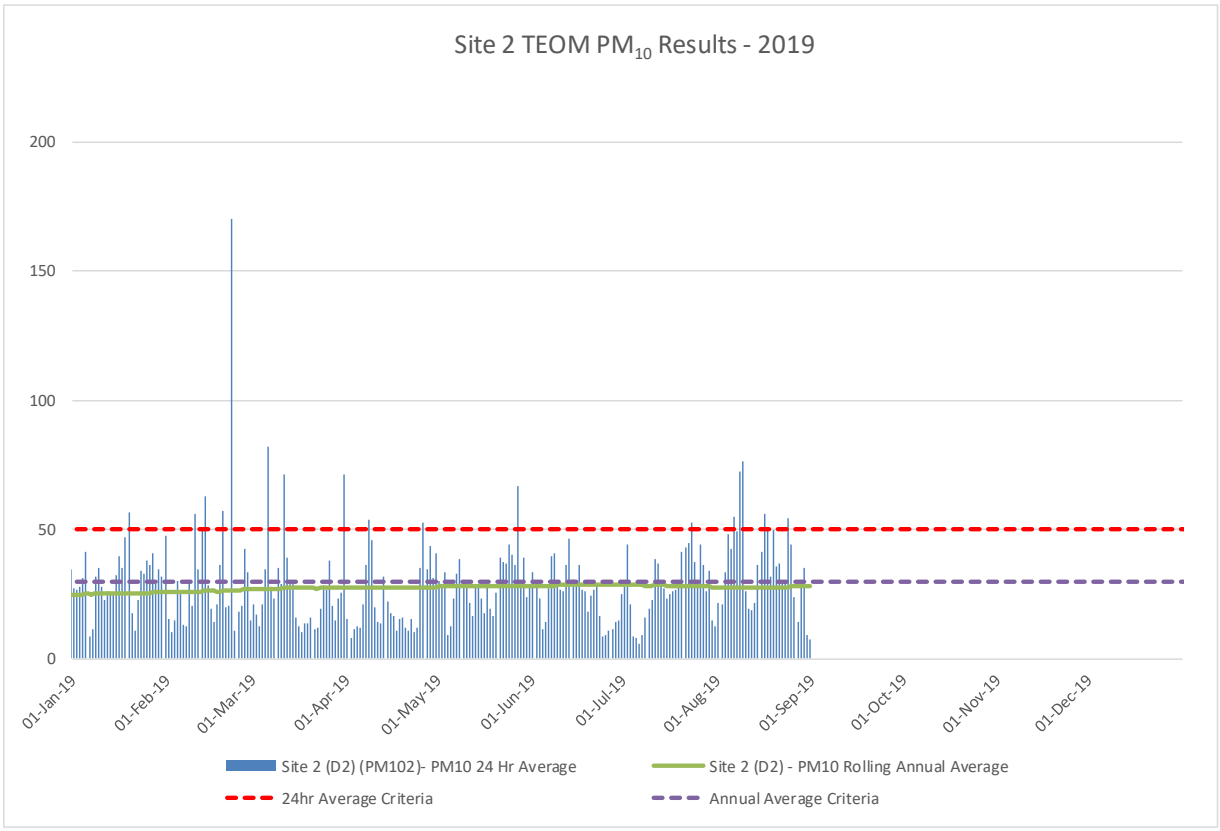
Suspended Particulates – PM_{10} and TSP

Figure 6.5 and **6.6** and **Table 6.5** present the PM_{10} data for the reporting period whilst **Figures 6.7** and **6.8** present the long-term monitoring data. The highest recorded 24-hour average PM_{10} concentration during the reporting period ranged between 157.5µg/m^3 and 314.2µg/m^3, with the highest value measured on 26 November 2019 at monitoring Site 7. All monitoring locations recorded maximum suspended particulate concentrations above the 50µg/m^3 24-hour incremental development consent criteria, particularly throughout October to December 2019. These elevated concentrations are consistent with similarly elevated PM_{10} levels recorded at the Upper Hunter Air Quality Monitoring Network (UHAQMN) station at Camberwell at this time due to the extended drought and bushfires.

Table 6.5
Summary of PM_{10} Monitoring Results – 2019

Monitoring Site	Minimum 24-hr µg/m^3	Maximum 24-hr µg/m^3	Short-Term Criteria µg/m^3	Annual Average 2019 µg/m^3	Annual Average Criteria µg/m^3
Site 7	6.0	314.2	50	34.6	30
Site 9	5.5	216.8		42.0	
Site 10	4.9	157.5		34.9	
Site 2	5.6	170.2		29.0	
UHAQMN	6.2	294.4		39.9	

Source: Ashton Coal Operations Pty Limited * Provided as reference



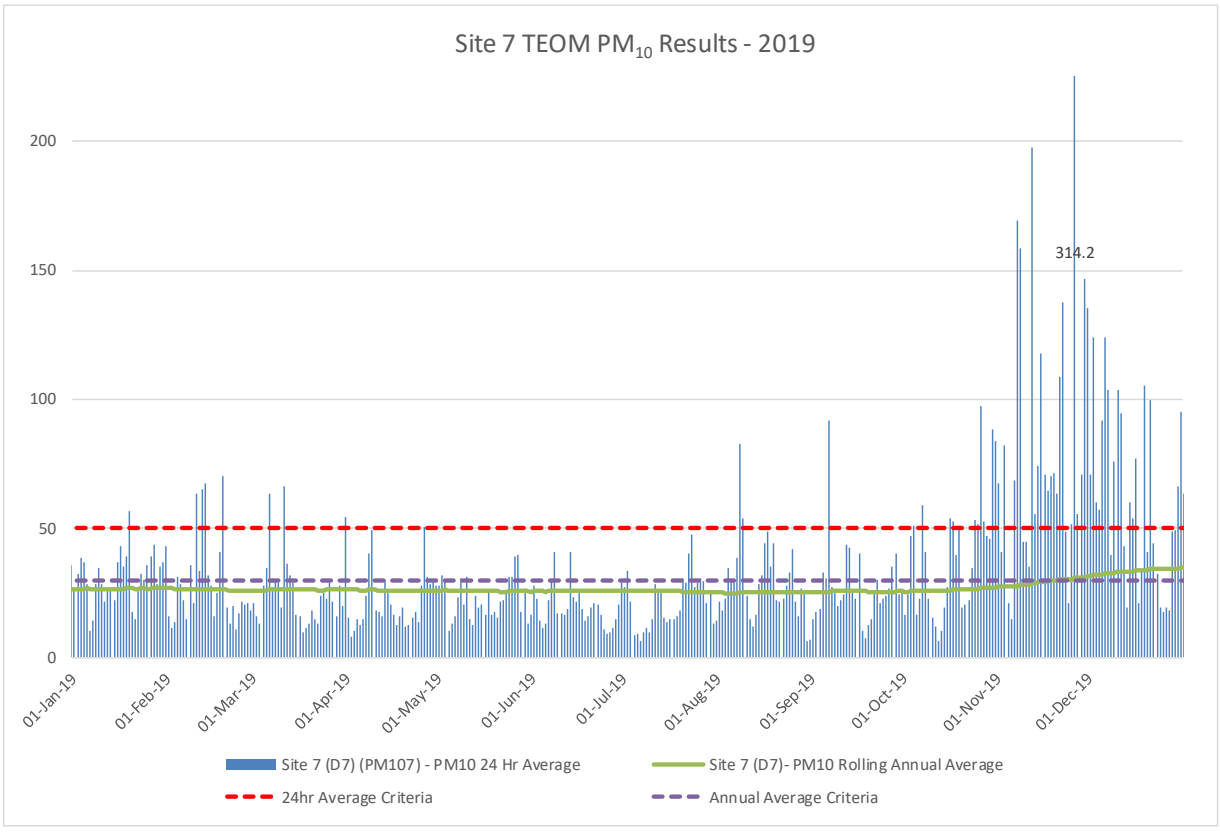
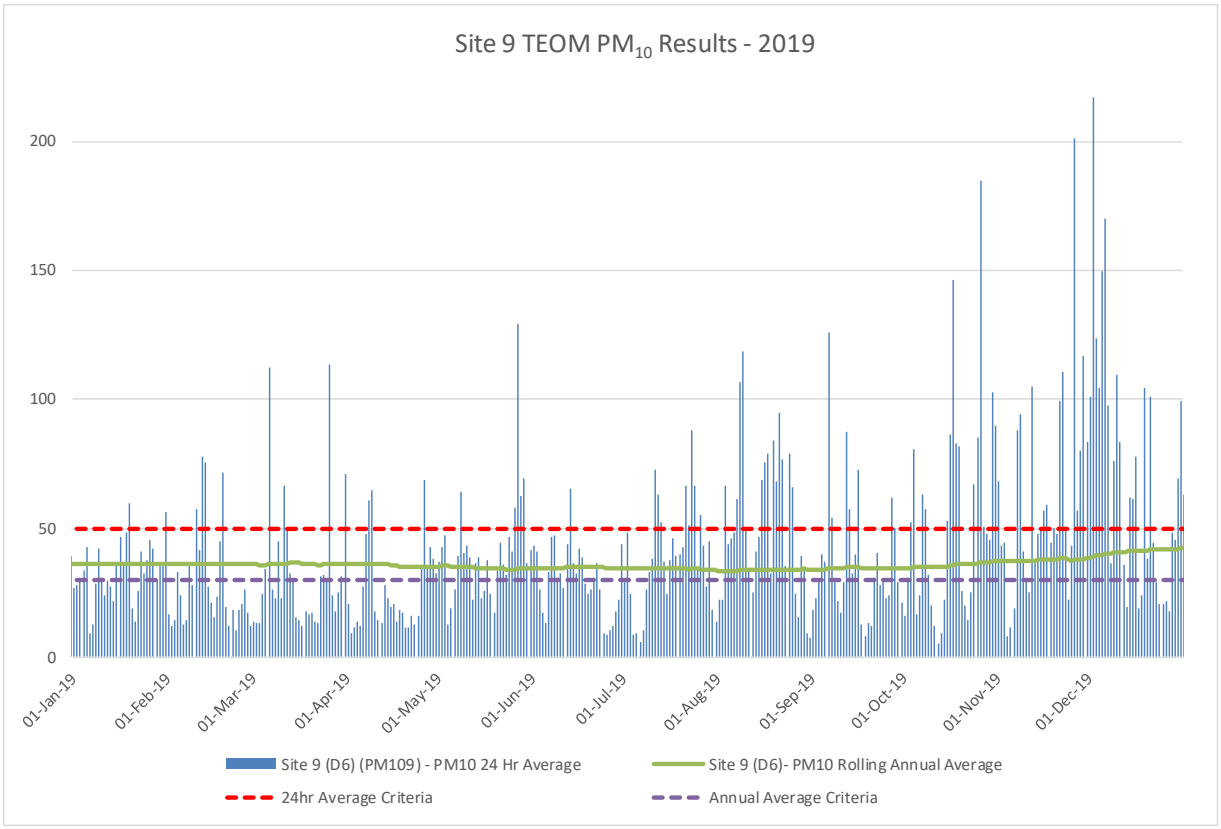


Figure 6.5 PM_{10} Monitoring Results - 2019



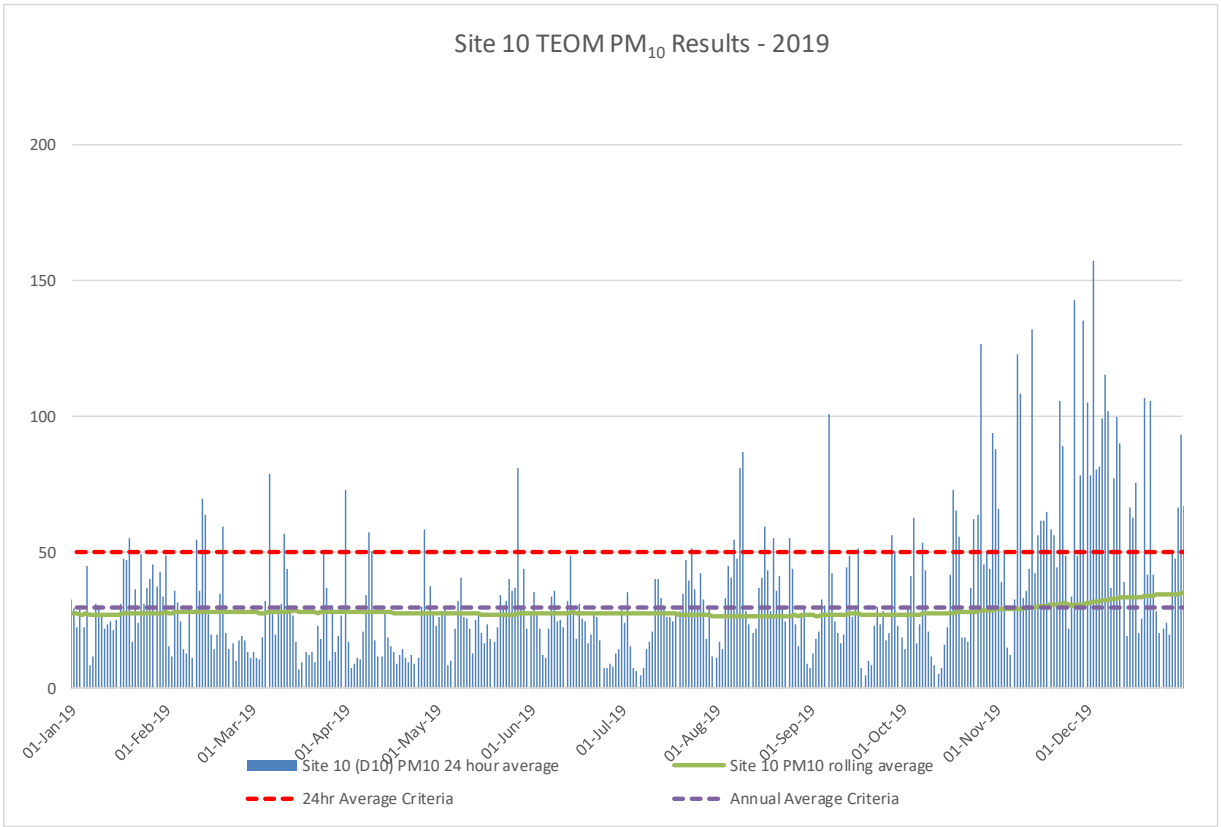
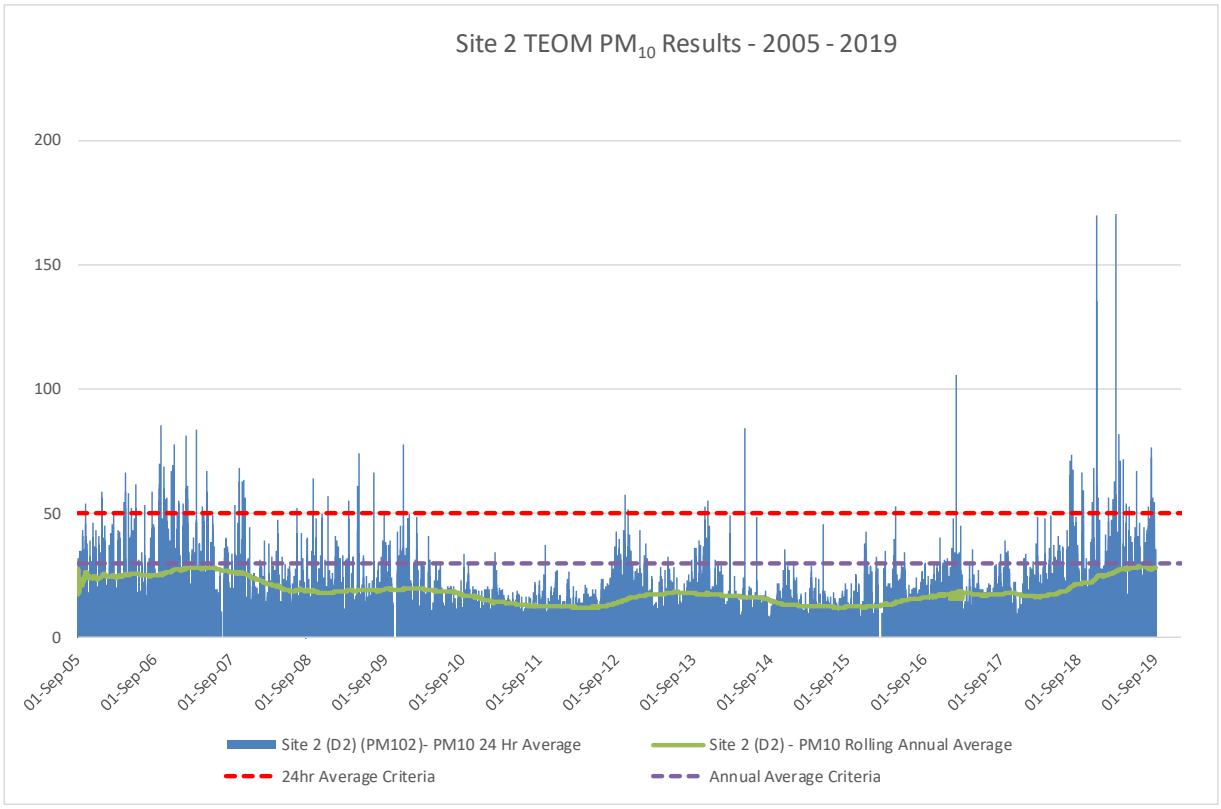


Figure 6.6 PM_{10} Monitoring Results - 2019



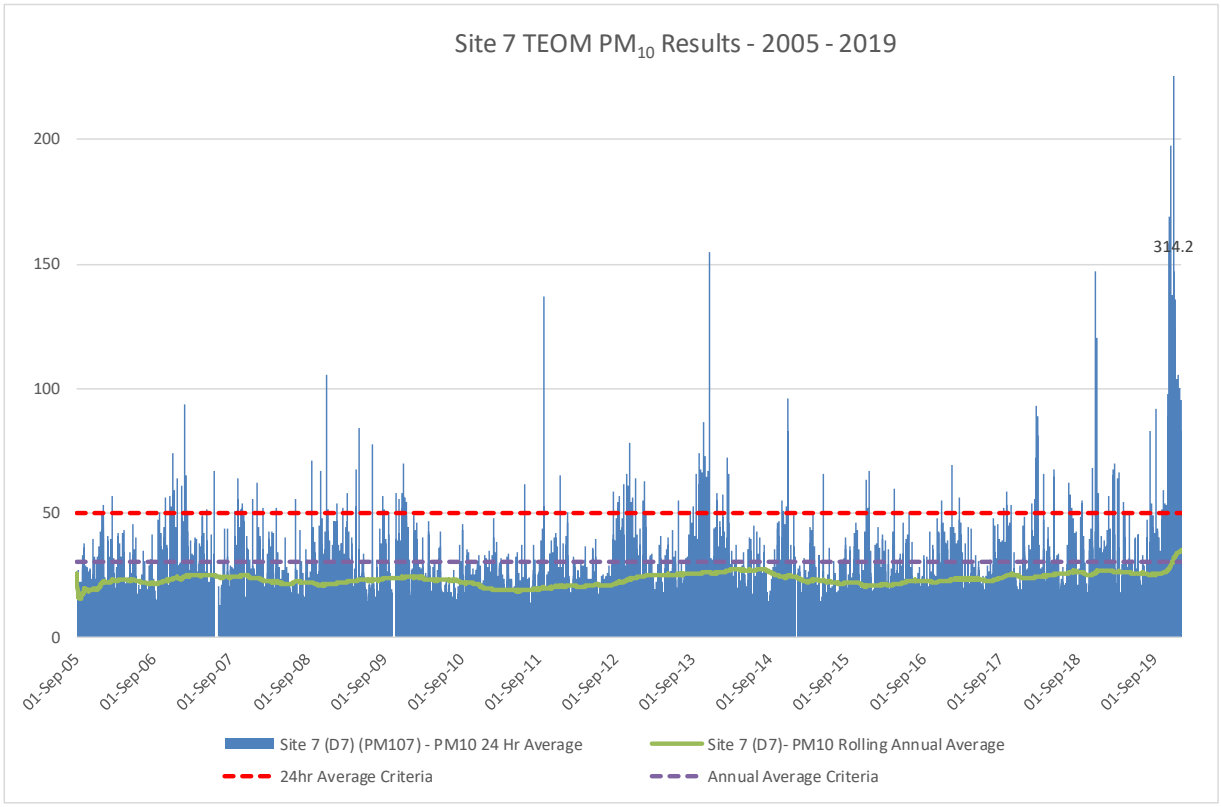
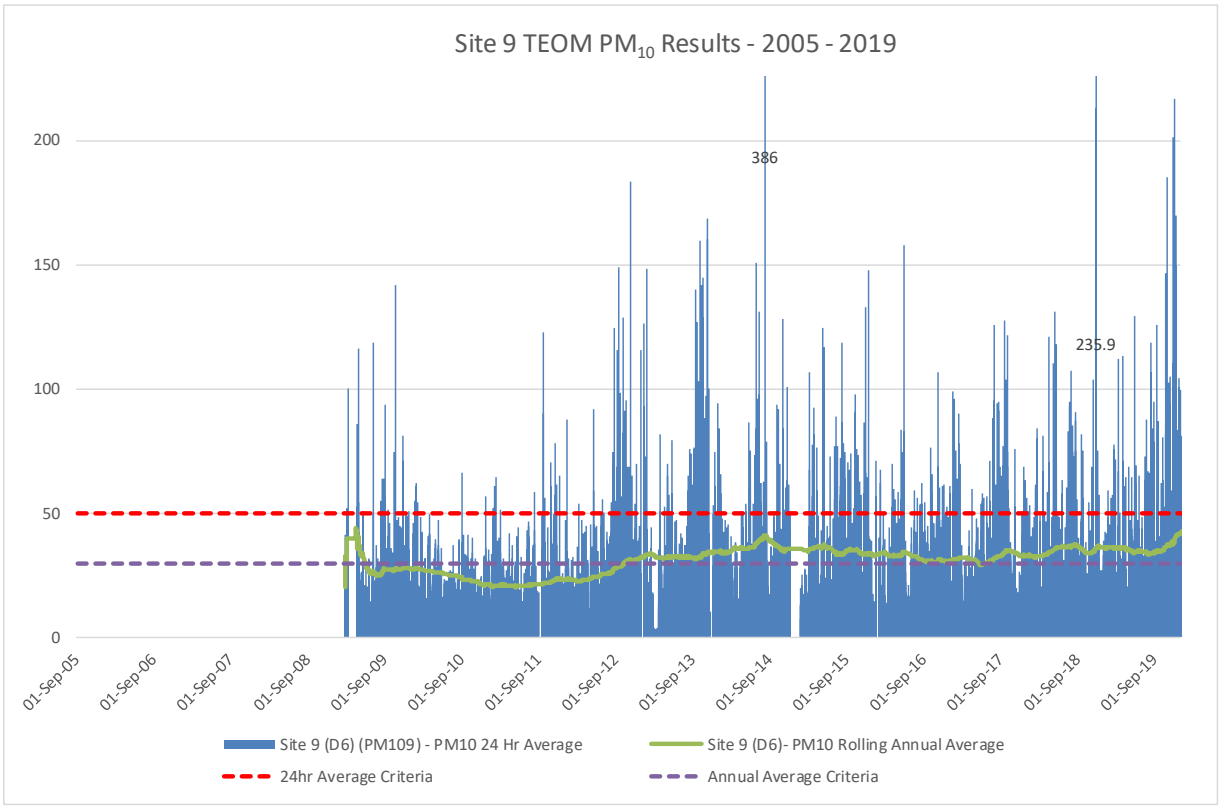


Figure 6.7 Long Term PM_{10} Monitoring Results – 2005 - 2019



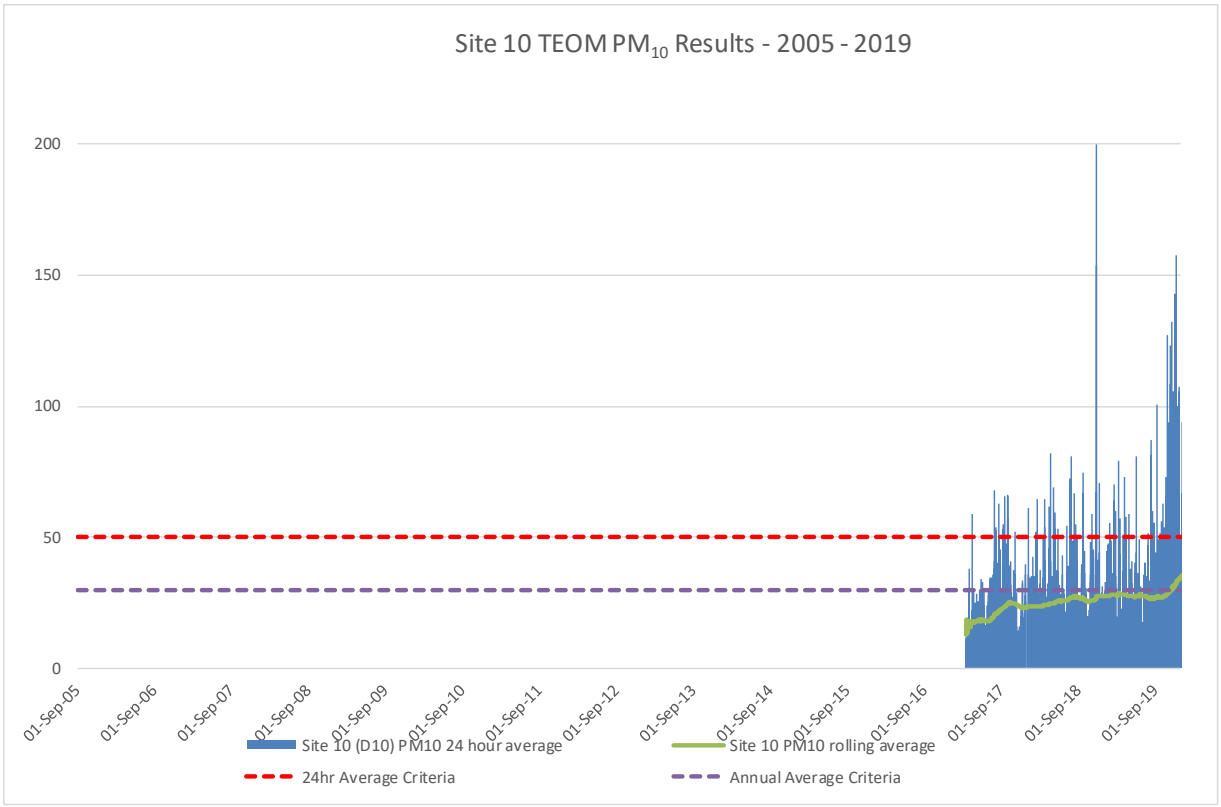


Figure 6.8 Long Term PM_{10} Monitoring Results – 2005 - 2019

All PM_{10} results above 50µg/m^3 at ACP boundary monitors were investigated throughout the year including a review of wind direction data and "upstream / downstream" monitoring points, as well as assessing regional air quality trends and localised influences or events at the time. All exceedances and the contributions that may be attributable to Ashton Coal operations are shown in **Table 6.6**.

Table 6.6
24-hour PM_{10} Exceedance Investigation Outcomes – 2019

Date	Site 2 PM_{10} Result	Site 9 PM_{10} Result	Site 10 PM_{10} Result	Potential ACP Contribution	Comments
19/1/19	56.4	59.4	55.2	1.5	
22/1/19	22.9	25.8	70.0	1.3	Due to single elevated measurement at 4am at D10
31/1/19	47.5	56.1	48.8	5.9	
10/2/19	55.9	57.2	54.7	9.0	
12/2/19	50.8	77.7	69.9	4.9	
13/2/19	62.9	75.5	63.7	3.9	
19/2/19	57.3	71.6	59.7	10.3	
22/2/19	170.2	18.1	16.6	3.3	Demolition dust from adjacent house
06/3/19	82.0	112.1	79.0	18.0	
11/3/19	71.4	66.7	57.1	9.6	
12/3/19	39.4	50.2	43.8	7.7	
24/3/19	28.2	31.8	50.7	24.1	
26/3/19	38.1	113.3	9.9	2.2	
31/3/19	71.5	70.8	72.8	18.5	
8/4/19	54.1	60.8	57.7	17.4	
9/4/19	46.1	64.6	50.2	14.4	
26/4/19	52.7	68.9	58.6	10.3	
13/6/19	46.4	65.1	49.0	8.0	
11/7/19	38.5	72.6	40.5	10.3	
12/7/19	37.1	63.1	40.3	11.5	
13/7/19	29.6	52.4	33.4	8.1	
21/7/19	43.1	66.4	47.2	19.2	
22/7/19	44.7	51.0	39.6	11.4	
23/7/19	53.0	87.8	51.5	3.4	
24/7/19	37.7	66.7	36.3	5.0	
26/7/19	44.0	55.2	42.6	11.8	
3/8/19		66.2	33.3	8.7	D2 decommissioned
6/8/19		48.1	54.5	24.5	
7/8/19		61.1	47.7	13.4	
8/8/19		106.9	81.2	18.5	
9/8/19		118.8	86.9	29.0	
15/8/19		68.6	40.7	7.5	
16/8/19		75.5	59.7	15.8	
17/8/19		79.1	43.7	14.3	
19/8/19		84.0	55.5	10.4	
20/8/19		68.4	36.2	15.1	
21/8/19		94.8	41.3	18.9	
22/8/19		76.7	29.8	5.2	
24/8/19		78.8	55.5	22.7	

Table 6.6 (Cont'd)
24-hour PM_{10} Exceedance Investigation Outcomes – 2019

Date	Site 2 PM_{10} Result	Site 9 PM_{10} Result	Site 10 PM_{10} Result	Potential ACP Contribution	Comments
25/8/19		66.1	44.1	2.1	
6/9/19		126.0	100.8	6.3	
7/9/19		54.2	42.2	12.0	
12/9/19		87.3	44.5	7.6	
13/9/19		57.6	49.1	8.5	
16/9/19		71.5	51.5	20.98	
27/9/19		62.0	56.1	21.2	
28/9/19		49.9	50.2	10.2	
3/10/19		52.5	41.5	11.0	
4/10/19		80.7	62.9	17.8	
7/10/19		63.3	53.8	9.5	
8/10/19		57.2	43.2	14	
15/10/19		52.8	22.4	3.4	
16/10/19		86.2	41.7	3.7	
17/10/19		146.4	73.2	51.8	Investigation indicated <50 ug/m^3 at nearest residence
18/10/19		82.8	65.7	21.5	
19/10/19		81.6	55.9	16.1	
24/10/19		66.8	62.4	9.2	
25/10/19		85.1	63.8	21.3	
26/10/19		184.9	126.9	32.2	
27/10/19		50.7	45.8	4.9	
28/10/19		48	50.7	3.6	
30/10/19		102.6	93.8	8.8	
31/10/19		89.5	88.0	4.3	
1/11/2019		67.2	66.3	0.0	
3/11/2019		82.0	51.2	8.2	
6/11/2019		68.6	32.9	10.9	
7/11/2019		169.1	122.9	10.9	
8/11/2019		158.3	108.7	12.0	
12/11/2019		197.7	132.4	9.9	
13/11/2019		55.3	42.2	13.1	
14/11/2019		74.3	56.6	1.9	
15/11/2019		117.6	62	7.3	
16/11/2019		70.7	61.7	0.0	
17/11/2019		64.6	64.7	2.6	
18/11/2019		70.1	58.3	1.2	
19/11/2019		71.2	56.6	4.2	
20/11/2019		63.6	44.3	19.3	
21/11/2019		108.6	105.7	2.8	
22/11/2019		137.7	89.2	2.2	
25/11/2019		51.8	33.6	18.2	
26/11/2019		314.2	142.7	37.2	Regional dust day
27/11/2019		55.4	48.6	8.1	
28/11/2019		70.8	78.6	0.0	
29/11/2019		146.9	135.2	5.5	

Table 6.6 (Cont'd)
24-hour PM_{10} Exceedance Investigation Outcomes – 2019

Date	Site 2 PM_{10} Result	Site 9 PM_{10} Result	Site 10 PM_{10} Result	Potential ACP Contribution	Comments
30/11/2019		135.5	105.3	17.3	
1/12/2019		100.8	78.4	1.7	
2/12/2019		216.8	157.5	49.8	
3/12/2019		123.5	80.5	13.2	
4/12/2019		104.2	81.4	13.9	
5/12/2019		149.7	99.3	30.6	
6/12/2019		169.8	115.6	28.8	
7/12/2019		97.3	101.8	0.0	
9/12/2019		76.0	77.4	0.0	
10/12/2019		109.6	100.1	3.4	
11/12/2019		83.6	90.0	0.0	
14/12/2019		62.1	66.8	1.4	
15/12/2019		61.4	62.6	8.1	
16/12/2019		77.8	75.6	1.0	
19/12/2019		104.3	107.1	15.6	
21/12/2019		101.0	105.8	1.8	
30/12/2019		69.4	66.6	1.8	
31/12/2019		99.5	93.7	12.6	
Source: Ashton Coal Operations Pty Limited					

There were no days when the ACP calculated contribution at nearby privately-owned residences exceeded the 50µg/m^3 24-hour incremental PM_{10} criteria. An initial notification was made to DPIE following an elevated PM_{10} result at Site 9 on 17 October 2019. This event was investigated in accordance with the AQGGMP and it was determined that there was no exceedance of the 50µg/m^3 24-hour incremental criteria as a result of ACP activities at any residence on privately-owned land or on more than 25% privately-owned land. DPIE reviewed the investigation report and confirmed with ACP on 7 November 2019 that no further action would be taken.

The annual average PM_{10} concentrations for each monitoring location ranged between 29µg/m^3 and 42µg/m^3 during the reporting period. The rolling annual average for PM_{10} concentrations exceeded the annual average criteria value of 30µg/m^3 from late November 2019 and throughout December 2019 at monitoring Sites 7 and 10, coinciding with the period of regionally elevated particulates resulting from bushfires. Bushfires and dust storms are defined by the development consent as extraordinary events and are excluded from the criteria and therefore are not classified as an exceedance. Prior to these events, the rolling annual average PM_{10} remained in compliance. The rolling annual average PM_{10} concentration at Site 9 continued to exceed the annual average criteria value of 30µg/m^3 throughout the reporting period, consistent with the trend since 2013.

Notably, the annual average PM_{10} during the reporting period for all ACP monitoring sites was consistent with or lower than that recorded at the UHAQMP site at Camberwell, which recorded an annual average PM_{10} of 39.9µg/m^3.

As TSP is proportionally calculated from the annual average PM_{10} result at Site 10, all exceedances of the annual PM_{10} criteria equate to an exceedance of the annual TSP criteria of $90\mu g/m^3$ and would have similar proportional contributions from the ACP operations.

Greenhouse Gas

Greenhouse gas emissions associated with the ACP were reported on behalf of ACOL by Yancoal Australia Limited under the National Greenhouse and Energy Reporting Scheme (NGER) for the 2018-2019 reporting period. Scope 1 greenhouse gas emissions include both direct greenhouse gas production as a result of ACP operations as well as fugitive emissions associated with underground mine ventilation, gas drainage, gas flaring and post-mining gas. Scope 2 emissions include indirect greenhouse gas emissions primarily associated with emissions generated during the production of electricity used on site.

Table 6.7 presents an overview of ACP Scope 1 and Scope 2 greenhouse gas emissions for the reporting period and the previous five reporting periods. In summary, scope 1 emissions associated with the ACP totalled 216,181tCO_{2-e} (tonnes CO_2 equivalent) compared to 259,148tCO_{2-e} for the previous 2017-2018 reporting period, representing a decrease of approximately 16.6%. Scope 2 emissions associated with the ACP during the 2018-2019 reporting period totalled 35,738tCO_{2-e} compared to 35,506tCO_{2-e} during the previous 2017-2018 reporting period, representing an increase of approximately 0.7%.

Table 6.7
ACP Greenhouse Gas Emissions – 2016/2017 to 2018/2019

Greenhouse Gas Emission Type	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019
Scope 1 (tCO_{2-e})	399 611	299 810	389 794	339 443	259 148	216 181
Scope 2 (tCO_{2-e})	36 383	37 443	340 048	43 076	35 506	35 738
Total (tCO_{2-e})	435 994	337 253	423 842	382 519	294 654	251 919

Source: Yancoal Australia Limited – National Greenhouse and Energy Reporting Scheme Results 2016/2017, 2017/2018 & 2018/2019.

Significant variability in year to year ACP greenhouse gas emissions are primarily a reflection of changes in gas management methods as well as differences in gas levels between longwalls and seams mined during each reporting period. Notwithstanding, the installation of the gas drainage and flaring facility in February 2014 resulted in a substantial reduction in emissions.

Reportable Incidents

Whilst an elevated 24-hour average PM_{10} result was initially reported to DPIE, subsequent investigation indicated that PM_{10} levels were below development consent limits at the nearest privately owned residence. Therefore, no reportable incidents relating to air pollution occurred during the reporting period.

Further Improvements

Whilst elevated suspended particulates were recorded during the reporting period due to extended drought conditions and bushfires, evaluation of 24-hour average exceedances indicates that the calculated contribution from activities at ACP remained within the approved criteria. As the controls and management measures in place are considered effective, these will

continue to be applied during the next reporting period. However, as identified during the 2019 Independent Environmental Audit, a further improvement will be implemented during the next reporting period, namely use of an automated alarm that notifies ACOL staff and contracted environmental monitoring database managers upon nonreceipt of monitoring data. This will assist in a more rapid response to equipment failure. The use of this system will be incorporated into the 2020 review of the AQGGMP.

6.6 BIODIVERSITY

Environmental Management

Biodiversity at the ACP site is managed under the Ashton Coal Flora and Fauna (Biodiversity) Management Plan (FFMP) and the Southern Woodland Conservation Area (SWCA). Management measures include establishment of the SWCA, targeted rehabilitation to improve habitat linkages across the landscape, placement of nesting boxes, stock exclusion from selected areas, weed and feral pest control and ongoing monitoring.

Environmental Performance

Multiple terrestrial and aquatic flora and fauna monitoring programs are completed each year to determine the condition of ecological communities and habitats, and compare these findings against relevant management plan performance indicators and closure objectives.

The monitoring programs include terrestrial and aquatic monitoring, weed and vertebrate pest monitoring and associated management measures where required. The monitoring program covers important biodiversity areas including the Bowmans Creek riparian corridor, the River Red Gum communities and the SWCA. It complements the rehabilitation monitoring of Bowmans Creek Diversion and North East Open Cut (NEOC), and the mining impacted "Farmland" over the underground mine, which is discussed further in Section 8. The following provides a summary of the key outcomes of the monitoring undertaken during the reporting period.

It is noted that, where relevant, monitoring has been compared to updated completion / performance criteria developed during the reporting period. These updated completion / performance criteria are to be included in an amended MOP to be submitted during the next reporting period.

Flora and Fauna Monitoring

Bi-annual fauna monitoring was undertaken during the reporting period by Umwelt Environmental and Social Consultants in June 2019 and November 2019. Fauna monitoring at the ACP site has been undertaken within the Southern Woodlands Conservation Area (SWCA) since 2005 and was expanded in 2010 to include the northern woodland and SEOC areas. The program was again expanded in 2018 to include monitoring of rehabilitated areas within the NEOC and Bowmans Creek Diversion. The study areas for bi-annual fauna monitoring include ten survey transect sites, including four sites consisting of remnant vegetation ('control' sites), four sites located over previously undermined areas ('impact' sites) and two sites within rehabilitated areas.

A total of 126 fauna species were recorded as a result of the bi-annual fauna monitoring program, including 26 mammals, 87 birds, five amphibians and eight reptiles. The following nine threatened species were recorded during the fauna monitoring surveys.

- Grey-crowned babbler (*Pomatostomus temporalis temporalis*).
- Speckled warbler (*Pyrrholaemus sagittatus*).
- Little lorikeet (*Glossopsitta pusilla*).
- White-bellied sea-eagle (*Haliaeetus leucogaster*).
- Brush-tailed phascogale (*Phascogale tapoatafa*).
- Grey-headed flying-fox (*Pteropus poliocephalus*).
- Little bentwinged-bat (*Miniopterus australis*).
- Large-eared pied bad (*Chalinolobus dwyeri*).

All nine species are listed as vulnerable under the NSW *Biodiversity Conservation Act 2016* and the grey-headed flying-fox (*Pteropus poliocephalus*) is also listed as vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. With the exception of the little lorikeet (*Glossopsitta pusilla*), all of the above threatened species have previously been recorded at the ACP site with a total of 26 threatened species having been recorded since monitoring commenced in 2006.

The following seven introduced species were recorded during the fauna monitoring surveys.

- European rabbit (*Oryctolagus cuniculus*).
- Brown hare (*Lepus capensis*).
- Red fox (*Vulpes vulpes*).
- Black rat (*Rattus rattus*).
- House mouse (*Mus Musculus*).
- Common myna (*Sturnus tristis*).
- Spotted turtle-dove (*Streptopelia chinensis*).

Analysis of the fauna monitoring results indicated that species diversity was similar between the control (90 species) and impact (84 species) monitoring sites. Comparisons among species groups indicated a slight decrease in species diversity for both mammals and birds as well as more pronounced decreases for both reptiles and amphibians compared to previous monitoring results (see **Figure 6.9**). These declines were consistent across both control and impact monitoring sites and are most likely explained by the drought conditions occurring with three consecutive years of below average rainfall and above average temperatures.

Nest box inspections indicated that 37 of the 39 nest boxes installed in the SWCA remain in a condition sufficient to support roosting and nesting of arboreal species. A total of 31 nest boxes were replaced during the previous reporting period, with multiple designs utilised to support use by gliders, phascogales and microbats. Common brushtail possums (Trichosurus vulpecula) were the only species found to be using the next boxes during the fauna surveys.

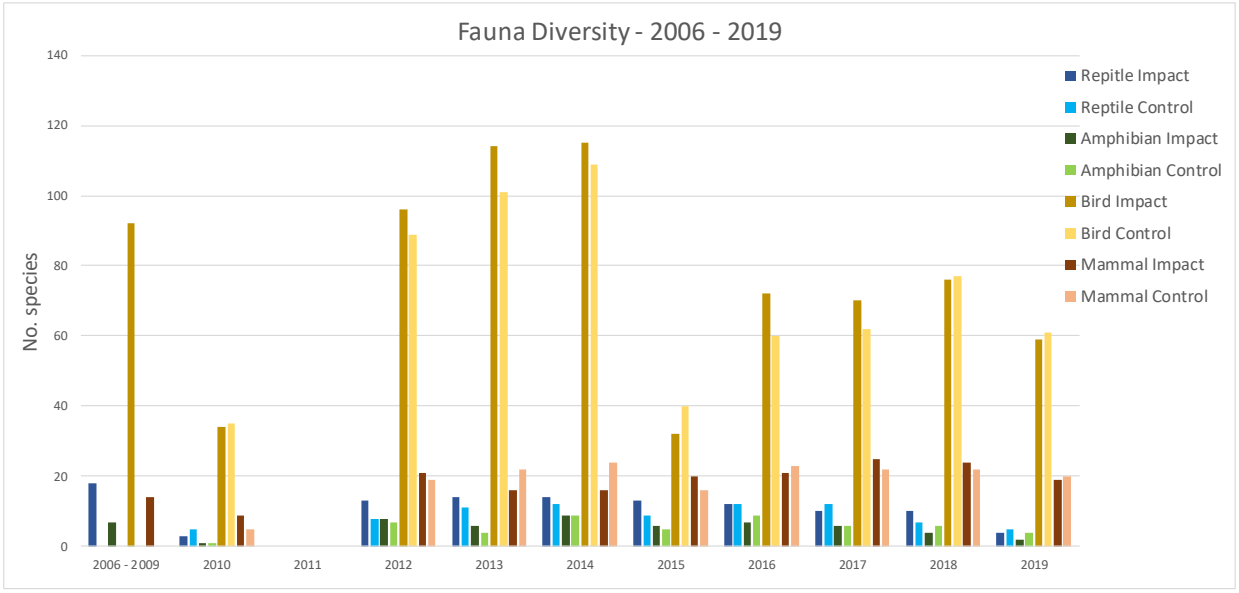


Figure 6.9 Fauna Diversity 2006 - 2019

The results of the bi-annual fauna monitoring program indicate that threatened fauna species and their habitats have not been adversely impacted by mining activities. Furthermore, the results of the fauna monitoring program indicate compliance with the relevant performance criteria outlined in the FFMP and no further actions are required to address FFMP compliance.

Aquatic Ecology – Bowmans Creek and Glennies Creek

Biannual monitoring of aquatic ecology was undertaken by Marine Pollution Research Pty Ltd in autumn (28 to 30 May 2019) and spring (5 to 6 December 2019).

Monitoring during this reporting period builds on both the results of initial surveys conducted in 2001 to support the original development application as well as the results of biannual monitoring undertaken since 2006. These results also include the seventh year of monitoring for the Bowmans Creek Diversion which was completed in 2012.

Monitoring locations currently include 18 sites within Bowmans Creek, one within each of the two Bowmans Creek Diversion channels and two within Glennies Creek. A further two monitoring sites will be added to the Bowmans Creek Diversion channels and Glennies Creek locations following the proposed increase in block bank height and the commencement of the SEOC construction respectively.

Habitat Condition

As a consequence of regional drought conditions and generally low rainfall recorded at the ACP site, sampling during the reporting period was only possible in isolated refuge pools separated by lengths of dry channel. Aquatic habitat conditions for each monitoring site, measured using the Riparian Channel Environment habitat scoring system (RCE index), are presented in **Table 6.8**.

Table 6.8
Monitoring Site RCE Index Score – 2014 to 2019

Year	Period	Site RCE Index Score (% Condition)[1]												
		BCUp	BC1	BCLW6B[2]	BCED1[3]	BC3	BC4.5	BCLW7A[2]	BCWD2[3]	BC6	BC6.5	BCDown	GCUp	GCMid
2014	Autumn	78.8	77.9	72.1	74.0	78.8	-	72.1	76.9	76.9		76.0	73.1	73.1
	Spring	78.8	77.9	73.1	75.0	76.9	-	71.2	76.9	75.0		74.0	73.1	73.1
2015	Autumn	78.8	76.9	71.2	78.8	77.9	-	76.0	79.8	74.0		73.1	74.0	73.1
	Spring	77.9	75.0	69.2	75.0	77.9	-	73.1	76.9	74.0		71.2	74.0	74.0
2016	Autumn	77.9	75.0	69.2	75.0	77.9	-	73.1	76.9	74.0		71.2	74.0	74.0
	Spring	77.9	75.0	69.2	75.0	77.9	-	73.1	76.9	74.0		70.2	74.0	74.0
2017	Autumn	76.9	74.0	68.3	74.0	77.9	-	73.1	75.0	74.0		70.2	72.1	71.2
	Spring	74.0	74.0	69.2	74.0	77.9	-	73.1	75.0	72.1		70.2	73.1	73.1
2018	Autumn	76.0	76.9	71.2	Dry	77.9	68.3	75.0	Dry	72.1		70.2	73.1	73.1
	Spring	76.0	76.9	Dry	Dry	Dry	69.2	75.0	Dry	Dry	66.3	70.2	71.2	71.2
2019	Autumn	Dry	73.1	Dry	Dry	Dry	69.2	Dry	Dry	Dry	61.5	70.2	71.2	71.2
	Spring	Dry	74.0	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	73.1	71.2	71.2
Minimum		**74.0**	**73.1**	**68.3**	**74.0**	**76.9**	**68.3**	**71.2**	**75.0**	**72.1**	**61.5**	**70.2**	**71.2**	**71.2**
Maximum		**78.8**	**77.9**	**73.1**	**78.8**	**78.8**	**69.2**	**76.0**	**79.8**	**76.9**	**66.3**	**76.0**	**74.0**	**74.0**
Mean		**77.3**	**75.6**	**70.3**	**75.1**	**77.9**	**68.8**	**73.5**	**76.8**	**74.0**	**63.9**	**71.7**	**72.8**	**72.7**

Note 1: Monitoring sites are presented in order from upstream (left) to downstream (right). See **Figure 6.1**.
Note 2: Excised Creek monitoring sites.
Note 3: Diversion channel creek sites.

Source: Marine Pollution Research Pty Ltd (2019).

Of the thirteen monitoring sites, seven (54%) were dry during the autumn monitoring round and nine (69%) were dry during the spring monitoring round for this reporting period. For those sites which were sampled, all sites were found to be in 'good' condition (i.e. >70%) with the exception of sites BC4.5 and BC6.5. During both the autumn and spring sampling rounds habitat condition scores were below the long term mean for all sites with the exception of BCDown which was slightly above the long term mean during the spring survey. Site condition scores were generally consistent with or slightly lower than scores reported for each site during the previous reporting period.

Lower habitat condition scores recorded during the reporting period generally reflect the effects of dry conditions, with isolated refuge pools providing minimal habitat diversity and a high degree of exposure associated with shallow depths. Between the autumn and spring survey periods, water levels in refuge pools were observed to decrease by up to 70cm and dieback of macrophyte stands was observed in adjacent dry channel sections. The primary factors contributing to reduced habitat condition scores at sites BC4.5 and BC6.5 included channel shape (i.e. long pools and few riffle zones), a lack of retention structures (e.g. logs, rocks), the amount of channel bank undercutting and the volume of sediment and detritus within the channel.

Habitat condition scores recorded at Glennies Creek monitoring sites (GCUp and GCMid) remained consistent with those recorded during the previous reporting period. Habitat conditions at these sites are similarly dependent upon water levels, with upstream dam water releases providing relatively stable flow rates during the reporting period.

Stream Health – Aquatic Fauna

Table 6.9 and **Table 6.10** present the long term macroinvertebrate diversity and SIGNAL Index scores respectively for monitoring locations within Bowmans Creek and Glennies Creek. In accordance with sampling triggers outlined in the FFMP, diversity values and SIGNAL scores are ranked as either 'Low', 'In' or 'High' if they fall below, within or above one standard deviation from the long term mean.

Macroinvertebrate diversities recorded for Bowmans Creek during the reporting period were low for two of the three sites sampled in autumn (BC1 and BC6) and low for both sites sampled in spring (BC1 and BC Down). Low values are likely the result of dry conditions resulting in a deterioration of water quality (increased salinity and sediments) and habitat condition due to drought induced pool contraction and associated dieback of exposed plants.

Site SIGNAL scores recorded for Bowmans Creek were also low at two of the three sites sampled in autumn (BC6 and BC Down) and low at one of the two sites sampled in spring (BC Down). Low SIGNAL scores are likely the result of the survival and predominance of more tolerant taxa with low SIGNAL values, whilst high scores recorded at site BC1 in spring may be due to the persistence of taxa with relatively high SIGNAL values in refuge pools with moderate habitat conditions and water quality.

For Glennies Creek, with the exception of site GC Mid which recorded a low diversity during the autumn sampling round, all macroinvertebrate diversities and SIGNAL scores were within one standard deviation from the long term mean during both seasonal sampling periods. The low value recorded for site GC Mid is considered to be representative of natural variation in macroinvertebrate diversity, as both habitat and sampling conditions were consistent with former conditions recorded at this site.

In summary, 'low' trigger values recorded for monitoring sites within both Bowmans Creek and Glennies Creek during the reporting period are attributable to natural variation and natural environmental responses to prevailing climatic conditions. As such, no further action was required under the FFMP TARP.

In addition to aquatic macroinvertebrates, four native fish species, flathead gudgeons (*Phylipnodon grandiceps*), striped gudgeon (*Gobiomorphus australis*), long-finned eel *(Anguilla reinhardtii*), firetail gudgeons (*Hypseleotris galii*) and tadpoles, and one pest species, plague minnow (*Gambusia holbrooki*), were also recorded at sites within both Bowmans Creek and Glennies Creek during the reporting period.

Vegetation - Bowmans Creek Riparian Zone

Monitoring of the Bowman Creek riparian vegetation was undertaken during the reporting period between 27 May 2019 and 12 June 2019 by DnA Environmental. Monitoring of riparian vegetation is undertaken at the ACP site to assess the condition of vegetation associated with Bowmans Creek, the status of vegetation and rehabilitated areas within the Bowmans Creek Diversion channels, and the condition of local protected River Red Gum (Eucalyptus camaldulensis) populations. A revised monitoring program was implemented during the reporting period to ensure that key biodiversity outcomes outlined in the FFMP are more fully assessed against the revised completion/performance criteria.

Table 6.9
Stream Health Monitoring – Macroinvertebrate Diversity

Year	Period	Diversity (No. Taxa)																		
		Bowmans Creek Sites^										Summary		Glennies Creek Sites^					Summary	
		BC Up	BC1	BCLW6B	BCED1	BC3	BC4.5	BCLW7A	BCWD2	BC6	BC Down	*Total*	*Mean Site*	GC Up	GCOC Up	GC Mid	GCOC Down	GC Down	*Total*	*Mean*
2007	Autumn	12	-	-	-	-	-	21	-	-	9	***25***	***14.0***	26	-	17	-	14	***34***	***19.0***
	Spring	21	-	-	-	-	-	17	-	-	17	***30***	***17.0***	22	26	22	23	20	***42***	***22.6***
2008	Autumn	20	-	-	-	-	-	21	-	-	16	***32***	***18.8***	26	24	24	24	23	***42***	***24.2***
	Spring	24	12	18	-	-	-	21	-	-	16	***37***	***18.8***	21	20	21	22	20	***34***	***20.8***
2009	Autumn	23	12	24	-	-	-	21	-	-	22	***44***	***19.8***	22	24	23	27	24	***41***	***24.0***
	Spring	-	15	12	-	23	-	29	-	-	25	***46***	***21.2***	21	-	20	-	23	***33***	***21.0***
2010	Autumn	-	12	14	-	12	-	26	-	-	22	***40***	***17.5***	18	-	25	-	22	***36***	***22.0***
	Spring	18	-	19	-	-	-	-	-	22	12	***39***	***19.2***	9	-	30	22	-	***34***	***20.3***
2011	Autumn	20	-	19	-	-	-	-	-	18	21	***33***	***20.0***	-	-	27	23	-	***34***	***25.0***
	Spring	22	-	21	-	-	-	-	-	17	19	***37***	***19.8***	20	-	27	22	-	***35***	***23.0***
2012	Autumn	26	-	19	-	-	-	-	-	24	17	***39***	***22.2***	14	-	17	18	-	***26***	***16.3***
	Spring	35	22	17	-	-	-	35	-	31	23	***52***	***26.7***	26	-	28	24	-	***41***	***26.0***
2013	Autumn	27	23	23	-	26	-	33	-	24	24	***52***	***25.7***	17	-	21	-	-	***22***	***19.0***
	Spring	35	18	27	24	26	-	29	21	25	30	***53***	***26.1***	24	-	29	-	-	***32***	***26.4***
2014	Autumn	31	24	15	26	29	-	27	25	25	23	***52***	***25.0***	26	-	23	-	-	***31***	***24.5***
	Spring	32	20	25	27	22	-	21	21	31	24	***52***	***24.8***	22	-	22	-	-	***30***	***22.0***
2015	Autumn	23	21	13	27	23	-	24	21	20	19	***47***	***21.2***	20	-	21	-	-	***28***	***20.5***
	Spring	21	18	10	21	20	-	20	18	20	16	***38***	***18.2***	18	-	18	-	-	***23***	***18.0***
2016	Autumn	21	20	13	23	22	-	20	24	27	24	***49***	***21.6***	20	-	22	-	-	***27***	***21.0***
	Spring	21	16	20	22	23	-	20	24	20	22	***41***	***20.9***	19	-	18	-	-	***26***	***18.5***
2017	Autumn	23	20	18	19	22	-	19	22	21	20	***36***	***20.4***	17	-	20	-	-	***25***	***18.5***
	Spring	20	20	18	16	26	-	17	21	23	24	***42***	***20.6***	19	-	15	-	-	***22***	***17.5***
2018	Autumn	22	17	14	Dry	15	19	16	Dry	19	15	***39***	***17.1***	21	-	20	-	-	***28***	***20.5***
	Spring	21	18	Dry	Dry	Dry	20	24	Dry	14	19	***40***	***19.3***	17	-	19	-	-	***22***	***18.0***
2019	Autumn	Dry	14	Dry	Dry	Dry	18	Dry	Dry	14	21	***30***	***16.8***	18	-	16	-	-	***26***	***17.0***
	Spring	Dry	13	Dry	Dry	Dry	Dry	Dry	Dry	Dry	9	***18***	***11.0***	20	-	19	-	-	***25***	***19.5***
LTM[1]		***23.6***	***18.1***	***18.0***	***22.8***	***22.2***	***19.5***	***23.1***	***21.9***	***22.4***	***20.0***	***41.5***	***20.7***	***20.2***	***-[4]***	***22.0***	***-[4]***	***-[4]***	***31.1***	***21.2***
SD LTM[2]		***5.5***	***3.7***	***4.6***	***3.7***	***4.6***	***0.7***	***5.3***	***2.1***	***4.6***	***4.7***	***7.7***	***3.2***	***4.1***	***-[4]***	***4.0***	***-[4]***	***-[4]***	***6.4***	***2.9***
2019	Autumn	-	Low	-	-	-	-	-	-	Low	In	***Low***	***Low***	In	-	Low	-		***In***	***Low***
Status[3]	Spring	-	Low	-	-	-	-	-	-	-	Low	***Low***	***Low***	In	-	In	-		***In***	***In***

Note 1: Long Term Mean of results preceding the two seasonal results recorded for the current reporting period.
Note 2: Standard deviation of results preceding the two seasonal results recorded for the current reporting period from the Long Term Mean.
Note 3: Status of each site compared to the Long Term Mean (LTM), where 'Low' = results below one standard deviation from the LTM, 'In' = results within one standard deviation from the LTM, and 'High' = results higher than one standard deviation above the LTM.
Note 4: Value not calculated due to low sample number.

^ See **Figure 6.1**.

Source: Marine Pollution Research Pty Ltd (2019).

Table 6.10
Stream Health Monitoring – SIGNAL Scores

Year	Period	Signal Score																		
		Bowmans Creek Sites^										Summary		Glennies Creek Sites^					Summary	
		BC Up	BC1	BCLW6B	BCED1	BC3	BC4.5	BCLW7A	BCWD2	BC6	BC Down	Creek Score	Mean Site	GC Up	GCOC Up	GC Mid	GCOC Down	GC Down	Creek Score	Mean Site
2007	Autumn	2.17	-	-	-	-	-	3.24	-	-	3.33	***2.95***	***2.92***	3.71	-	3.81	-	3.58	***3.71***	***3.70***
	Spring	3.57	-	-	-	-	-	3.35	-	-	3.59	***3.64***	***3.69***	4.19	3.92	3.71	3.48	3.65	***3.80***	***3.79***
2008	Autumn	3.84	-	-	-	-	-	3.81	-	-	4.25	***4.00***	***4.02***	4.16	3.82	3.71	4.13	3.62	***3.90***	***3.89***
	Spring	4.13	3.92	3.89	-	-	-	3.71	-	-	3.88	***3.93***	***3.92***	3.85	3.84	4.00	3.62	3.40	***3.74***	***3.74***
2009	Autumn	3.87	3.64	3.50	-	-	-	4.00	-	-	3.70	***3.75***	***3.74***	3.68	4.00	4.10	3.96	4.05	***3.95***	***3.96***
	Spring	-	3.29	3.82	-	3.15	-	3.70	-	-	3.74	***3.55***	***3.54***	3.63	-	3.56	-	3.90	***3.71***	***3.70***
2010	Autumn	-	3.36	2.83	-	4.09	-	3.63	-	-	3.90	***3.61***	***3.58***	4.00	-	4.25	-	3.68	***3.98***	***3.98***
	Spring	3.33	-	3.84	-	-	-	-	-	3.52	3.67	***3.58***	***3.59***	3.22	-	3.61	3.55	-	***3.53***	***3.46***
2011	Autumn	3.60	-	3.47	-	-	-	-	-	3.44	3.60	***3.58***	***3.57***	-	-	3.81	3.74	-	***3.78***	***3.78***
	Spring	3.86	-	3.35	-	-	-	-	-	4.06	3.68	***3.79***	***3.80***	4.10	-	3.80	4.05	-	***3.97***	***3.98***
2012	Autumn	3.85	-	3.33	-	-	-	-	-	3.57	3.44	***3.55***	***3.53***	3.71	-	3.53	3.50	-	***3.57***	***3.58***
	Spring	3.77	3.68	4.00	-	-	-	3.85	-	3.62	3.75	***3.82***	***3.83***	3.92	-	3.79	4.50	-	***4.05***	***4.07***
2013	Autumn	3.77	3.73	3.45	-	3.73	-	3.61	-	3.83	3.76	***3.70***	***3.70***	3.88	-	4.14	-	-	***4.03***	***4.01***
	Spring	3.76	4.00	3.62	3.45	4.04	-	3.74	3.42	3.95	4.11	***3.79***	***3.79***	4.17	-	4.00	-	-	***4.08***	***4.09***
2014	Autumn	3.53	3.21	3.54	3.96	3.37	-	3.88	3.35	3.67	3.59	***3.57***	***3.57***	3.91	-	4.38	-	-	***4.14***	***4.15***
	Spring	4.00	3.47	3.63	4.48	3.70	-	3.53	3.65	3.63	3.86	***3.67***	***3.66***	4.15	-	4.33	-	-	***4.24***	***4.24***
2015	Autumn	3.83	3.65	3.10	3.44	3.70	-	3.23	3.70	3.53	3.72	***3.57***	***3.54***	3.50	-	4.19	-	-	***3.85***	***3.85***
	Spring	3.57	3.39	3.00	3.67	3.95	-	3.30	3.88	3.90	4.00	***3.66***	***3.63***	3.81	-	4.29	-	-	***3.97***	***3.97***
2016	Autumn	3.75	4.05	3.77	3.45	3.50	-	3.17	3.63	3.40	3.82	***3.61***	***3.61***	3.22	-	3.71	-	-	***3.44***	***3.47***
	Spring	3.52	3.13	3.26	3.70	3.38	-	3.00	3.73	3.47	3.50	***3.36***	***3.41***	3.65	-	3.35	-	-	***3.65***	***3.50***
2017	Autumn	3.35	3.78	2.94	3.88	4.05	-	3.11	3.38	3.42	3.68	***3.42***	***3.51***	3.94	-	3.53	-	-	***3.56***	***3.73***
	Spring	3.61	3.84	3.59	3.44	3.38	-	3.38	3.52	3.55	3.45	***3.42***	***3.53***	3.55	-	3.63	-	-	***3.54***	***3.59***
2018	Autumn	3.71	3.27	2.62	Dry	2.92	3.39	2.69	Dry	3.28	3.20	***3.18***	***3.13***	3.42	-	3.88	-	-	***3.64***	***3.65***
	Spring	3.05	3.18	Dry	Dry	Dry	3.39	3.71	Dry	3.45	3.00	***3.30***	***3.30***	4.14	-	3.75	-	-	***3.93***	***3.95***
2019	Autumn	Dry	3.43	Dry	Dry	Dry	3.19	Dry	Dry	3.08	3.05	***3.18***	***3.19***	3.94	-	3.86	-	-	***3.90***	***3.90***
	Spring	Dry	4.09	Dry	Dry	Dry	Dry	Dry	Dry	Dry	2.75	***3.42***	***3.42***	4.12	-	3.61	-	-	***3.86***	***3.87***
LTM[1]		***3.62***	***3.56***	***3.43***	***3.61***	***3.61***	***3.39***	***3.48***	***3.58***	***3.61***	***3.68***	***3.6***	***3.6***	***3.80***	***-[4]***	***3.87***	***-[4]***	***-[4]***	***3.83***	***3.83***
SD LTM[2]		***0.40***	***0.30***	***0.38***	***0.21***	***0.37***	***0.00***	***0.34***	***0.18***	***0.22***	***0.28***	***0.2***	***0.2***	***0.29***	***-[4]***	***0.29***	***-[4]***	***-[4]***	***0.2***	***0.2***
2019	Autumn	-	In	-	-	-	-	-	-	Low	Low	***Low***	***Low***	In	-	In	-		***In***	***In***
Status[3]	Spring	-	High	-	-	-	-	-	-	-	Low	***In***	***In***	High	-	In	-		***In***	***In***

Note 1: Long Term Mean of results preceding the two seasonal results recorded for the current reporting period. See **Figure 6.1**
Note 2: Standard deviation of results preceding the two seasonal results recorded for the current reporting period from the Long Term Mean.
Note 3: Status of each site compared to the Long Term Mean (LTM), where 'Low' = results below one standard deviation from the LTM, 'In' = results within one standard deviation from the LTM, and 'High' = results higher than one standard deviation above the LTM.
Note 4: Value not calculated due to low sample number.
Source: Marine Pollution Research Pty Ltd (2019).

A total of 17 riparian vegetation sites were monitored during the reporting period, including nine Casuarina monitoring sites, five Eucalypt Woodland monitoring sites, and three Casuarina reference sites. Monitoring of reference sites which are representative of natural vegetation communities is undertaken in order to inform appropriate completion criteria and ecological targets for rehabilitated areas within the ACP site.

Table 6.11 presents an overview of the performance of each monitoring site against the relevant completion criteria. In summary, rehabilitated casuarina and eucalypt woodland sites have generally formed functional and stable ecosystems comparable to conditions recorded in reference sites not subject to mining-related impacts. Compared to reference sites, several monitoring sites along both the natural Bowmans Creek channel and Bowmans Creek Diversion displayed lower stability associated with increased animal disturbance and a higher diversity and abundance of exotic species. Other performance targets which have not yet been achieved are primarily dependent upon community maturity, with performance indicators including litter cover, trunk diameter and provision of wildlife habitat expected to develop over time.

Monitoring also indicated that the remnant River Red Gum population remained in moderate to good health, with a viable reproductive population present and high numbers of saplings reflecting previous regeneration and recruitment events.

Erosion and decreased soil stability associated with cattle presence in riparian areas is the most significant threat to the health of riparian areas associated with Bowmans Creek. During drought conditions, in particular, increased levels of grazing in riparian areas combined with increased vulnerability of soils and creek banks to erosion may threaten rehabilitated areas as well as established remnant vegetation. Twelve priority and declared weed species were also recorded across the Bowmans Creek monitoring sites during the reporting period and will require continued control.

Vegetation - Southern Woodland Conservation Area

A Voluntary Conservation Agreement covering the SWCA was established between ACOL and the Minister for the Environment under the *National Parks and Wildlife Act 1974* on 16 September 2010. The SWCA covers an area of 65.66ha above the existing underground mine (see **Figure 6.1**) and contains remnant Hunter Valley vegetation communities, threatened fauna species and archaeological sites of high significance.

Monitoring of the SWCA was undertaken during the reporting period by DnA Environmental between 27 May 2019 and 12 June 2019. The monitoring program for the SWCA was revised during the reporting period to ensure that the data obtained would more fully assess mining-related impacts, including areas previously impacted by subsidence. Monitoring methods included the use of the Biometric Assessment Method in areas of subsidence repair, OEH monitoring forms and photo points for three established sites (SVCA01, SVCA02 & SVCA03), transects in areas of subsidence repair and additional photo monitoring points. Three eucalypt woodland reference sites were also used to inform benchmark ecological community values and determine appropriate ecological performance targets and completion criteria.

Table 6.11
Bowmans Creek Riparian Zone – Completion Criteria Status

Rehabilitation Phase	Completion Criteria	Performance Indicator	Unit of Measure	Monitoring Site													
				C1	C2	C3	C4	Q3	Q4	Q7	Q9	Q10	R1	R3	R5	R6	RRG01
Phase 2: Landform establishment and stability	Landform suitable for final landuse and generally compatible with surrounding topography and final landform design	Slope	< Degrees (18°)	2	4	18	15	3	15	15	14	3	3	1	18	2	22
	Areas of active erosion are limited	No. Rills/Gullies	No.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phase 3: Growth medium development	Soil properties are suitable for the establishment and maintenance of selected vegetation species	pH	pH (5.6-7.3)	7.0	6.8	7.5	6.9	NA	6.4	NA	7.1	NA	6.9	6.5	7.1	6.2	7.3
		Organic Matter	% (>4.5)	2.8	2.4	3.0	2.1	NA	4.8	NA	4.4	NA	2.9	2.8	5.3	5.4	5.4
		Phosphorous	mg/ kg (50)	36.4	40.0	34.1	20.0	NA	17.7	NA	23.9	NA	34.1	71.2	24.9	23.3	55.8
Phase 4: Ecosystem & Landuse Establishment	Landform is stable and performing as it was designed to do	LFA Stability	%	72.3	64.0	68.4	65.8	72.8	75.4	67.6	75.9	74.4	69.9	69.5	67.5	64.5	62.9
		LFA Landscape organisation	%	100	100	100	92	100	100	95	93	100	100	100	100	100	63
	Vegetation contains a diversity of species comparable to that of the local remnant vegetation	Diversity of shrubs and juvenile trees	% population	100	100	100	100	NA	0	NA	0	0	100	100	100	100	100
		Total species richness	No./ area	40	27	37	21	NA	30	NA	29	27	35	28	33	33	31
		Native species richness	>No./ area	8	7	13	5	NA	7	NA	7	7	11	9	15	20	10
		Exotic species richness	<No./ area	32	20	24	16	NA	23	NA	22	20	24	19	18	13	21
	Vegetation contains a density of species comparable to that of the local remnant vegetation	Density of shrubs and juvenile trees	No./ area	25	65	38	74	NA	0	NA	0	0	5	9	10	35	9
	The vegetation is comprised by a range of growth forms comparable to that of the local remnant vegetation	Trees	No./ area	1	2	5	1	NA	1	NA	1	1	3	3	3	6	2
		Shrubs	No./ area	0	0	2	0	NA	0	NA	1	1	2	1	0	1	1
		Herbs	No./ area	25	13	15	10	NA	16	NA	14	14	14	11	14	14	14
		Grasses	No./ area	9	8	12	7	NA	9	NA	9	6	11	9	10	10	6
Phase 5: Ecosystem & Landuse Sustainability	Landform is ecologically functional and performing as it was designed to do	LFA Infiltration	%	52.6	53.1	52.8	52.7	52.7	58.3	47.3	46.5	47.8	49.7	53.2	44.5	46.1	42.7
		LFA Nutrient recycling	%	51.9	53.3	51	51.8	53	56.3	45.7	44.2	46.0	47.1	52.2	41.1	46.2	38.9
	Ground layer contains protective ground cover and habitat structure comparable with the local remnant vegetation	Perennial plant cover (< 0.5m)	%	30	8.5	21	11	7.5	65	7.5	49.5	5	19	38	24.5	15	34.5
		Total Ground Cover	%	100	99	94	86	99	100	98.5	100	100	99	88	90.5	94.5	70
	Vegetation contains a diversity of species per square meter comparable to that of the local remnant vegetation	Native understorey abundance	> species/ m^2	0.6	0.4	0.6	2	1.8	1.4	0.8	1.8	0.4	1	0.2	2.2	2.4	0.4
		Exotic understorey abundance	< species /m^2	4.6	4.6	2.8	3.4	3.8	4.6	6.8	5.0	6.4	5.2	3.2	4.6	3.2	3
	Native ground cover abundance is comparable to that of the local remnant vegetation	Percent ground cover provided by native vegetation <0.5m tall	%	8.3	5.9	9.7	34.2	31.7	27.7	7.6	31.3	3.7	18.8	6.3	27.9	43.5	8.1

Table 6.11 (Cont'd)
Bowmans Creek Riparian Zone – Completion Criteria Status

Rehabilitation Phase	Completion Criteria	Performance Indicator	Unit of Measure	Monitoring Site													
				C1	C2	C3	C4	Q3	Q4	Q7	Q9	Q10	R1	R3	R5	R6	RRG01
Phase 5: Ecosystem & Landuse Sustainability	The vegetation is maturing and/or natural recruitment is occurring at rates similar to those of the local remnant vegetation	Shrubs and juvenile trees 0 - 0.5m in height	No./ area	0	1	0	0	NA	0	NA	0	1	0	0	2	0	3
		Shrubs and juvenile trees >2m in height	No./ area	24	62	33	74	NA	0	NA	0	0	4	6	5	29	6
	The vegetation is developing in structure and complexity comparable to that of the local remnant vegetation	Foliage cover 0.5 - 2 m	% cover	36	15	30	4	7	19	11	0	0	16	20	2.5	15	0
		Foliage cover >6m	% cover	25	25	17	27	14	44	10	10	16	5	0	0	0	49
	Vegetation contains a diversity of maturing tree and shrubs species comparable to that of the local remnant vegetation	Tree diversity	species/ area	1	1	4	1	NA	1	NA	1	1	3	3	1	4	2
	Vegetation contains a density of maturing tree and shrubs species comparable to that of the local remnant vegetation	Tree density	No./ area	24	80	37	98	NA	7	NA	4	10	14	20	2	11	9
	The vegetation is in a condition comparable to that of the local remnant vegetation.	Healthy trees	% population	91.7	35	62.2	37.8	NA	57.1	NA	0	20	85.7	80	100	100	44.4
		Medium health	% population	8.3	57.5	35.1	59.2	NA	42.9	NA	50	0	14.3	20	0	0	22.2
		Advanced dieback	% population	0	6	3	3	NA	0	NA	0	0	0	0	0	0	11.1
		Dead Trees	% population	0	1	0	0	NA	0	NA	50	80	0	0	0	0	22.2
		Flowers/fruit: Trees	% population	4.2	3	5	7	NA	57	NA	50	10	14.3	30	0	45.5	55.6

NA = Not Applicable Green = Meets or exceeds completion criteria. Blue = Soil performance indicator target falls within industry guidelines but may not be similar to local soils.
Light Brown = Eucalypt Woodland sites meet or exceed comparable ecological performance targets derived from Casuarina reference sites.

Source: DnA Environmental (2019).

Table 6.12 presents an overview of the performance of each monitoring site within the SWCA against the relevant completion criteria. In summary, woodland sites SVCA01, SVCA02 and SVCA04 met many of the specified completion criteria although both native species diversity and shrub foliage cover remained lower than that recorded for reference sites. Sites SVCA05 and SVCA06 have previously been subject to subsidence repair works and achievement of completion criteria is anticipated to occur over time. Derived native grassland at site SVCA03 had a slightly higher cover and abundance of exotic species compared to reference sites, with no tree or shrub regeneration observed.

Subsidence crack treatment works involving clearing, excavation and backfilling were undertaken at sites SVCA05 and SVCA06 during the previous reporting period. These two sites displayed low ecological function, reduced levels of groundcover and perennial cover, limited projected foliage and a predominance of exotic species. It is anticipated that these sites will develop towards the completion criteria as they mature.

Vegetation - Farmland Underground Mining Area

Monitoring of the agricultural grazing lands, including both pasture and woodland, located above the underground mining area was undertaken by DnA Environmental between 27 May 2019 and 12 June 2019.

As for the SWCA monitoring, the monitoring program for these areas was revised during the reporting period to ensure that monitoring targeted mining-related impacts, including subsidence and associated rehabilitation works. Three eucalypt woodland and three native grassland reference sites were used to develop benchmark ecological values and inform ecological performance targets and completion criteria for woodland and grassland areas within the underground mining affected areas.

Table 6.13 presents an overview of the performance of each monitoring site against the relevant completion criteria. In summary, woodland sites in farmland areas displayed low native species diversity and low perennial cover due to competition with dominant Bulloak regrowth. Recently rehabilitated woodland sites also displayed low ecological function, low groundcover and perennial cover levels and higher proportion of exotic species. With the exception of two recently subsidence-rehabilitated pasture sites, all pasture sites displayed ecological functions comparable to or higher than the native grassland reference sites.

Soil analyses indicated that soils in the farmland areas generally displayed elevated levels of sulfur, iron and silicon, however, similar concentrations recorded for refence sites indicate that these elevated levels may occur naturally in the local area. Site UGPast06 displayed significantly elevated levels of sulfur and zinc in addition to low pH, high EC and ESP compared to reference site values. The causes of these abnormal concentrations will be investigated further as a greater database of soil analysis results is developed over coming years.

Both woodland and pasture sites within the underground mining affected areas were subject to variable levels of subsidence-related impacts. Several sites have previously been subject to subsidence rehabilitation works, including ripping, seeding and/or planting, with further general subsidence and subsidence cracking impacts observed during the reporting period requiring further treatment. As predicted, some pasture areas have been subjected to increased ponding in natural drainage lines following subsidence of the natural landform.

Table 6.12
Southern Woodland Conservation Area – Completion Criteria Status

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Primary Performance Indicators	Unit of measure	Woodland ecosystem range 2019		SVCA01	SVCA02	SVCA03	SVCA04	SVCA05	SVCA06
						Lower	Upper						
Phase 2: Landform establishment and stability	Landform slope, gradient	Landform suitable for final landuse and generally compatible with surrounding topography and final landform design	Slope	Landform is generally compatible within the context of the local topography and final landform design.	< Degrees (18°)	5	25	10	7	3	8	8	7
	Subsidence cracking	No visible subsidence cracking	No. Subsidence Cracks	Woodland impacted by mine subsidence are restored and comparable to the reference sites	No.	0	0	0	0	0	1	0	0
			Sum of subsidence cracks width	Provides an assessment of the extent of subsidence cracking and demonstrates that repair works have been satisfactory	m	0	0	0.00	0.00	0	0.05	0.00	0.00
Phase 3: Growth medium development	Soil chemical, physical properties and amelioration	Soil properties are suitable for the establishment and maintenance of selected vegetation species	pH	pH is typical of the surrounding landscape or falls within desirable ranges provided by the agricultural industry	pH (5.6-7.3)	5.4	6.2	5.5	5.6	5.6	NA	NA	NA
			Organic Matter	Organic Matter levels are typical of the surrounding landscape, increasing or fall within desirable ranges provided by the agricultural industry	% (>4.5)	2.6	4.0	6.7	5.4	5.0	NA	NA	NA
			Phosphorous	Available Phosphorus is typical of the surrounding landscape or fall within desirable ranges provided by the agricultural industry	mg/kg (50)	3.6	15.4	10.5	8.2	14.4	NA	NA	NA
Phase 4: Ecosystem & Landuse Establishment	Landscape Function Analysis (LFA): Landform stability and organisation	Landform is stable and performing as it was designed to do	LFA Stability	The LFA stability index is comparable to or trending towards the local remnant vegetation	%	62.7	68.9	64.1	66.5	74.3	74.1	57.6	61.4
			LFA Landscape organisation	The Landscape Organisation Index provides a measure of the ability of the site to retain resources and is comparable to the local remnant vegetation	%	81	100	90	100	100	99	39	53

Table 6.12 (Cont'd)
Southern Woodland Conservation Area – Completion Criteria Status

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Primary Performance Indicators	Unit of measure	Woodland ecosystem range 2019		SVCA01	SVCA02	SVCA03	SVCA04	SVCA05	SVCA06
						Lower	Upper						
Phase 4: Ecosystem & Landuse Establishment (Cont'd)	Vegetation diversity	Vegetation contains a diversity of species comparable to that of the local remnant vegetation	Diversity of shrubs and juvenile trees	The diversity of shrubs and juvenile trees with a stem diameter < 5cm is comparable to the local remnant vegetation.	species/area	2	3	6	3	0	NA	NA	NA
				The percentage of shrubs and juvenile trees with a stem diameter < 5cm dbh which are local endemic species and these percentages are comparable to the local remnant vegetation	% population	79	100	95	86	0	NA	NA	NA
			Total species richness	The total number of live plant species is comparable to the local remnant vegetation	No./area	38	46	51	32	38	NA	NA	NA
			Native species richness	The total number of live native plant species is greater than or comparable to the local remnant vegetation	>No./area	31	38	43	29	24	NA	NA	NA
			Exotic species richness	The total number of live exotic plant species is less than or comparable to the local remnant vegetation	<No./area	3	8	8	3	14	NA	NA	NA
	Vegetation density	Vegetation contains a density of species comparable to that of the local remnant vegetation	Density of shrubs and juvenile trees	The total density of shrubs or juvenile trees with a stem diameter < 5cm is comparable to the local remnant vegetation	No./area	9	211	39	42	0	NA	NA	NA
				The density of endemic shrubs or juvenile trees with a stem diameter < 5cm is comparable to that of the local remnant vegetation	No./area	9	166	37	36	0	NA	NA	NA

Table 6.12 (Cont'd)
Southern Woodland Conservation Area – Completion Criteria Status

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Primary Performance Indicators	Unit of measure	Woodland ecosystem range 2019		SVCA01	SVCA02	SVCA03	SVCA04	SVCA05	SVCA06
						Lower	Upper						
Phase 4: Ecosystem & Landuse Establishment (Cont'd)	Ecosystem composition	The vegetation is comprised by a range of growth forms comparable to that of the local remnant vegetation	Trees	The number of tree species regardless of age comprising the vegetation community is comparable to the local remnant vegetation	No./area	2	2	3	2	0	NA	NA	NA
			Shrubs	The number of shrub species regardless of age comprising the vegetation community is comparable to the local remnant vegetation	No./area	0	2	3	2	0	NA	NA	NA
			Herbs	The number of herbs or forb species comprising the vegetation community is comparable to the local remnant vegetation	No./area	17	22	21	9	17	NA	NA	NA
			Grasses	The number of grass species comprising the vegetation community is comparable to the local remnant vegetation	No./area	9	11	12	12	14	NA	NA	NA
Phase 5: Ecosystem & Landuse Sustainability	Landscape Function Analysis (LFA): Landform function and ecological performance	Landform is ecologically functional and performing as it was designed to do	LFA Infiltration	LFA infiltration index is comparable to or trending towards the local remnant vegetation	%	42.4	49.6	49.8	56.5	54.6	59.4	33.5	30.7
			LFA Nutrient recycling	LFA nutrient recycling index is comparable to or trending towards the local remnant vegetation	%	42.7	46.3	48.2	54.2	50.2	54.4	28.8	26.4
	Protective ground cover	Ground layer contains protective ground cover and habitat structure comparable with the local remnant vegetation	Perennial plant cover (< 0.5m)	Percent ground cover provided by live perennial vegetation (<0.5m in height) is comparable to the local remnant vegetation	%	9	18	18.5	3.5	33.5	16.5	8	11.5
			Total Ground Cover	Total groundcover is the sum of protective ground cover components (as described above) and that it is comparable to the local remnant vegetation	%	91	98	99.5	100	99	96.5	42.5	65.5

Table 6.12 (Cont'd)
Southern Woodland Conservation Area – Completion Criteria Status

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Primary Performance Indicators	Unit of measure	Woodland ecosystem range 2019		SVCA01	SVCA02	SVCA03	SVCA04	SVCA05	SVCA06
						Lower	Upper						
Phase 5: Ecosystem & Landuse Sustainability (Cont'd)	Ground cover diversity	Vegetation contains a diversity of species per square meter comparable to that of the local remnant vegetation	Native understorey abundance	The abundance of native species per square metre averaged across the site has more than or an equal number of native species as the local remnant vegetation	> species/m2	6.4	7.8	4.4	2.6	4.4	6.6	2.8	3.2
			Exotic understorey abundance	The abundance of exotic species per square metre averaged across the site has less than or an equal number of exotic species as the local remnant vegetation	< species/m2	0.0	0.8	0	0.2	1.0	0	0.2	1.8
	Native ground cover abundance	Native ground cover abundance is comparable to that of the local remnant vegetation	Percent ground cover provided by native vegetation <0.5m tall	The percent ground cover abundance of native species (<0.5m) compared to exotic species is comparable to the local remnant vegetation	%	93	100	100	94.4	90.6	100	90	62.8
	Ecosystem growth and natural recruitment	The vegetation is maturing and/or natural recruitment is occurring at rates similar to those of the local remnant vegetation	shrubs and juvenile trees 0 - 0.5m in height	The number of shrubs or juvenile trees <0.5m in height provides an indication of establishment success and/or natural ecosystem recruitment and is comparable to the local remnant vegetation	No./area	4	79	13	20	0	NA	NA	NA
			shrubs and juvenile trees 0.5 - 1m in height	The number of shrubs or juvenile trees 0.5-1m in height provides an indication of establishment success, growth and/or natural ecosystem recruitment and is comparable to the local remnant vegetation	No./area	0	43	17	15	0	NA	NA	NA
			shrubs and juvenile trees 1.5 - 2m in height	The number of shrubs or juvenile trees 1.5-2m in height provides an indication of establishment success, growth and/or natural ecosystem recruitment and is comparable to the local remnant vegetation	No./area	1	23	3	0	0	NA	NA	NA

Table 6.12 (Cont'd)
Southern Woodland Conservation Area – Completion Criteria Status

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Primary Performance Indicators	Unit of measure	Woodland ecosystem range 2019		SVCA01	SVCA02	SVCA03	SVCA04	SVCA05	SVCA06
						Lower	Upper						
Phase 5: Ecosystem & Landuse Sustainability (Cont'd)	Ecosystem structure	The vegetation is developing in structure and complexity comparable to that of the local remnant vegetation	Foliage cover 0.5 - 2 m	Projected foliage cover provided by perennial plants in the 0.5 - 2m vertical height stratum indicates the community structure is comparable to the local remnant vegetation	% cover	0	4	2	1	0	7	0	0
			Foliage cover 2 - 4m	Projected foliage cover provided by perennial plants in the 2 - 4m vertical height stratum indicates the community structure is comparable to the local remnant vegetation	% cover	3	12	6	5	0	3	0	0
			Foliage cover 4 - 6m		% cover	6	32	24	19	0	14	2	0
			Foliage cover >6m	Projected foliage cover provided by perennial plants >6m vertical height stratum indicates the community structure is comparable to the local remnant vegetation	% cover	12	44	36	42	0	39	16	10
	Tree diversity	Vegetation contains a diversity of maturing tree and shrubs species comparable to that of the local remnant vegetation	Tree diversity	The diversity of trees or shrubs with a stem diameter >5cm is comparable to the local remnant vegetation	species/area	1	2	2	2	0	NA	NA	NA
				The percentage of maturing trees and shrubs with a stem diameter >5cm dbh which are local endemic species and these percentages are comparable to the local remnant vegetation	%	100	100	100	100	0	NA	NA	NA
	Tree density	Vegetation contains a density of maturing tree and shrubs species comparable to that of the local remnant vegetation	Tree density	The density of shrubs or trees with a stem diameter > 5cm is comparable to the local remnant vegetation	No./area	11	85	27	26	0	NA	NA	NA

Table 6.12 (Cont'd)
Southern Woodland Conservation Area – Completion Criteria Status

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Primary Performance Indicators	Unit of measure	Woodland ecosystem range 2019		SVCA01	SVCA02	SVCA03	SVCA04	SVCA05	SVCA06
						Lower	Upper						
Phase 5: Ecosystem & Landuse Sustainability (Cont'd)	Ecosystem health	The vegetation is in a condition comparable to that of the local remnant vegetation.	Healthy trees	The percentage of the tree population which are in healthy condition and that the percentage is comparable to the local remnant vegetation	% population	11	36	22.2	34.6	0	NA	NA	NA
			Flowers/fruit: Trees	The presence of reproductive structures such as buds, flowers or fruit provides evidence that the ecosystem is maturing, capable of recruitment and can provide habitat resources comparable to that of the local remnant vegetation	% population	0	21	11.1	0	0	NA	NA	NA

Green = Meets or exceeds completion criteria.
Blue = Soil performance indicator target falls within industry guidelines but may not be similar to local soils.
NA = Not Applicable.

Source: DnA Environmental (2019)

Table 6.13
Farmland – Completion Criteria Status

Rehabilitation Phase	Completion criteria	Performance Indicators	Unit of measure	Pasture						Woodland		
				UGPast01	UGPast02	UGPast03	UGPast04	UGPast05	UGPast06	UGWood01	UGWood02	UGWood03
Phase 2: Landform establishment and stability	Landform suitable for final landuse and generally compatible with surrounding topography and final landform design	Slope	< Degrees (18°)	2	2	3	5	2	2	2	1	4
	No visible subsidence cracking	No. Subsidence Cracks	No.	0	0	0	0	0	0	9	3	0
		Sum of subsidence cracks width	m	0	0	0	0	0	0	0.17	0.34	0.00
Phase 3: Growth medium development	Soil properties are suitable for the establishment and maintenance of selected vegetation species	pH	pH (5.6-7.3)	6.2	6.2	5.7	5.6	6.1	5.4	5.5	5.4	5.8
		Organic Matter	% (>4.5)	5.5	4.8	4.7	4.5	6.7	4.6	3.0	4.0	6.9
		Phosphorous	mg/kg (50)	39.7	92.2	11.8	36.4	189.9	39.7	10.8	11.2	15.4
Phase 4: Ecosystem & Landuse Establishment	Landform is stable and performing as it was designed to do	LFA Stability	%	70.9	74.3	70	61.3	76.7	67.2	55.5	59.9	66.6
		LFA Landscape organisation	%	93	100	100	65	100	85	100	100	76
	Pasture productivity is comparable to analogue sites.	Green Dry Matter Biomass	kg/ha	1400	1600	1000	700	400	400	NA	NA	NA
Phase 5: Ecosystem & Landuse Sustainability	Landform is ecologically functional and performing as it was designed to do	LFA Infiltration	%	49.8	54.4	50.6	35.4	47.2	39.8	38.7	45.5	45.1
		LFA Nutrient recycling	%	47.7	51.8	45.5	30.1	47.1	37.7	38.5	46	43.8
	Ground layer contains protective ground cover and habitat structure comparable with the local remnant vegetation	Perennial plant cover (< 0.5m)	%	28.0	30.5	47	39.5	49	46	0	8	42
		Total Ground Cover	%	90.5	100	93.5	62.5	96	73.0	76.5	87	80
	Vegetation contains a diversity of species per square meter comparable to that of the local remnant vegetation	Native understorey abundance	> species/m2	2.2	2.0	7.0	5.4	1.4	1.8	0.2	5	6
		Exotic understorey abundance	< species/m2	4.8	5.2	4	1.6	8.4	4.4	0.4	0	2.2
	Native ground cover abundance is comparable to that of the local remnant vegetation	Percent ground cover provided by native vegetation <0.5m tall	%	37.0	38.9	69.9	72.4	23.3	33.9	25	100	78.9
	The vegetation is developing in structure and complexity comparable to that of the local remnant vegetation	Foliage cover 0.5 - 2 m	% cover	NA	NA	NA	NA	NA	NA	13	22	11.3
		Foliage cover 2 - 4m	% cover	NA	NA	NA	NA	NA	NA	20.5	16	6
		Foliage cover 4 - 6m	% cover	NA	NA	NA	NA	NA	NA	21	14	2
		Foliage cover >6m	% cover	NA	NA	NA	NA	NA	NA	4	20	0

Green = Meets or exceeds completion criteria.
Blue = Soil performance indicator target falls within industry guidelines but may not be similar to local soils.
NA = Not Applicable.

Source: DnA Environmental (2019)

Nine priority and declared weed species were recorded across the underground mining monitoring sites, including Galenia (*Galenia pubescens*), Fireweed (*Senecio madagascariensis*) and Tiger Pear (*Opuntia aurantiaca*) which were the most common across multiple sites. One woodland monitoring site and several pasture monitoring sites displayed higher abundances of exotic species than comparable reference sites, although the abundance of exotic species has been largely attributed to pre-mining historic agricultural activities which degraded native grasslands.

Reportable Incidents

No reportable incidents were recorded during the reporting period.

Further Improvements

As a result of the monitoring undertaken during the reporting period the following improvements are planned.

- Livestock exclusion within the entire length of the Bowmans Creek Riparian corridor .
- Within the Bowmans Creek Riparian corridor, investigations will be undertaken to identify crucial erosion areas and where rehabilitation and restoration works are required.
- The successful establishment of vegetation within areas of subsidence rehabilitation will continue to be monitored and supplementary works undertaken as required.

Ongoing weed control will continue to be undertaken, including manual methods and use of cut and paste herbicide where existing native trees and shrubs are present to minimise collateral mortality associated with broadcast spraying.

6.7 HERITAGE

Management of heritage continued to be undertaken in accordance with the October 2017 Heritage Management Plan. During the reporting period this included inspection of planned ground disturbances associated with boreholes and end of panel inspections for LW 201 and LW 202. Salvage works were also undertaken in accordance with the Aboriginal Heritage Impact Permit for Panel LW 203.

Ongoing consultation with the Aboriginal community also continued through the Aboriginal Community Consultative Forums (ACCF), of which two were held during the reporting period on 18 June and 10 December 2019. During ACCF meetings, Company personnel and representatives of the Aboriginal community discussed current and future mine activities, upcoming cultural heritage and archaeological fieldwork, and any issues associated with the management of cultural heritage on site.

There were no reportable heritage incidents during the reporting period and currently no further improvements or changes to heritage management are planned during the next reporting period.

6.8 SUBSIDENCE

Environmental Management

To date, five Extraction Plans have been prepared/approved for the ACP. Environmental assessments, public safety management plans, subsidence assessments and subsidence monitoring plans have been incorporated into Extraction Plans as required. Copies of all relevant Extraction Plans and approvals are available on the ACP website.

Environmental Performance

Underground longwall mining operations commenced in February 2007, with mining of the PG seam (LW 1 to LW 8) and ULD seam (LW 101 to LW 106A) since completed. Mining operations during the reporting period were undertaken in LW 202 and LW 203, with extraction of LW 202 completed in August 2019 and extraction of LW 203 commencing in October 2019.

Subsidence monitoring was undertaken in accordance with the *Ashton Coal Mine Longwalls 201 to 204 Extraction Plan – November 2016* and included both regular surveys following longitudinal and transverse subsidence lines as well as visual inspections of environmental, land and infrastructure features. Subsidence monitoring for each longwall includes survey lines located over the start and end line for each panel as well as various traverse cross lines relevant to the panel, surface or strata features. **Table 6.14** summarises the maximum incremental and cumulative subsidence parameters for each of the relevant monitoring locations during the reporting period.

Table 6.14
Incremental and Cumulative Subsidence Monitoring Results

Location	Subsidence (m)		Strain (mm/m) (GB / SE)[1]		Tilt (mm/m) (GB / SE)[1]	
	Incremental	Cumulative	Incremental	Cumulative	Incremental	Cumulative
LW 202						
Predicted	*2.7*	*5.7*	*40 / 70*	*63 / 150*	*70 / 140*	*110 / 300*
LW2CL2[2]	2.6	5.4	20 / NA	30 / 63	33 / NA	40 / 212
LW202CL2[2,3]	2.35	4.0	15 / NA	10 / 45	32 / NA	45 / 90
XL5[2]	2.45	5.5	11 / 50	33 / 75	25 / 62	50 / 112
LW 203						
Predicted	*2.7*	*5.8*	*35 / 61*	*56 / 130*	*61 / 120*	*94 / 260*
XL5	**2.71**	**5.83**	13 / NA	15 / 73	50 / NA	60 / 127

Note 1: GB / SE = General Background / Stacked Edge.

Note 2: No stacked edge on this survey line for this longwall. NA indicates that stacked edges are not applicable to this longwall. Note that subsidence may have a stacked edge effect from upper seam extraction.

Note 3: Line installed post Pikes Gully (PG) seam extraction. Cumulative figure therefore excludes PG subsidence.

Source: Ashton Coal Operations Pty Limited (2020).

Subsidence monitoring indicated an exceedance of the incremental and cumulative subsidence prediction at monitoring location XL5 for Panel LW 203. In accordance with the Trigger Action Response Plan (TARP) outlined within the approved extraction plan, an exceedance of less than 15% deviance to the predicted subsidence triggered a Level 1 response. This included internal notification and continued monitoring.

Visual observations of cracking towards the northern end of LW 202 also triggered a Level 1 TARP response. The subsidence cracking was located on ACP owned land, amongst dense regrowth vegetation away from infrastructure, access tracks or other publicly accessible areas. A program of remedial backfilling, ripping and seeding was developed and commenced during the reporting period. These works will be continued in the next reporting period, as predicted subsidence impacts from LW 203 (which overlap with LW 202) develop.

Minor subsidence impacts including cracking were also observed on a private Right of Way associated with Property 130 during the reporting period. These impacts were consistent with Extraction Plan predictions. Alternate access to the property was arranged via the secondary access road prior to repair works, which were completed during the reporting period.

Ponding of water has been observed as a consequence of subsidence in areas which were typically flat prior to mining operations. Remediation of areas which display ponding is planned to occur following the completion of multi-seam mining operations below the surface. Ponding is considered low risk and has served to provide temporary water sources for stock and wildlife at the surface.

There were no further recorded or observed subsidence impacts, incidents, service difficulties or community complaints during the reporting period.

Reportable Incidents and Further Improvements

The results of subsidence monitoring indicate that subsidence-related impacts are generally in accordance with predicted impact levels with no reportable incidents during the reporting period. Monitoring will continue to be undertaken in accordance with the current Extraction Plan during the next reporting period. No further improvements to subsidence management or monitoring are considered necessary at this stage.

6.9 WASTE MANAGEMENT

In accordance with *Schedule 2, Condition 39* of DA 309-11-2001-i, a summary of waste management during the reporting period is provided as follows.

Wastes generated on site during the reporting period included the following.

- Hazardous (Recycled) – sludge, empty drums, lead acid batteries, oil filters, oily water, waste grease and waste oil.
- Non-Hazardous (Recycled) – paper and cardboard, confidential documents, scrap steel and timber.
- Hazardous (Disposal) – medical and sanitary waste, oily rags, asbestos and chemical anchors.
- Non-Hazardous (Disposal) – mixed solid waste.

As part of ACOL's Environmental Management Strategy and as outlined in the current MOP for the site, appropriate waste segregation and recycling are encouraged through the provision of appropriate on site recycling facilities.

The approximate volume of each waste stream generated during the reporting period is presented in **Table 6.15** together with the proportion of waste recycled. The proportion of waste recycled increased from 36.95% in 2018 to 40.39% in 2019, whilst the total volume of waste increased by approximately 12.4%.

There were no reportable incidents relating to waste during the reporting period. Waste volumes will continue to be monitored into the future and opportunities to minimise waste or increase recycling implemented, where appropriate.

Table 6.15
Approximate Waste Volumes 2017 to 2019

Waste Class	Waste Stream	Total Volume (kg)[1]		
		2017	2018	2019
Hazardous (Recycled)	Sludge	4 380	3 078	10 071
	Empty Drums	2 648	3 562	2 060
	Lead Acid Batteries	436	438	1 032
	Oil Filters	753	5 325	1 345
	Oily Water (Off Site)	106 447	19 258	66 942
	Waste Coolant	-	-	1 370
	Waste Grease	1 209	624	286
	Waste Oil	13 600	23 662	21 100
	Coagulant	-	-	1 936
	Activated Carbon	-	150	-
	Recycled (%)	**18.43%**	**9.36%**	**15.76%**
Non-Hazardous (Recycled)	Paper and Cardboard	7 085	6 685	6 710
	Confidential Documents	465	605	288
	Scrap Steel	174 020	145 760	149 440
	Timber (Uncontaminated)	38 840	12 200	9 340
	Recycled (%)	**31.38%**	**27.58%**	**24.62%**
Hazardous (Disposal)	Medical and Sanitary Waste	326	261	465
	Hydraulic Hose	870	1 282	-
	Asbestos	-	-	2 200
	Oily Rags	422	499	580
	Chemical Anchors	2 005	1 039	1 050
	Recycled (%)	**0.52%**	**0.51%**	**0.64%**
Non-Hazardous (Disposal)	Diesel Particulate Filters	-	10 563	17 145
	Mixed Solid Waste	348 885	364 132	379 920
	Recycled (%)	**49.67%**	**62.54%**	**58.97%**
Total Waste		**702 391**	**599 123**	**673 280**
Recycled Waste		**349 883**	**221 347**	**271 920**
Recycled Waste (%)		**49.81%**	**36.95%**	**40.39%**

Note 1: Combined waste volume generated by both the ACP open cut and underground mining operations.

Source: J R Richards & Sons total waste management report – ACP open cut and underground.

7. WATER MANAGEMENT

7.1 WATER TAKE AND BALANCE

The ACP has three primary water demands: aboveground dust suppression, underground supply and supply to the CHPP. **Table 7.1** presents the water take under each of the applicable water licences for the ACP over the 2018/2019 financial year (i.e. 1 July 2018 to 30 June 2019).

Table 7.1
Water Take – 2018/2019 Financial Year

WAL	Reference Number	Water Sharing Plan, Source and Management Zone	Entitlement (ML)	Passive Take / Inflows (ML)	Active Pumping (ML)	Total (ML)
Surface Water						
984	20AL201282	Hunter Regulated Water Sharing Plan, surface water, zone 3A (Glennies Creek)	9	0	0	0
997	20AL201311	Hunter Regulated Water Sharing Plan, surface water, zone 3A (Glennies Creek)	11	0	0	0
1120	20AL201624	Whole Water Source (Hunter Regulated River Water Source)	3	0	0	0
1121	20AL201625	Hunter Regulated Water Sharing Plan, surface water, zone 1B (Hunter River from Goulburn River Junction to Glennies Ck Junction)	335	4.30	3.40	7.7
1358	20AL203056	Hunter Regulated Water Sharing Plan, surface water, zone 3A (Glennies Creek)	4	0	0	0
6346	20AL203106	Hunter Regulated Water Sharing Plan, surface water, zone 1B (Hunter River from Goulburn River Junction to Glennies Creek Junction)	15.5	0	0	0
8404	20AL200491	Hunter Regulated Water Sharing Plan, surface water, zone 3A (Glennies Creek)	80	0	18.30	18.3
15583	20AL204249	Hunter Regulated Water Sharing Plan, surface water, zone 3A (Glennies Creek)	354	9.30	226.40	235.7
19510	20AL211015	Hunter Regulated Water Sharing Plan, surface water, zone 1B (Hunter River from Goulburn River Junction to Glennies Creek Junction)	130	0	0	0
23912	20AL211423	Hunter Unregulated and Alluvial Water Sources 2009, surface water, Whole Water Source (Jerry's Water Source) (Bowmans Creek)	14	0	0	0
29566	20AL212287	Hunter Unregulated and Alluvial Water Sources 2009, Aquifer, Jerry's Management Zone (Jerry's Water Source)	358	10.57	0	10.57
36702	20AL212975	Hunter Unregulated and Alluvial Water Sources 2009, Surface water, Jerry's Management Zone (Jerry's Water Source) (Bowmans Creek)	116	0	0	0
36703	20AL212976	Hunter Unregulated and Alluvial Water Sources 2009, Surface water, Jerry's Management Zone (Jerry's Water Source) (Bowmans Creek)	150	0	0	0

Table 7.1 (Cont'd)
Water Take – 2018/2019 Financial Year

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WAL	Reference Number	Water Sharing Plan, Source and Management Zone	Entitlement (ML)	Passive Take / Inflows (ML)	Active Pumping (ML)	Total (ML)
Groundwater						
41501	20AL216171	North Coast Fractured and Porous Rock Groundwater Sources 2016, Sydney Basin-North Coast Groundwater Source	100	0	0	0
41552	20AL219014		511	149.40	0	149.4
41553	20AL219015		81	0	0	0
		Total 2018/2019	**1 579.5**	**173.57**	**248.10**	**421.67**
		Total 2017/2018		*53.01*	*262.33*	*315.34*
		Total 2016/2017		*74.30*	*244.28*	*318.58*
Source: Ashton Coal Operations Pty Limited.						

Water take is measured and partitioned in accordance with the protocol detailed within the Water Management Plan (WMP), which incorporates a combination of site observations, measurements and predictions of the site water balance model. Water take occurs via two separate methods: incidental (or passive) take, and pumped surface water take. Incidental take occurs through mining-induced fracturing of aquifers which report to the underground workings. This water is removed from the mine by a network of dewatering pumps. Pumped surface water take involves active pumping from Glennies Creek and the Hunter River to provide higher quality water for a variety of uses including potable water, use in equipment and as fire-fighting water at the mine.

Both passive and active water take during the reporting period remained within licenced entitlements associated with individual WAL.

In addition to measuring water take, ACOL separately reports the ACP's water balance annually in accordance with the Mineral Council of Australia's *Water Accounting Framework for the Minerals Industry* (2012). **Table 7.2** provides a summary of the water inputs and outputs as well as the changes in water storage at the ACP during the reporting period.

Table 7.2
Input / Output Water Balance – 2019 Calendar Year

Page 1 of 2

Input / Output	Component	Sub – Component	Water Volume (ML)[1]
2019 Inputs	Surface Water	Precipitation and Runoff	350.1
		Rivers and Creeks	277.7
		External Surface Water Storages	0.0
	Groundwater	Aquifer Interception	287.0
		Bore Fields	0.0
		Entrainment	99.3
	Third Party Water	Contract / Municipal	0.4
		Waste Water	0.0
	Total Inputs		**1 014.5**

Table 7.2 (Cont'd)
Input / Output Water Balance – 2019 Calendar Year

Input / Output	Component	Sub – Component	Water Volume (ML)[1]
2019 Outputs	Surface Water	Discharge	0.0
		Environmental Flows	0.0
	Groundwater	Seepage	229.4
		Reinjection	0.0
	Supply to Third Party		0.0
	Other	Evaporation	279.2
		Entrainment	497.4
		Other (ventilation moisture loss)	246.1
	Total Outputs		**1 252.1**
Total Inputs minus Total Outputs			**-238.0**
Storage at the Start of 2019			**1 681.0**
Storage at the End of 2019			**1 500.0**
Overall Water Imbalance			**56.0**
Note 1: Volumes represent a combination of measured, simulated and estimated volumes with variable levels of confidence (low to high).			
Source: Hydro Engineering and Consulting Pty Ltd (2020).			

7.2 SURFACE WATER

Environmental Management

Surface water management at the ACP is conducted in accordance with the approved WMP and associated surface water monitoring program. The ACP site is a zero discharge site. No discharge off site occurred during the reporting period and no compensatory water was required by or provided to private landholders during the reporting period.

Environmental Performance

Water quality for the creeks and river surrounding ACP is monitored monthly by an independent consultant at 14 approved monitoring sites (see **Figure 7.1**) with sample analysis by a NATA accredited laboratory. Surface water quality (SWQ) monitoring data for the reporting period is summarised in **Table 7.1** and presented graphically in **Figure 7.2.** Data since 2012 is presented in **Figure 7.3**.

SWQ trigger levels specified within the WMP (and reproduced in **Table 7.1)** must be exceeded on three consecutive readings, or differ significantly from the preceding three readings, before an action response is required. Given the ongoing dry conditions, low flow trigger values (based on 5th and 95th percentile of background values) were applied to Bettys Creek and Bowmans Creek results during the reporting period. On five occasions exceedance of trigger values resulted in an action response of investigation by external expert hydrological engineers. Those trigger events, and subsequent investigation findings, are summarised as follows.

- Glennies Creek - January to March 2019, low pH was recorded at SM7 (7.5, 7.5 and 7.6), SM8 (7.4, 7.4 and 7.5) and SM11A (7.4, 7.6 and 7.6). This is not likely to have occurred due to ACP mining-related effects. Lower pH values have previously been recorded concurrently (typically in summer months) at ACP monitoring sites and monitoring locations upstream of the ACP, possibly influenced by release of lower pH water from Glennies Creek Dam.

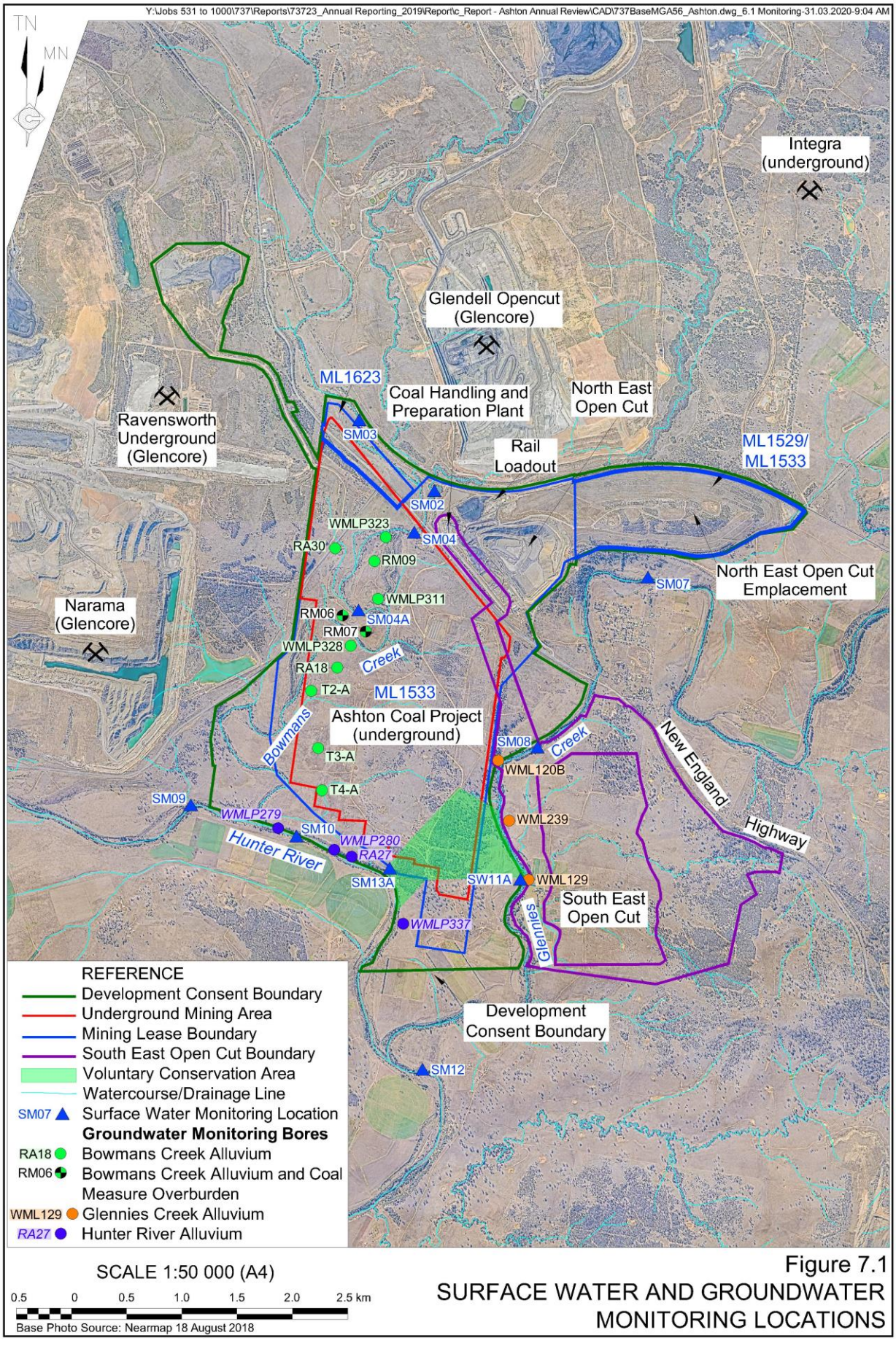


Figure 7.1
SURFACE WATER AND GROUNDWATER MONITORING LOCATIONS

Table 7.3
Surface Water Monitoring Summary - 2019

Sampling Site^	pH	pH Trigger Value[1]	EC (µS/cm)	EC Trigger Value[2]	TDS (mg/L)	TDS Trigger Value[2]	TSS (mg/L)	TSS Trigger Value[2]
Bettys Creek								
SM1	6.8 – 7.6 (7.2)	<6.97 - >7.70 [<6.6 - > 8.0]	314 – 442 (375)	>1 198 [>1 811]	265-389 (314)	>794 [>1 193]	265 – 389 (314)	>122 [>273]
SM2	NS	<6.87 - >7.63 [<6.6 - >7.6]	NS	>1 144 [>1 803]	NS	>732 [>1 105]	NS	>116 [>116]
Bowmans Creek								
SM3	6.6 – 7.3 (7.0)	<7.42 - >7.88 [<7.2 - >8.1]	1 337 – 1 776 (1 556)	>1 440 [>1 620]	868 – 1 300 (1084)	>878 [>965]	14 – 427 (221)	>20 [>62]
SM4	7.6 – 8.3 (8.0)	<7.71 - >8.09 [<7.4 - > 8.3]	3 930 – 5 620 (4 346)	>3 656 [>10 790]	2 380 – 3 650 (2 800)	>2 270 [>6 331]	17 – 818 (180)	>37 [>104]
SM4A	NS	<7.60 - >8.10 [<7.4 - >8.3]	NS	>1 140 [>1 796]	NS	>653 [>1 067]	NS	>19 [>44]
SM5	NS	<7.66 - >7.97 [<7.5 - > 8.1]	NS	>1 542 [>1 796]	NS	>891 [>1 031]	NS	>20 [>31]
SM6	7.8 – 8.5 (8.1)	<7.84 - >8.23 [<7.6 - >8.4]	456 – **2 240** (1 222)	>1 108 [>1 831]	342 – 1 500 (796)	>642 [>810]	9 – 495 (143)	>26 [>60]
Glennies Creek								
SM7	**7.5** – 8.2 (7.8)	<7.66 - >8.03 [<7.5 - >8.2]	268 – 407 (299)	>577 [>763]	158 – 262 (205)	>342 [>424]	158 – 262 (205)	>19 [>35]
SM8	**7.4** – 8.1 (7.7)	<7.62 - >7.96 [<7.3 - >8.1]	269 – 413 (292)	>562 [>756]	157 – 241 (199)	>334 [>422]	157 – 241 (199)	>22 [>45]
SM11A	**7.4** – 8.1 (7.8)	<7.74 - >8.02 [<7.6 - >8.3]	270 – 418 (296)	>564 [>768]	152 – 274 (202)	>332 [>409]	152 – 274 (202)	>20 [>43]
Hunter River								
SM9	7.8 – 8.3 (8.0)	<8.00 - >8.32 [<7.8 - >8.4]	432 – 1 087 (741)	>942 [>1 101]	281 – 652 (451)	>541 [>646]	21 –**142** (49)	>34 [>69]
SM10	7.8 – 8.3 (8.1)	<8.00 - >8.32 [<7.8 - >8.4]	435 – 1 095 (742)	>942 [>1 101]	292 – **648** (451)	>526 [>644]	11 – **145** (51)	>42 [>63]
SM12	7.7 – 8.3 (8.0)	<7.84 - >8.24 [<7.6 - >8.3]	209 – 515 (412)	>728 [>913]	179 – 334 (266)	>415 [>506]	179 – **334** (266)	>36 [>82]
SM13A	7.8 – 8.3 (8.0)	<8.02 - >8.32 [<7.8 - >8.4]	432 – 1 114 (730)	>927 [>1 080]	299 – **659** (449)	>516 [>639]	299 – 659 (449)	>41 [>76]

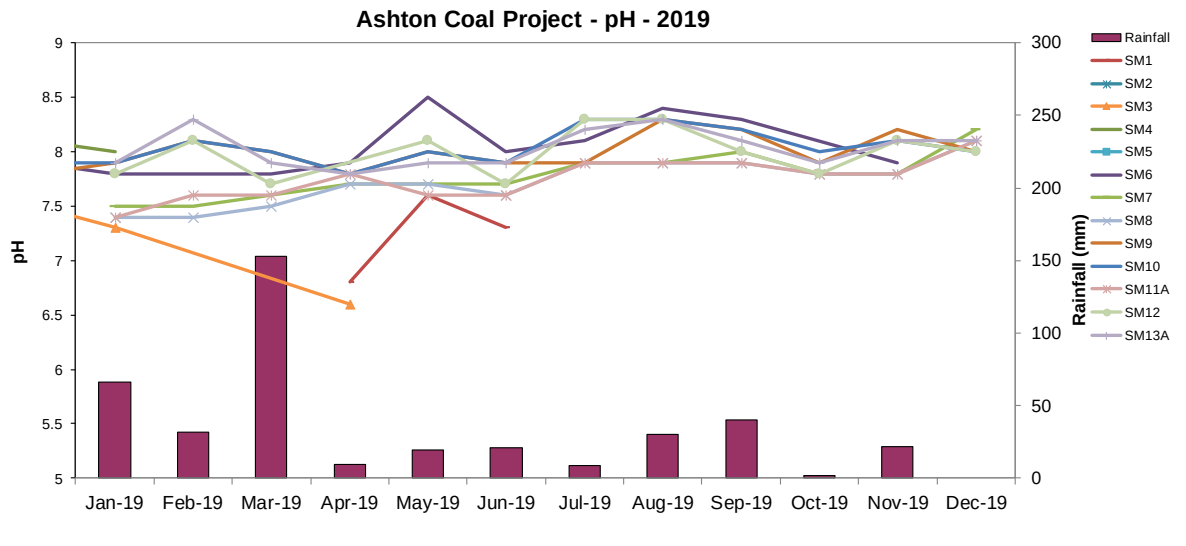
( ) = Average [ ] = no / low flow trigger value NS – Not Sampled (Dry)

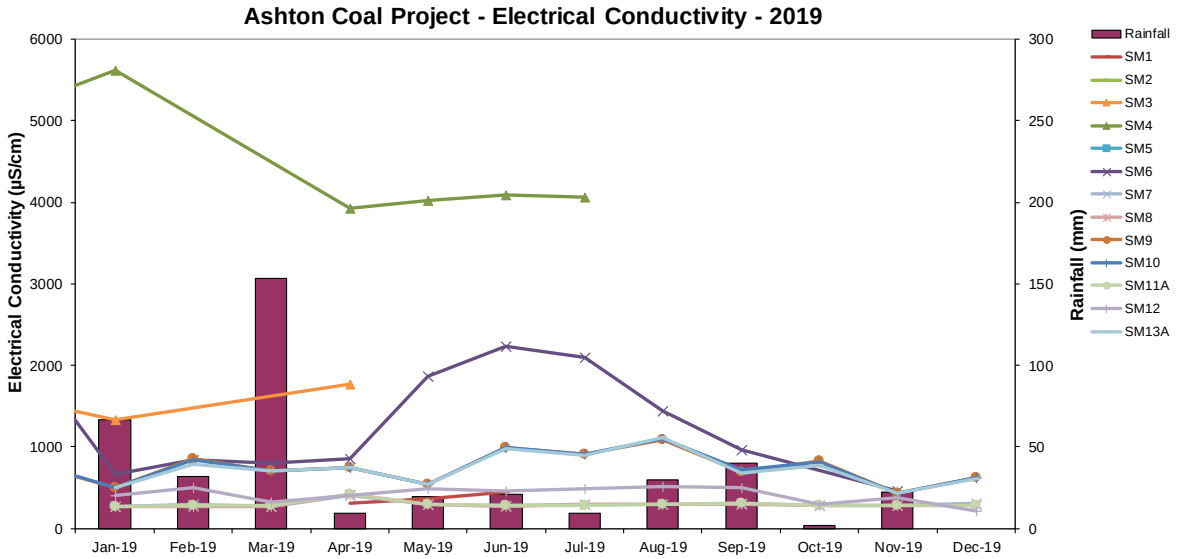
^ See **Figure 7.1** **Bold Red Text –** Exceedance of Trigger Level for three consecutive samples.

Note 1: pH trigger values are less than the 20th and 5th percentile of baseline values (i.e. to December 2011) for each site during flow and no / low flow conditions respectively.

Note 2: EC and TSS trigger values are greater than the 80th and 95th percentile of baseline values (i.e. to December 2011) for each site during flow and no / low flow conditions respectively.

Source: Ashton Coal Operations Pty Limited.





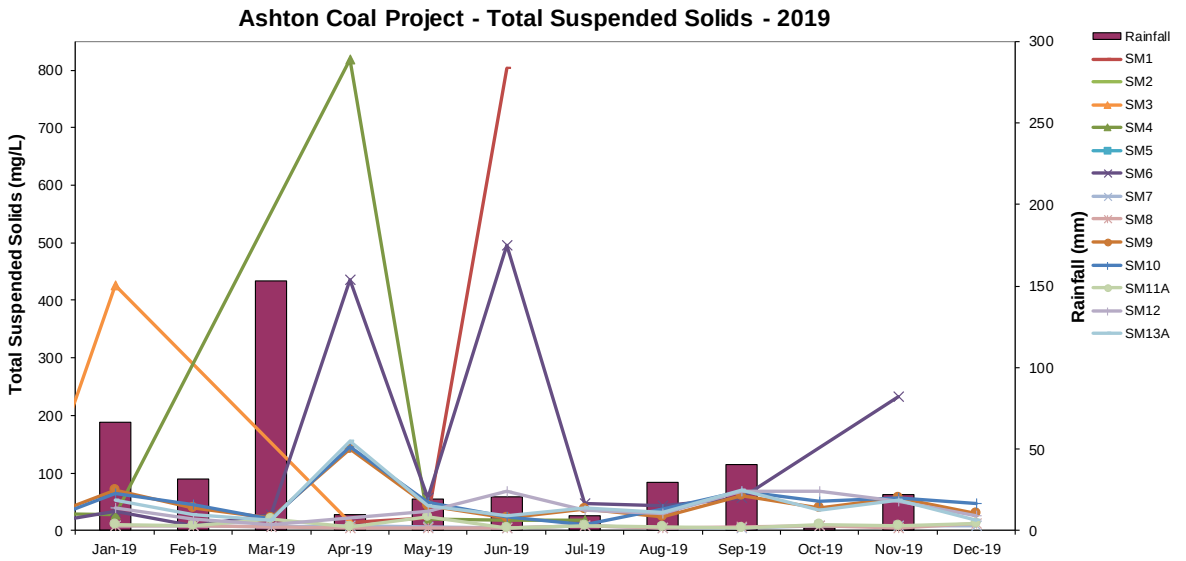


Figure 7.2 Surface Water Quality Monitoring Results – 2019

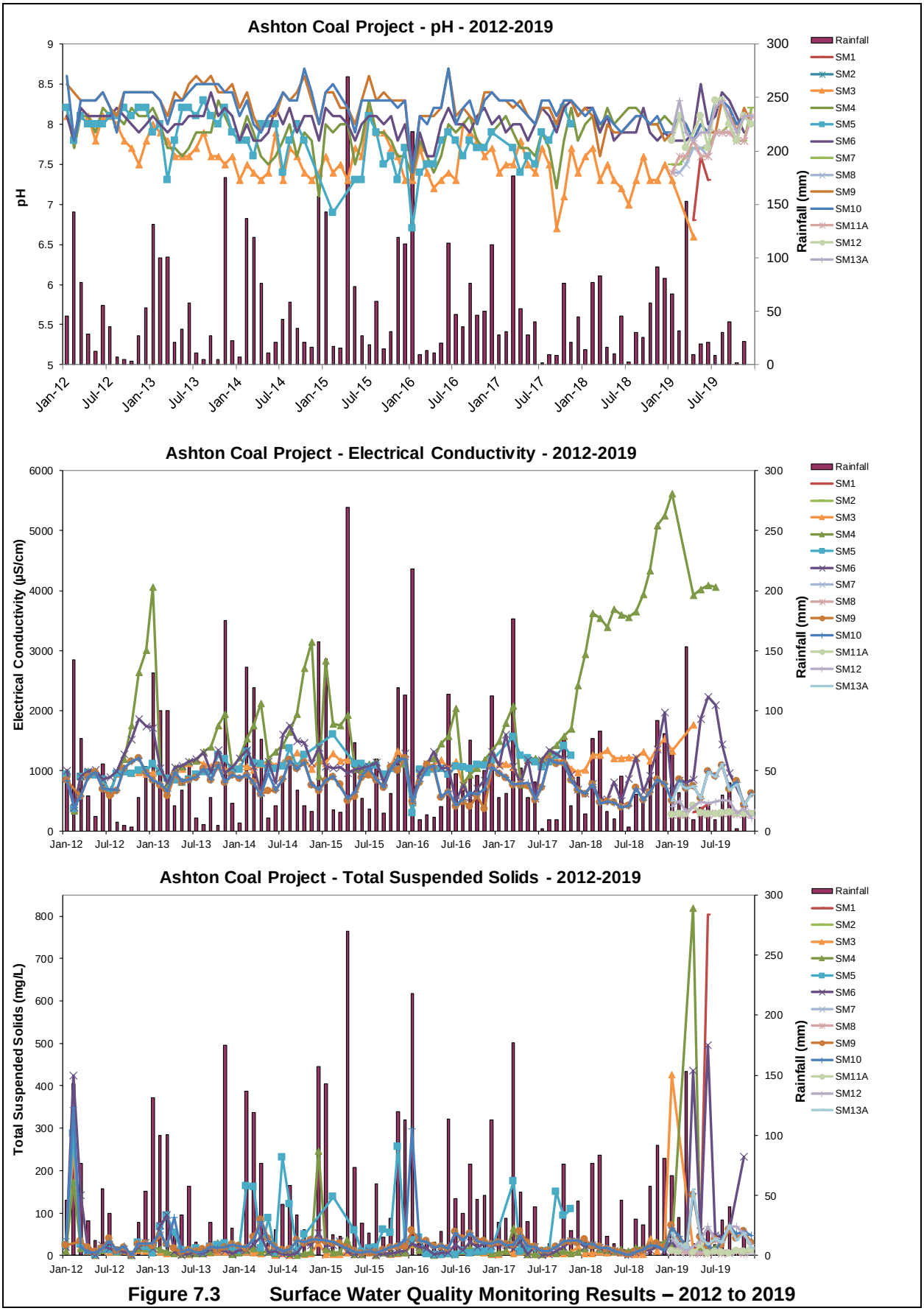


Figure 7.3 Surface Water Quality Monitoring Results – 2012 to 2019

- SM13A (Hunter River) – March to June, decreased pH (7.9, 7.8, 7.9, 7.9) was considered to be related to discharge from the river alluvium, with little risk that mine water (which is at a much lower level than alluvial groundwater and river levels) could migrate to the river.
- Lower Bowmans Creek - May to July, elevated electrical conductivity was recorded at SM6 (1,863µS/cm, 2,240µS/cm, and 2,100µS/cm). The elevated electrical conductivity was considered to be due to sampling from non-flowing, drying pools, with increasingly concentrated solute load and does not represent an EC increase due to mining impacts.
- Hunter River - June to August, elevated Total Dissolved Solids (TDS) were recorded at SM10 (639mg/L, 533mg/L, 648mg/L) and SM13A (659mg/L, 565mg/L, 623mg/L). These levels are considered to be related to discharge from the river alluvium, with the higher TDS in the river alluvium becoming more of an influence at lower river flow rates. Little risk that mine water, which is at a much lower level than alluvial groundwater and river levels, could affect river TDS values.
- Hunter River - September to November, elevated Total Suspended Solids (TSS) at SM9 (60mg/L, 40mg/L, 56mg/L), SM10 (69mg/L, 51mg/L, 56mg/L), and SM12 (69mg/L, 68mg/L, 50mg/L) and December at SM10 (47mg/L) related to low river flow and low rainfall, as well as elevated TSS in river flow from upstream of ACP. No indication of mining-related effect on TSS in the Hunter River.

Results during this reporting period follow similar trends to previous years in the Hunter River and Glennies Creek, which is to be expected since they are regulated water flows and generally maintain consistent minimum flow although low flows were recorded. The water quality for both Bettys Creek and Bowmans Creek was indicative of the continued dry conditions with sample sites dry throughout the majority of the reporting period. However, sufficient water to allow sampling was generally present at monitoring location SM6 (Bowmans Creek) with ten samples obtained. As expected, due to the dry conditions, when present, water tended to record higher conductivities and suspended solids. During dry conditions, higher conductivity is considered likely to result from the greater proportion of contribution from coal outcrops, whilst higher suspended solids is due to the low water volume and influence of silts and muds at the base of the creeks.

Mining impact on surface flow in Bowmans Creek is monitored via comparison of the ACP flow monitoring station J2 and the Water NSW flow monitoring station 210130 *D/S Bowmans*. Both monitoring stations recorded Bowmans Creek as dry (no flow) for the whole of the reporting period.

Reportable Incidents

As the investigations of trigger action response levels determined water quality was not affected by the ACP, no reportable incidents occurred during the reporting period.

Further Improvements

No alteration to current surface water control measures are planned or currently considered necessary.

7.3 GROUNDWATER

Environmental Management

Groundwater management at the ACP is conducted in accordance with the approved WMP and associated groundwater monitoring program. A groundwater model based on mine plans and past groundwater monitoring results is employed to predict changes to the local hydrological regime and potential impacts on groundwater associated with ACP activities. In order to determine if groundwater impacts associated with ACP operations remain consistent with those predicted a groundwater monitoring network has been established (see **Figure 7.1**) targeting the following aquifers.

- Saturated quaternary sediments (alluvium) including:
  - Bowmans Creek Alluvium (BCA);
  - Glennies Creek Alluvium (GCA); and
  - Hunter River Alluvium (HRA).
- Shallow Permian sandstone and minor coal seams, referred to as coal measures overburden (CMOB).
- Permian coal measures of varying thickness targeted by mining (Coal Measure).

As part of the approved WMP, impact assessment criteria and TARPs have been developed to investigate and, if necessary, respond to any monitoring results that are inconsistent with predicted impacts / defined criteria.

Groundwater monitoring was undertaken by Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) throughout the reporting period including both water level and water quality. A detailed annual groundwater summary prepared by AGE is presented as **Appendix 2**, with key monitoring observations summarised in the following sections.

Groundwater Levels

Monitoring results for BCA bores indicated that groundwater levels declined throughout the reporting period, with a maximum decline of 1.31m recorded for bore PB1. Several BCA bores, including T2A, WMLP311, PB1 and RA18 were also recorded as dry during the reporting period. Groundwater levels for all BCA bores were recorded below the relevant trigger values for each monitoring location over at least three consecutive groundwater level measurements, triggering the response plan outlined in the WMP.

Investigations conducted by AGE (2020) (see **Appendix 2**) concluded that groundwater level declines recorded for BCA bores during the reporting period are linked to regional drought conditions and are primarily the result of decreased rainfall recharge due to drought conditions coupled with drawdown associated with underground operations (which are approved to intercept this groundwater source). As Bowmans Creek is not a flow-regulated Creek,

monitoring results for BCA bores are more reflective of natural regional climatic conditions, compared to the bores targeting alluvial aquifers associated with the flow-regulated Glennies Creek and the Hunter River.

Monitoring results for GCA bores indicated that groundwater levels were relatively stable during the reporting period, with a slight decline in groundwater levels observed between January and September 2019 prior to a recovery associated with increased water releases from the upstream Glennies Creek Dam during the last quarter of 2019. Similarly, groundwater levels recorded for HRA bores remained relatively stable, displaying a variation of +/- 0.2m across the reporting period. The relative stability of HRA groundwater levels is attributed to the regularity of controlled releases in the Hunter River upstream of the ACP.

Groundwater results recorded during the reporting period for longwall specific monitoring bores indicated that water levels remained relatively stable for bores adjacent panels LW201/LW202, with the exception of the pressure head in the ULLD Seam which slightly declined. Groundwater levels recorded in bores adjacent to panels LW203/LW204 displayed variable groundwater level trends during the reporting period. Water levels in the surrounding Coal Measure bores were also stable during the reporting period, with the exception of bore WML262 in the ULD Seam which decreased by almost 5m between June and October 2019 - a significantly larger rate than surrounding bores. AGE (2020) notes that this bore has shown an enhanced rate of decline since late 2011 and potential mining impacts should be investigated should the trend continue.

Monitoring results for CMOB bores displayed a general decrease in groundwater levels over the reporting period. AGE (2020) concluded that results for CMOB bores reflect decreased rainfall recharge due to long-term drought conditions.

Generally, the site has experienced no mining impacts to the GCA and HRA alluvial aquifers and impacts are within predictions in the coal measures. A lack of rainfall recharge has impacted groundwater levels in the BCA and shallow CMOB bores.

Groundwater Quality

Groundwater pH measurements remained stable throughout the reporting period for all monitored aquifers. There were no consecutive exceedances of pH trigger values and the slight changes in pH are attributed to natural variation. As previously recorded, pH within alluvial bores was slightly acid to neutral with the following ranges.

- BCA – pH 6.37 (T3A) to 8.66 (RA18).
- GCA – pH 6.09 (WML129) to 7.69 (WMLP343).
- HRA – pH 6.58 (WMLP336) to 7.48 (WMLP279).
- Coal Measure – pH 5.64 (WML119) to 8.20 (WML262).
- CMOB - pH 6.63 (WML115B) to 7.67 (T4P).

During the reporting period the electrical conductivity (EC) within all monitored aquifers ranged from fresh to brackish as follows.

- BCA – 964 (WML113C) to 2,627µS/cm (WMLP326).
- GCA – 316 (WML129) to 1,034µS/cm (WMLP349).

- HRA – 615 (WMLP336) to 2,957µS/cm (WMLP337).
- Coal Measure – 749 (WML120A) to 4,458µS/cm (WML183).
- CMOB – 1,019 (T2P) to 3,203µS/cm (WML115B).

EC levels were relatively steady throughout 2019, with no prevailing trend being evident except within the BCA bores. ECs within the BCA bores continued to increase during 2019 due to a decline in BCA water levels. Three BCA bores exceeded the trigger levels on three consecutive occasions, triggering the response plan outlined in the WMP. These bores have been investigated on two previous occasions. These investigations concluded that BCA EC levels have increased as a result of reduced rainfall recharge. This trend is expected to persist if the water levels in the BCA continues to decline. Whilst minor fluctuations occurred within the other aquifers, no significant trends were identified.

Analysis of major ions indicated that the similar CMOB, BCA and HRA water types are distinguishable from the GCA and the coal measure water types, due to the differing water source and recharge/discharge mechanism associated with each body. Dissolved metals, select nutrients, turbidity and cyanide concentrations were also compared against ANZECC|ARMCANZ livestock limits (ANZECC & ARMCANZ, 2000). There were no exceedances for any of the analytes assessed.

Reportable Incidents

No reportable incidents occurred during the reporting period. Whilst the trigger action response within the WMP was enacted for elevated EC results and decreasing water levels in the BCA bores, subsequent investigation concluded that these trigger events were attributable to the ongoing drought conditions and no further action (except continued monitoring) was required.

Further Improvements

Monitoring will continue in accordance with the current Water Management Plan (WMP), with a review of the WMP planned for the next reporting period to reflect the new EPL groundwater monitoring sites (see Section 10). A review of the site groundwater model will also be completed during the next reporting period, which will result in revision of groundwater make predictions.

8. REHABILITATION

8.1 REHABILITATION PERFORMANCE DURING THE REPORTING PERIOD

Figure 8.1 shows the status of rehabilitation and a summary of the areas of rehabilitation is provided in **Table 8.1**.

Table 8.1
Rehabilitation Summary

	Previous Reporting Period (Actual)	This Reporting Period (Actual)	Next Reporting Period (Forecast)
Mine Area Type	**2018 (ha)**	**2019 (ha)**	**2020 (ha)**
Total mine footprint[1]	909.6	909.6	909.6
Total active disturbance	177.3	178.9	178.9
Land being prepared for rehabilitation	0	0	0
Land under active rehabilitation	732.2	733.2	733.2
Completed rehabilitation[2]	0	0	0
Note 1: Excludes subsidence remediation areas. Note 2: Areas which have been formally relinquished or signed off by the relevant agency.			

During the reporting period minor rehabilitation works were completed in accordance with Ground Disturbance Permits for gas drainage infrastructure, exploration boreholes and archaeological scrape sites (see **Figures 8.1** and **8.2**). Furthermore, minor rehabilitation works were completed in areas including a private right of way and access tracks with surface cracks associated with subsidence. Rehabilitation of subsidence-related impacts included excavation to the limit of the crack, backfilling, compaction, topsoil spreading and seeding of the impacted areas.

Monitoring of NEOC rehabilitation (and other important biodiversity areas) was undertaken during May and June 2019 by DnA Environmental. Revised completion and performance criteria were developed and utilised for performance evaluation, and an amended MOP reflecting these updated criteria is to be submitted for approval during the next reporting period.

Monitoring outcomes for the Bowmans Creek Riparian corridor, SWCA, and farmland areas are discussed in Section 6.6, given that these areas principally relate to biodiversity management and improvement. A summary of the NEOC rehabilitation monitoring is discussed in the following Section.

Monitoring of the NEOC rehabilitation area includes assessment of areas rehabilitated to *mixed woodland habitat* (formerly “Trees Over Grass”) and *exotic pastures*. The current final land use for the NEOC rehabilitation is exotic pasture suitable for livestock grazing with patches of native trees to improve wildlife connectivity. Rehabilitation of the NEOC overburden emplacement commenced in 2005, with the entire ~140ha of rehabilitation being completed in 2012. There is currently ~68ha of rehabilitated exotic pasture and ~71ha of native trees and shrubs.

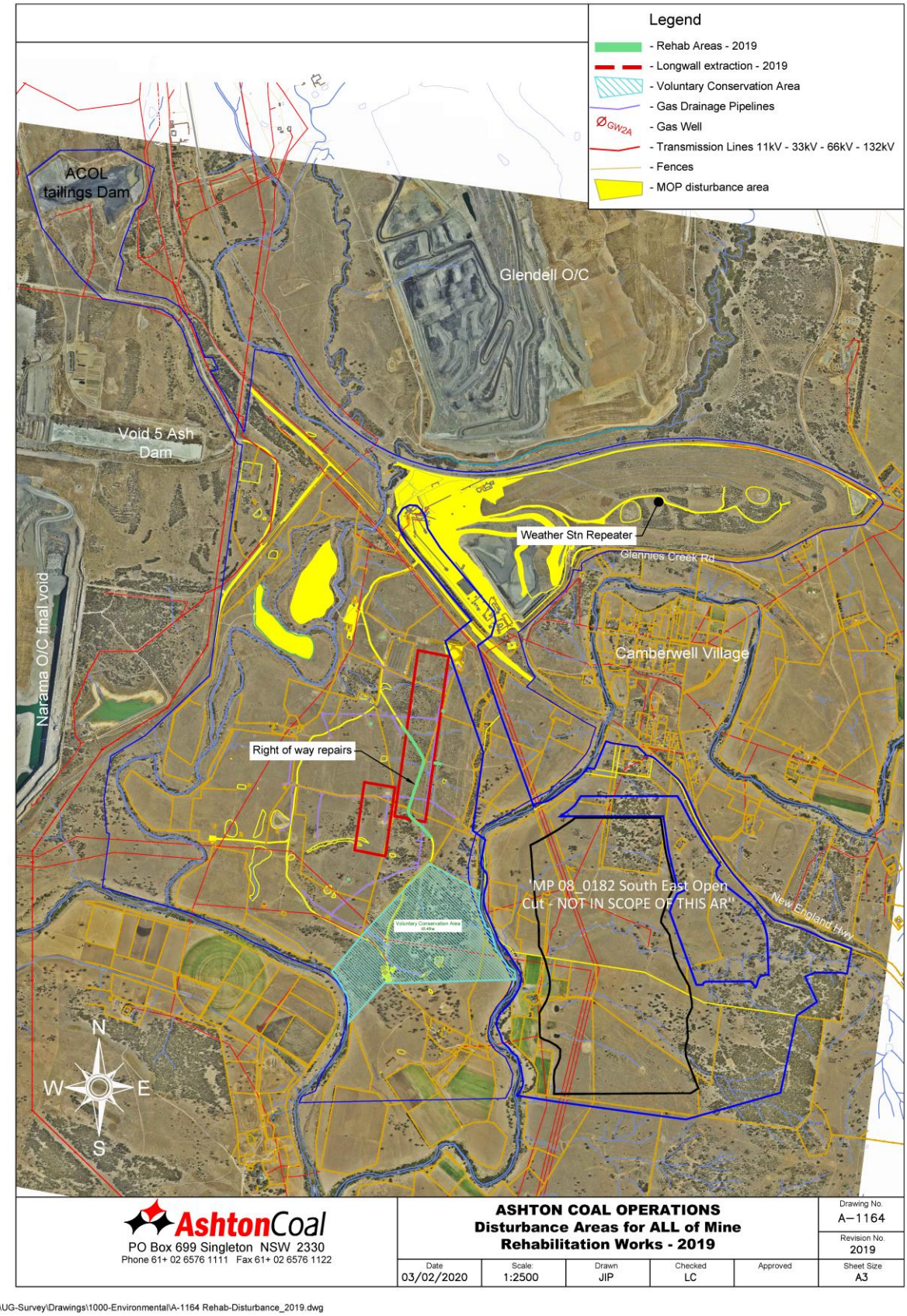


Figure 8.1 ACP Rehabilitation Activities (1 January – 31 December 2019)

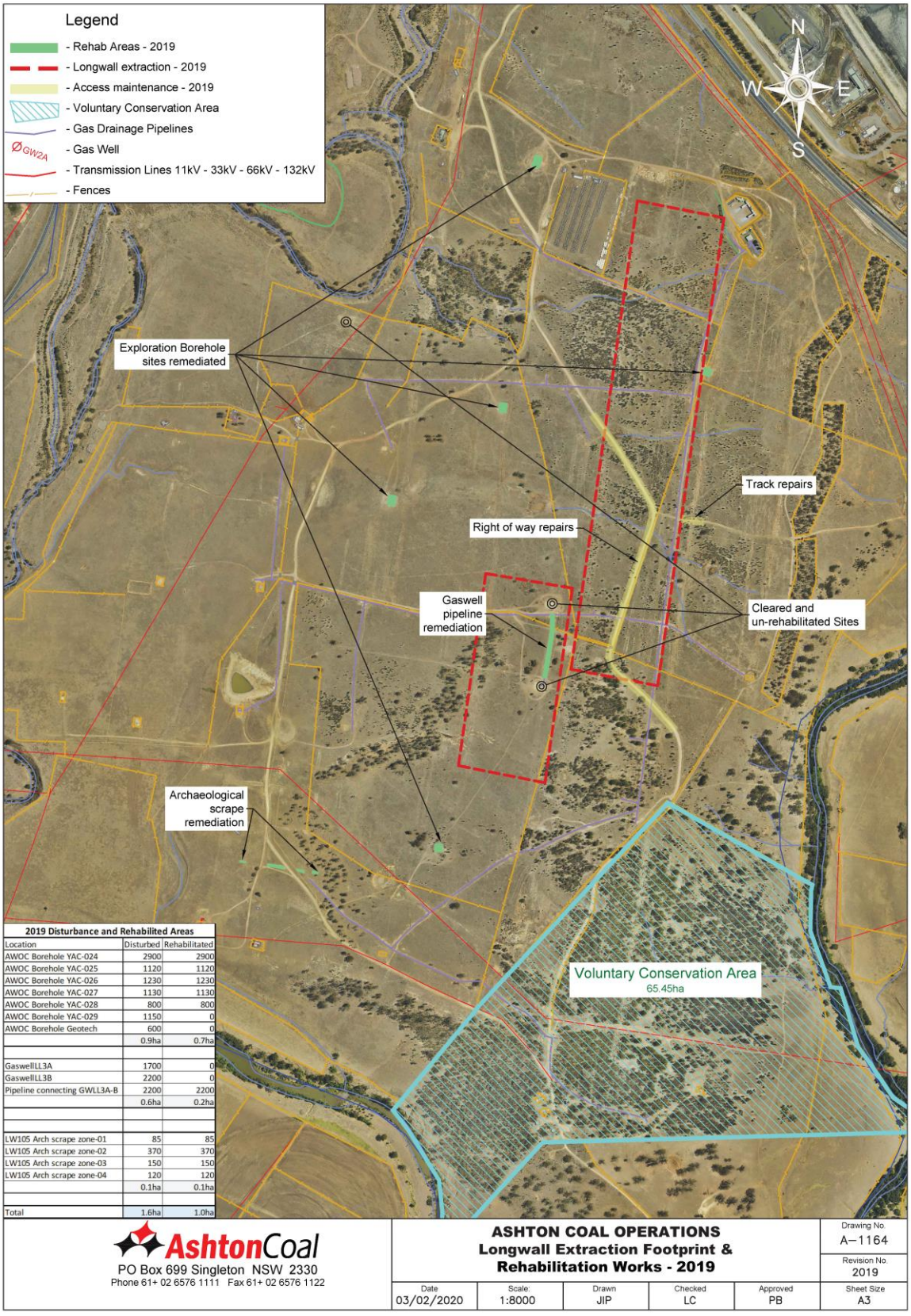


Figure 8.2 Rehabilitation Activities – Underground Area (1 January – 31 December 2019)

During the reporting period it was decided, following advice from DnA Environmental, that livestock grazing was no longer considered an appropriate post-mining landuse option for the NEOC rehabilitation. Instead, a single final land use domain, *"Mixed eucalypt woodland habitat",* consisting of additional woodland habitat of various densities and a higher diversity of shrubs, will cover the areas formerly referred to as *Pasture* and *Trees-over-Grass*. It is intended to convert exotic pasture areas into areas of eucalypt woodland habitat over the next five years (subject to improved meteorological conditions). This updated rehabilitation strategy will be reflected within a MOP amendment to be submitted during the next reporting period.

Rehabilitation monitoring continued to assess the performance of both the existing mixed woodland habitat and exotic perennial pastures, with three woodland rehabilitation sites and four exotic pasture rehabilitation sites being monitored in 2019. Rehabilitation performance is compared against a range of ecological performance targets and completion criteria obtained from non-mining-disturbed reference sites. In 2019, three mixed eucalypt woodland and three native grassland reference sites were established. The range values of each performance indicator will be measured annually to reflect seasonal conditions and disturbance events.

Rehabilitation performance is assessed against the completion criteria summarised in **Table 8.2**. Completion criteria targets are met if they are within the specified target ranges recorded at corresponding woodland or grassland reference sites, as represented by an appropriately coloured box.

The outcomes of the 2019 monitoring demonstrate that many completion targets have been met, with some exceptions. Ecological performance indicators for the mixed eucalypt woodland habitat and exotic pastures demonstrate these rehabilitated areas have generally developed into highly functional and stable communities, functionally comparable to the local woodlands and native grasslands. It was also noted that the extreme seasonal conditions experienced over the past ten to eleven years, combined with simultaneous changes in total grazing pressure (both livestock and macropods), has had a significant impact on the composition and diversity of both the NEOC vegetation and the reference sites.

Due to the age of the woodland rehabilitation and positive monitoring results, DnA Environmental suggest that monitoring effort in existing woodland rehabilitation areas could be scaled down to assessment every 3 to 5 years, with monitoring effort being focussed on assessing the development of new woodland areas established as part of the proposed pasture-to-woodland conversion program.

It was also recommended that, whilst areas of exotic perennial pastures previously established on the NEOC are likely to persist, additional sowing of exotic species should be avoided, as these highly competitive species can restrict germination and establishment of native tree and shrub seed and reduce the diversity of desirable grasses and herbs in the longer-term.

Table 8.2
North East Open Cut Rehabilitation Area – Rehabilitation Sites Completion Criteria Status 2019

Rehabilitation Phase	Completion criteria	Performance Indicators	Unit of measure	Exotic Pasture Sites				Woodland Sites		
				M2008 01	M2008 02	M2009 01	M2010 01	M2008 03	M2012 03	M2012 04
Phase 2: Landform establishment and stability	Landform suitable for final landuse and generally compatible with surrounding topography and final landform design	Slope	< Degrees (18°)	14	14	14	14	4	2	1
	Areas of active erosion are limited	No. Rills/Gullies	No.	0	0	0	0	0	0	0
Phase 3: Growth medium development	Soil properties are suitable for the establishment and maintenance of selected vegetation species	pH	pH (5.6-7.3)	7.2	7.0	8.08	7.1	8.3	9.19	8.87
		Organic Matter	% (>4.5)	5.3	5.6	14.0	8.9	6.6	5.7	6.1
		Phosphorous	mg/kg (50)	11.5	219.8	184.0	54.8	126.9	6.6	4.3
Phase 4: Ecosystem & Landuse Establishment	Landform is stable and performing as it was designed to do	LFA Stability	%	71.6	70.3	75.8	79.7	67.3	63.5	66.2
		LFA Landscape organisation	%	94	89	95	98	96	97	98
	Vegetation contains a diversity of species comparable to that of the local remnant vegetation	Diversity of shrubs and juvenile trees	% population	NA	0	0	0	100	100	100
		Exotic species richness	No./area	25	10	6	11	14	9	5
	Pasture productivity is comparable to analogue sites	Green Dry Matter Biomass	kg/ha	>3000	>3000	>3000	>3000	NA	NA	NA
	Vegetation contains a density of species comparable to that of the local remnant vegetation	Density of shrubs and juvenile trees	No./area	NA	0	0	0	50	2	119
	The vegetation is comprised by a range of growth forms comparable to that of the local remnant vegetation	Trees	No./area	NA	0	0	0	4	5	8
		Shrubs	No./area	NA	0	0	0	0	1	1
Phase 5: Ecosystem & Landuse Sustainability	Landform is ecologically functional and performing as it was designed to do	LFA Infiltration	%	46.2	46.2	51.9	57.6	53.6	53.6	49.6
		LFA Nutrient recycling	%	45.2	42.9	52.2	56.5	49.7	51.7	48.7
	Ground layer contains protective ground cover and habitat structure comparable with the local remnant vegetation	Perennial plant cover (< 0.5m)	%	51	29.0	29.5	54	43	23	1
		Total Ground Cover	%	94	87.5	90.0	95.5	99	94.5	69
	Vegetation contains a diversity of species per square meter comparable to that of the local remnant vegetation	Exotic understorey abundance	< species/m^2	6.8	1.6	1.2	2.8	1.8	2.4	0.6
	The vegetation is maturing and/or natural recruitment is occurring at rates similar to those of the local remnant vegetation	Shrubs and juvenile trees 0 - 0.5m in height	No./area	NA	NA	NA	NA	3	2	11
		Shrubs and juvenile trees 1.5 - 2m in height	No./area	NA	NA	NA	NA	9	0	13
		Shrubs and juvenile trees > 2m in height	No./area	NA	NA	NA	NA	31	0	83
	The vegetation is developing in structure and complexity comparable to that of the local remnant vegetation	Foliage cover 0.5 - 2 m	% cover	NA	NA	NA	NA	13	8	13
		Foliage cover >6m	% cover	NA	NA	NA	NA	6	2	4
	Vegetation contains a diversity of maturing tree and shrubs species comparable to that of the local remnant vegetation	Tree diversity	%	NA	NA	NA	NA	100	100	100
	Vegetation contains a density of maturing tree and shrubs species comparable to that of the local remnant vegetation	Tree density	No./area	NA	NA	NA	NA	28	11	55
	The vegetation is in a condition comparable to that of the local remnant vegetation.	Healthy trees	% population	NA	NA	NA	NA	53.6	100	56.4
		Flowers/fruit: Trees	% population	NA	NA	NA	NA	35.7	27.3	20

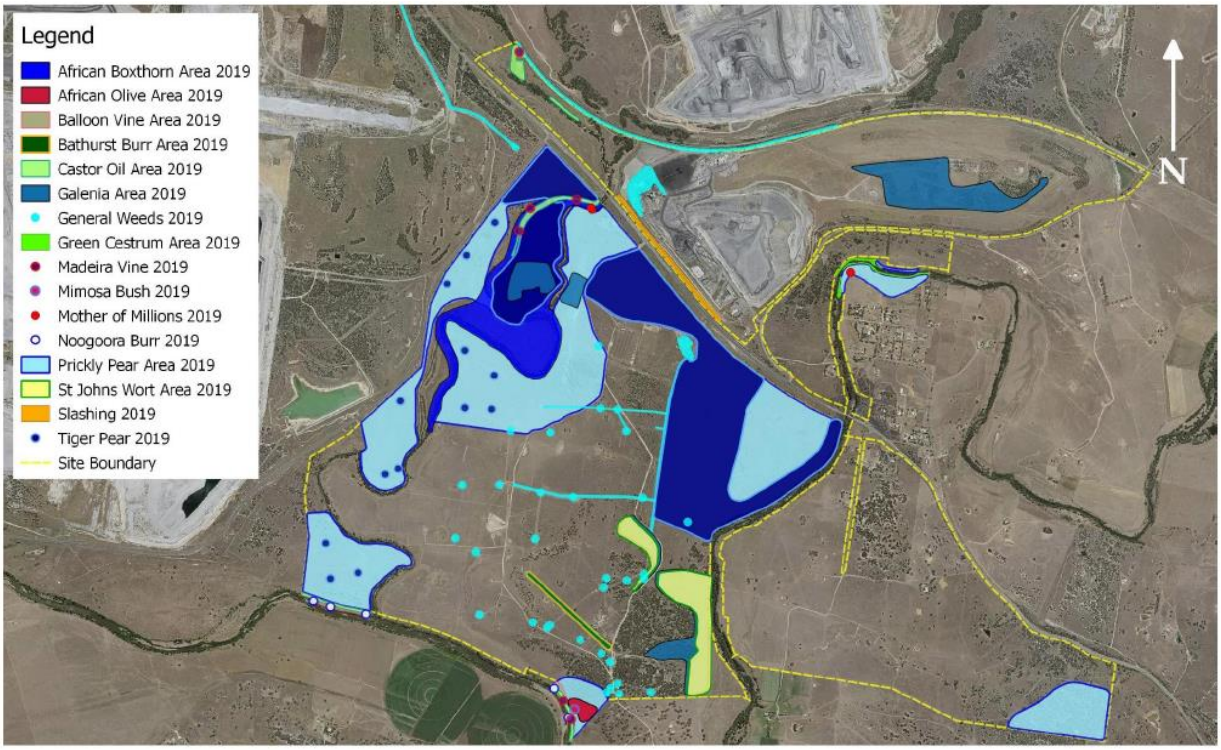
Green = Meets or exceeds completion criteria.
Blue = Performance indicator target falls within industry guidelines or desirable ranges but may not be similar to reference sites
NA = Not Applicable.

Source: DNA (2019)

A programmed range of pest and weed control activities were also undertaken across ACP rehabilitation areas, biodiversity conservation areas and buffer land during the reporting period. This included wild dog and fox baiting programs completed during autumn (May to June 2019) and spring (September and October 2019), accounting for a total of 13 feral dogs and 40 foxes. A feral pig trapping program was also commenced in April 2019; however, no pigs were detected during the initial week of free-feeding, so the traps were removed and the program halted. These programs were timed to occur simultaneously with other baiting programs at sites within the Singleton and Muswellbrook areas, thereby forming part of a broader regional baiting program targeting the control of wild dogs and foxes.

Active weed control treatment was also completed across approximately 400 hectares of land owned by ACOL, targeting African Boxthorn, African Olive, Balloon Vine, Bathurst Burr, Castor Oil, Galenia, Green Cestrum, Madeira Vine, Mimosa Bush, Mother of Millions, Noogoora Burr, Prickly Pear, St John's Wort, Tiger Pear and, general weeds around infrastructure and disturbed areas. **Figure 8.3** displays the areas treated for weeds during the reporting period.

No rehabilitation trials or research was undertaken during the current reporting period and there were no variations to the rehabilitation activities.



Source: ENRIGHT Land Management (2020) – Map 11

Figure 8.3 Weed Treatment Areas - 2019

No permanent buildings were structurally altered, renovated or removed during the reporting period.

8.2 ACTIONS FOR THE NEXT REPORTING PERIOD

Rehabilitation during the next reporting period will principally relate to rehabilitation of disturbance associated with gas drainage network development, exploration (currently one hole is planned – see Section 4.5) and other minor infrastructure projects, as needed. Should favourable meteorological conditions develop, the first block of the woodlands rehabilitation conversion program may be undertaken within the NEOC area. An amendment to the MOP will also be lodged during the next reporting period to reflect the revised completion and performance criteria and proposed conversion of pasture rehabilitation to mixed eucalypt woodland within the NEOC emplacement area.

Rehabilitation of subsidence impacts will also be undertaken, as required, including surface crack backfilling, compaction, and vegetation enhancement. Ongoing repairs will be made to any subsidence-damaged infrastructure, including the right of way access road, in accordance with the approved subsidence monitoring and management plans.

Maintenance works, such as erosion and sediment control, and ongoing control of weeds and feral pests will also be undertaken as required. Additional feral pest control options will also be investigated including for feral cats, hares, rabbits and feral pigs. Other measures to improve biodiversity outcomes, as outlined in Section 6.6 of this Annual Review will also be investigated and implemented as appropriate.

9. COMMUNITY

9.1 COMMUNITY COMPLAINTS

Three complaints were received during the 2019 reporting period, each relating to noise of which two were confirmed to be unrelated to the ACP. All complaints during the reporting period were recorded in the complaints register (available on the Ashton Coal Website) which is reproduced as **Table 9.1**.

Table 9.1
Community Complaints Summary - 2019

Date and Time	Nature of Complaint	Details
19/2/2019 06:48	Noise	Community noise complaint received from Camberwell resident at 0648 on 19/02/2019. Message read: NOISE COMPLAINT - "ALL I CAN HEAR IS THE DOZER ON THE HILL AND IT'S BEFORE 7 O'CLOCK". Investigation found that no dozer activity was being undertaken at Ashton during complaint period (CHPP Coordinator). Wind enhancing noise from NNW (Ashton direction) between 0620 - 0700. Audio recording from 0645-0700 contained highway and dozer track slap noise. Elevated noise levels from 0500 – 0700 associated with daily New England Highway traffic increase. Informed complainant at 0715 that source of noise was not Ashton (no dozers operating at Ashton) and followed up with email at 0935, inviting complainant for site inspection.
7/4/2019 07:01	Noise	Noise complaint received from Camberwell resident at 0701 on 07/04/2019. Message read: “MAKING A NOISE COMPLAINT”. Investigation found that no dozer activity was being undertaken at Ashton during complaint period (CHPP Coordinator). Wind enhancing noise from W to NW (Ashton direction) between 0500 - 0700. Audio recording from 0645-0700 contained highway noise. Elevated noise level from 0500 – 0700 (peak 61dBA at 0615) mainly New England Highway traffic. Complainant informed that source of noise was not Ashton.
29/6/2019 08:27	Noise	Noise complaint received from Camberwell resident about very loud truck noise which was occurring at, and started just before, the time of the complaint. Investigation found that Ashton CHPP had a single truck and front-end loader, and dozer, operating from approximately 2am, with a second dozer commencing work at about 8am. Audio recordings from Camberwell continuous noise monitor indicated a mining continuum (consistent with continual operation of a large truck fleet), rail/highway noise and periodic dozer track slap (consistent with unloaded dozers travelling rapidly) was clearly audible before, after, and at time of the complaint. A moderate temperature inversion formed for a short period from 0815 – 0845, based on lapse rated measured at two local weather stations. The complainant was responded to and informed of investigation findings.
Source: ACOL		

A summary of all complaints received over the life of the mine is presented as **Figure 9.1** and illustrates a decreasing trend in complaints, with the greatest reduction occurring following completion of the NEOC. Previously the nature of complaints was predominantly noise, followed by dust and blasting.

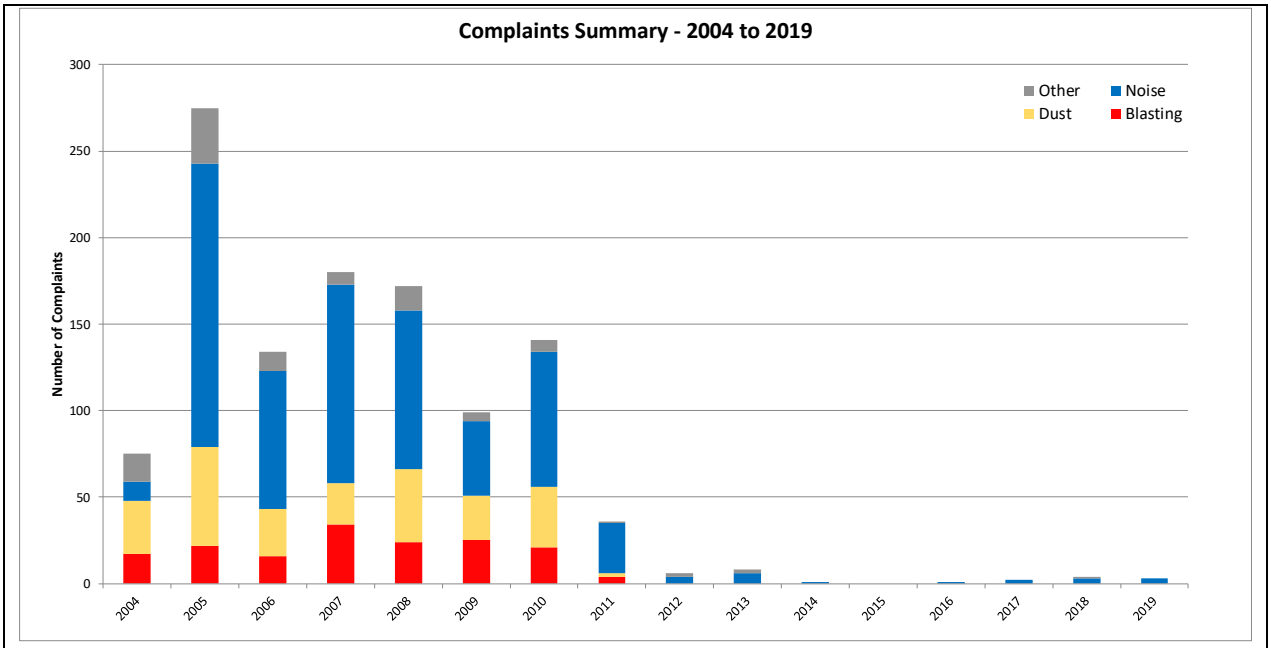


Figure 9.1 Community Complaints – Mine Life

9.2 COMMUNITY LIAISON

The principal formal community consultation undertaken is via the Ashton Community Consultative Committee. In accordance with *Condition 7* of *Schedule* 5 of DA 309-11-2001-i, ACOL has established a Community Consultative Committee for the ACP. During the reporting period, the committee consisted of:

- three representatives of the local community (Mr John McInerney, Ms Debbie Richards, Mr Michael Bestic);
- a representative from Singleton Shire Council (Clr. Godfrey Adamthwaite); and
- three representatives from ACOL (Mr Aaron McGuigan, Mr Lachlan Crawford and Mr Phillip Brown).

The committee was chaired by Mrs Margaret MacDonald-Hill, an independent chairperson appointed as the independent Chair by the Secretary, Department of Planning and Environment.

The committee held a total of three meetings during the reporting period (14 February, 13 June and 17 October 2019). An inspection of the Bowman's Creek Diversion was also undertaken by the CCC immediately prior to the June 2019 CCC meeting. The meetings have continued to provide an opportunity for ACOL to keep the community up to date with activities undertaken and programmed at the ACP and for community members to table issues relating to the ACP for ACOL's consideration. It is noted that ACOL provided presentations during each meeting to provide updates on mine development, environmental monitoring and performance, subsidence management, planning, and other relevant matters.

Copies of minutes, presentations and annual CCC Chairperson's reports to DPIE are available on the Ashton Coal website at www.ashtoncoal.com.au.

ACOL also undertakes engagement through the Aboriginal Community Consultation Forum (ACCF). The ACCF is a community engagement process in place to ensure ongoing dialogue between the Aboriginal Community and Ashton Coal. ACCF meetings regularly discuss planned mining operations, potential impacts to Country, upcoming projects and salvage works. There were two meetings held during the reporting period, 18 June and 10 December 2019, and regular meetings will continue during the next reporting period (see Section 6.8 for further information).

9.3 COMMUNITY SUPPORT PROGRAM

ACOL provides support to local community groups, initiatives and sponsorships through the Community Support Program. Following applications made via ACOL's website (https://www.ashtoncoal.com.au/page/sustainability/community/community-support-program/), opportunities to generate positive community impacts through either monetary grants or in-kind support are identified with a focus on four categories including: social and community, environment and education, health and training.

During the reporting period, a total of approximately $32,000.00 was presented either directly by ACOL or jointly with Mount Thorley Warkworth to the following community groups and causes.

- Singleton Heights Pre-school and Public School – Softfall surfacing for playground and herb garden.
- Westpac Helicopter – Sponsor Upper Hunter Golf Day.
- Singleton Schools Learning Community – Visible wellbeing project.
- Singleton Rotary – 2019 Singleton art prize.
- Singleton Business Chamber – Sponsor Singleton Business Excellence Awards.

10. INDEPENDENT AUDIT

In accordance with the requirements of DA 309-11-2001i (MOD5), an independent environmental audit of the ACP was undertaken by Barnett & May on 5 December 2019 and finalised on 5 March 2020. The audit covers the period from 20 June 2016 to 30 September 2019. A total of six non-compliances were recorded, four with EPL 11879 and one each with ML1533 and ML1623 relating to the following.

- Failure of air quality monitoring equipment resulting in non-continuous monitoring (EPL Condition M2.2).
- Piezometers being destroyed resulting in inability to sample all locations specified by EPL Point 8 (EPL Condition M2.3).
- The telephone complaints line was identified in 2017 as being inactive (EPL Condition M6.1).
- The annual noise compliance report was not submitted to EPA (EPL Condition R5.1).
- Inspection by Resources Regulator on 29 May 2018 identified not all requirements of the MOP were fully implemented (ML1533 Condition 2.1 / ML1623 Condition 3a).

No non-compliances were recorded against DA 309-11-2001i (MOD5). The non-compliances for the mining leases were both rectified during the 2018 reporting period and non-compliances for EPL 11879 are reported separately as part of the EPL Annual Return.

A number of recommendations were provided within the audit with a response plan submitted to the DPIE on 6 March 2020 together with the final Audit Report. A review of the status of the response plan as at the end of this reporting period is provided in **Table 10.1**..

The next independent environmental audit is due in 2022.

Table 10.1
2019 Independent Audit - Action Response Plan Status

Ref	Audit Observation	Auditor Recommendation	ACOL Response	Proposed Action	Timeline	Status Update
EPL Cond M2.2	In 2016 PM_{10} data was not able to be captured for a period of 19 days at Site 2 due to equipment failure. In 2017 PM_{10} data was not captured on multiple occasions from Points 7, 9 and 10, due to equipment failures and supply delays in replacement of the faulty equipment. Air monitoring stations are inspected regularly.	There is no recommendation related to this non-compliance. Ashton's existing equipment monitoring program is appropriate.	In 2016, the 19 days of non-captured data represents 5% of total annual data. 2017 non-captured data represented 1.8% of total annual data. ACOL has an existing monitoring and maintenance regime for the three onsite AQ monitors (TEOM), including daily checks of TEOM function and data receipt, monthly field audit and servicing, and quarterly calibration	Introduction of automated alarm that notifies ACOL staff and contracted environmental monitoring database managers upon nonreceipt of monitoring data. Incorporate this requirement into the ACOL Air Quality and Greenhouse Gas Management Plan (AQGGMP).	6/06/2020	The review and update of the AQGGMP remains in progress.
EPL Cond M2.3	In 2017 groundwater samples were not collected from all piezometers associated with Point 8. It is noted that failure to collect water from a dry piezometer does not trigger a non-compliance against this condition. However, if piezometers have been destroyed by the mining operations, then, in consultation with the EPA, those piezometers should be either replaced (relocated) or removed from the groundwater monitoring plan (refer to EPL Condition P1.3).	Consult with the EPA regarding the modification of the groundwater monitoring requirements for Point 8.	Selection of replacement EPL groundwater monitoring sites in consultation with EPA has been completed. EPA have incorporated new groundwater monitoring sites into latest version of EPL11879 (21 November 2019) as Sites 20 to 31.	New EPL groundwater monitoring sites to be documented in groundwater monitoring program, as part of Water Management Plan (WMP) review.	6/06/2020	The review and update of the WMP remains in progress.

Table 10.1 (Cont'd)
2019 Independent Audit - Action Response Plan Status

Ref	Audit Observation	Auditor Recommendation	ACOL Response	Proposed Action	Timeline	Status Update
EPL Cond M6.1	Ashton's website provides both email and telephone enquiries and complaints lines. In 2017 the telephone complaints line was found to in active by DPE on 1 February 2017.	Schedule checks of the complaints line (monthly) to ensure that it is operational.	Following the February 2017 incident, complaints handling protocols were revised to ensure notification of ACOL staff following community complaints, and the requirement for a monthly test of the Community Enquiries Line was introduced.	Requirement for monthly test of the Community Enquiries Line to be documented in the Complaints Handling Procedure (Doc No: 4.3.1.1.2).	6/06/2020	The update of the Complaints Handling Procedure remains in progress.
EPL Cond R5.1	No evidence was sighted by the Auditor to confirm that annual noise compliance assessment reports were prepared and issued to the EPA.	Prepare annual Noise Compliance Assessment Reports and issue those reports to the EPA	Annual Noise Compliance Assessment Reports (NCAR) were submitted to NSW EPA subsequent to IEA, with no further action required by EPA. 2019 NCAR submitted to NSW EPA with 2019 EPL Annual Return.	Requirement to check for, and include, supporting reports as part of EPL Annual Return to be documented in the Environmental Management Strategy	6/06/2020	The review and update of the Environmental Management Strategy remains in progress.
ML1533 Cond 2.1/ ML1623 Cond 3(a)	An inspection by DRE inspectors on 29 May 2018 identified several instances where the requirements of the MOP were not being fully implemented. The DRE recommendations were fully implemented.	Ensure that all commitments in the MOP (and other management plans) are fully implemented. Ensure that all Annual Reviews are submitted with the required time frames.	Non-compliance resulted from (a) lack of clarity regarding topsoil management for minor disturbance projects, and (b) inconsistency between MOP and Fauna and Flora Management Plan commitments regarding handling of cleared vegetation. Both issues were rectified during the drafting of the latest MOP (September 2018)	No additional action proposed	Not Applicable	No further actions required.

11. INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

During the reporting period there were no:

- non-compliances with the development consent, mining leases or water access licences.
- notifiable / reportable incidents or exceedances; or
- official cautions, warning letters, penalty notices or prosecution proceedings.

As discussed in Section 6.5, an initial notification was made to DPIE following an elevated PM_{10} result on 17 October 2019. However, this event was investigated and the ACP contribution at the nearest privately owned residence was determined to be less than 50ug/m^3.

Whilst not a penalty notice, a notice under Section 240(1)(c) was received on 19 December 2018 (i.e. prior to this reporting period) directing a management plan to be prepared addressing updated rehabilitation objectives and completion criteria and associated TARPs, an action plan to address the 2017 Annual Review rehabilitation monitoring recommendations and a strategy for the installation of the NEOC diversion. These matters were addressed in a response report to the Resources Regulator dated 30 April 2019 and within the 2018 Annual Review. Additionally, extensive monitoring of both rehabilitation areas and other important biodiversity areas was undertaken with revised completion and performance criteria developed. Monitoring during the reporting period has been evaluated against these updated criteria and an amended MOP reflecting these updated criteria is to be submitted for approval during the next reporting period.

Non-compliances with EPL 11879 relating to monitoring frequencies has been reported separately through the 2019 EPL Annual Return.

12. ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

Activities planned to be completed during the next reporting period are outlined in Section 4.3 and planned improvements in environmental management practices in Sections 6 and 7. In summary, the key actions for the next reporting period are summarised in **Table 12.1**.

Table 12.1
Actions to be Completed Next Reporting Period

Action	Indicative Completion Date
1. Submit a MOP amendment to integrate revised rehabilitation criteria, TARP trigger / response details and biodiversity enhancement measures to align with Section 240 Notice response.	30 April 2020
2. Review and update of the AQGGMP, FFMP, WMP, Environmental Management Strategy and Complaints Handling Procedure.	6 June 2020
3. A review of the site groundwater model in relation to groundwater make predictions	6 June 2020
4. Investigate livestock exclusion and habitat enhancement plantings within the Bowmans Creek Riparian area and implemented as appropriate	31 December 2020
5. Investigate and identity crucial erosion areas and where rehabilitation and restoration works are required within the Bowmans Creek Riparian area.	31 December 2020
6. Continue planning towards (and subject to improved meteorological conditions, implementation of) program to convert areas of NEOC pasture rehabilitation to mixed eucalypt woodland.	October 2020 (subject to met conditions)