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 2023 – 31 December 2023

ASHTON COAL

PTY LTD

ABN: 22 078 556 500

Annual Review

for the

Ashton Coal Project

1 January 2023 – 31 December 2023

Prepared for:

Ashton Coal Operations Pty Limited
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Ref No. 737/29c March 2024

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 #	Multiple - see Section 3
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
RMP start date	01/08/2022
RMP end date	Not applicable
Annual Review start date	01/01/2023
Annual Review end date	31/12/2023

I, Michael Bartlett, 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 2023 to 31 December 2023 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	Michael Bartlett
Title of authorised reporting officer	Operations Manager
Signature of authorised reporting officer	
Date	28 March 2024

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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	No
Mining Leases 1529, 1533, 1623 (ACP Area)	Yes
Mining Leases 1834, 1835, 1836, 1837, 1861 (ACOL-operated RUM)	Yes
Water Access Licences 1358, 15583, 8404, 997, 1120, 1121, 6346, 23912, 984, 19510, 36702, 36703, 29566, 41501, 41552, 41553, 41529	Yes

Table 1.2
Non-compliances

Relevant Approval	Cond #	Condition Description (summary)	Compliance Status	Comment	Where Addressed in Annual Review
DA 309-11-2001-i	3/34	The Applicant must prepare a Heritage Management Plan for the Ashton Mine Complex to manage the potential impacts of the development. … The Applicant must implement the approved management plan as approved from time to time by the Planning Secretary.	Non-compliant	One reportable heritage incident occurred during the reporting period involving an unplanned disturbance of a heritage site – being non-compliant with the Heritage Management Plan. The incident was reported the (then) DPE and appropriate internal measures take.	Sections 6.7 and 11
DA 309-11-2001-i	SoC 7.1	The bed and bank of the diverted creek will be surveyed: At 5 yearly intervals, or immediately after a flood with a peak flow greater than 150m^3/s (about 5 years ARI), at existing cross sections in the retained sections of the existing creek.	Non-compliant	This survey was due to be undertaken in 2022. The survey was commenced December 2003 with the reporting to be finalised in early 2024.	Section 10 and 11

Compliance Status Key

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

2. 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 11 times, with the most recent modification (MOD11) being granted on 6 July 2022. The most recent modification provided for part of the approved Ravensworth Underground Mine (RUM) coal resources to be extracted and processed as part of the ACP and other associated changes to facilitate this. This additional area is referred to as the ACOL-operated RUM.

Ashton Coal Operations Pty Limited also held 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 MOD5 permitted the integration of the existing ACP and the SEOC project, with the combined development referred to as the Ashton Mine Complex. Operations at the SEOC project were not commenced with PA 08_0182 subsequently lapsing on 17 April 2022 (following a two-year extension) as Ashton was unable to reach agreement to purchase or lease Property 129, as required by Schedule 2 Condition 10A of that approval. 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

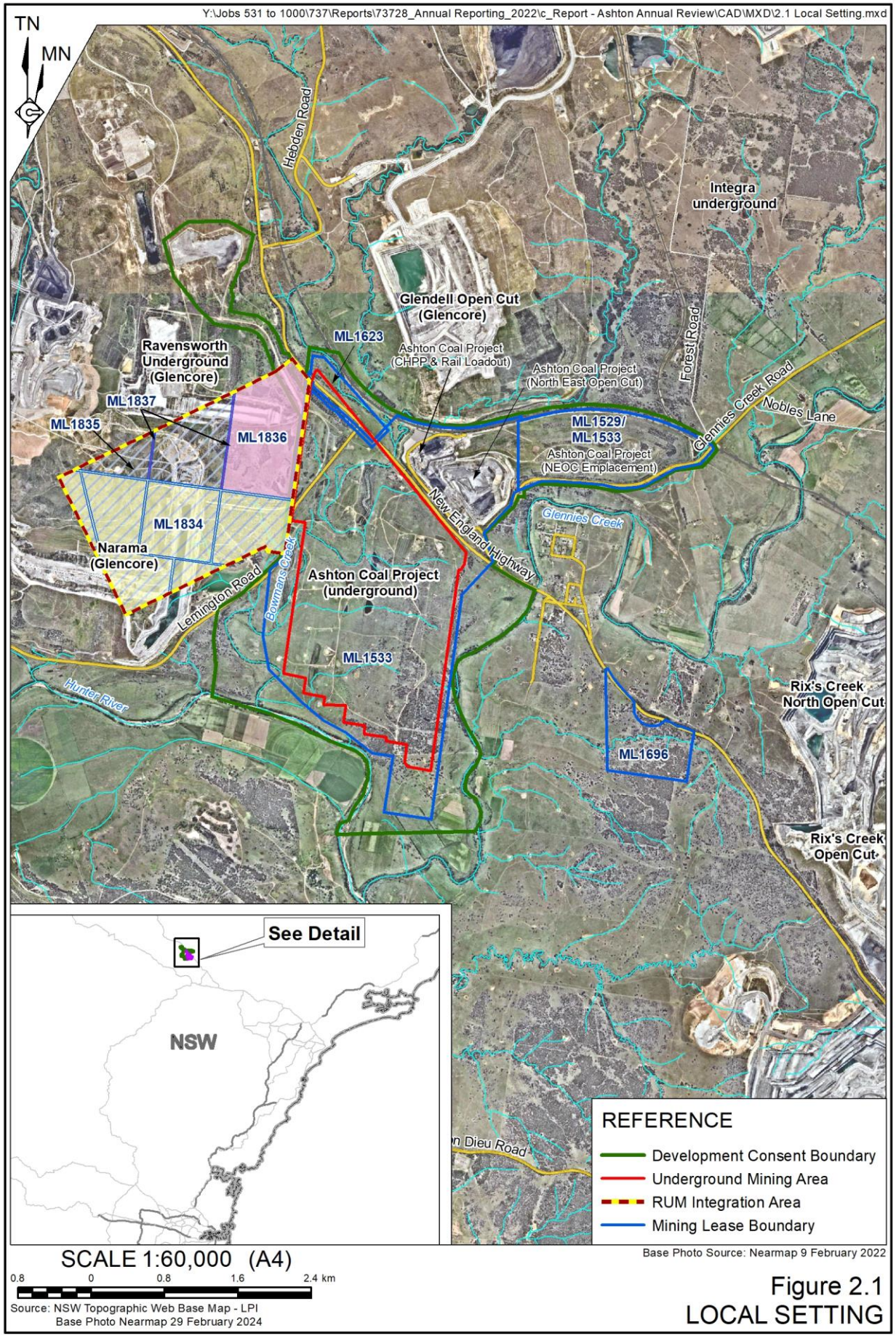
The Ashton underground operations commenced in December 2005 with the first longwall coal extracted within the Pikes Gully Seam in March 2007. Construction of the Bowmans Creek Diversion was completed in November 2012 allowing extraction of coal from beneath those excised sections of Bowmans Creek. Coal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

ACOL-operated RUM

Operational activities commenced within the ACOL-operated RUM during the reporting period.


Y:\Jobs 531 to 1000\737\Reports\73728_Annual Reporting_2022\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
Glennies Creek Road
Nobles Lane
Ravensworth Underground (Glencore)
ML1837
ML1835
ML1836
ML1529/ ML1533
Ashton Coal Project (NEOC Emplacement)
New England Highway
Glennies Creek
ML1834
Narama (Glencore)
Lemington Road
Bowmans Creek
Ashton Coal Project (underground)
ML1533
Hunter River
Rix's Creek North Open Cut
ML1696
Rix's Creek Open Cut
See Detail
NSW
REFERENCE
Development Consent Boundary
Underground Mining Area
RUM Integration Area
Mining Lease 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 Nearmap 29 February 2024
Base Photo Source: Nearmap 9 February 2022
Figure 2.1
LOCAL SETTING

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 (ACOL). ACOL became part of Yancoal Australia Limited in July 2009.

This is the ninth Annual Review submitted for the ACP, following eleven Annual Environmental Management Reports, and is applicable for the period 1 January 2023 to 31 December 2023 ("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 (MOD11). This Annual Review generally follows the format and content requirements identified in the (then) Department of Planning and Environment's (DPE) *Annual Review Guideline* dated October 2015.

2.3 KEY PERSONNEL CONTACT DETAILS

The Operations Manager, Mr Michael Bartlett is the primary mine contact (Tel: 02 6570 9104) and 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	31 December 2035[1]	Granted by the (then) Minister for Planning and last modified on 6 July 2022 (MOD11).
Mining Authorities[2]			
Mining Lease ML 1529	10 September 2003	11 November 2030	Granted by the (then) Minister for Mineral Resources. Incorporates 128.7ha of surface area. Renewed on 12 July 2022.
Mining Lease ML 1533	26 February 2003	25 February 2045	Granted by the (then) Minister for Mineral Resources. Incorporates 883.4ha of surface area. A renewal application was lodged 21 February 2023 and approved 26 February 2024.
Mining Lease ML 1623	30 October 2008	30 October 2029	Granted by (then) Minister for Mineral Resources. Incorporates 26.17ha of surface area.
Mining Lease ML 1834	22 December 2022	3 June 2033	Partial transfer of 231.7ha including surface and depth restrictions.
Mining Lease ML 1835	22 December 2022	31 December 2044	Partial transfer of 404.6ha including surface and depth restrictions.
Mining Lease ML 1836	22 December 2022	31 December 2044	Partial transfer of 102.7ha including surface and depth restrictions.
Mining Lease ML 1837	22 December 2022	1 October 2043	Partial transfer of 3.304ha including surface and depth restrictions.
Mining Lease ML 1861	14 September 2023	14 September 2044	Granted by the Minister for Mineral Resources. Incorporates 52.59ha of surface area to a depth of 100m.
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 3 November 2022.
Water Access Licence (WAL) 1358	Continuing		Hunter Regulated River Water Source. Supplementary water. Share component: 4ML.
WAL 15583	Continuing		Hunter Regulated River Water Source. General security. Share component: 354ML.
WAL 8404	Continuing		Hunter Regulated River Water Source. High security. Share component: 80ML.
WAL 997	Continuing		Hunter Regulated River Water Source. High security. Share component: 11ML.
WAL 1120	Continuing		Hunter Regulated River Water Source. High security. Share component: 3ML.
WAL 1121	Continuing		Hunter Regulated River Water Source. General security. Share component: 335ML.

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)			
WAL 6346	Continuing		Hunter Regulated River Water Source. Supplementary water. Share component: 15.5ML
WAL 23912	Continuing		Jerrys Water Source. Share component: 14ML.
WAL 984	Continuing		Hunter Regulated River Water Source. General security. Share component: 9ML.
WAL 19510	Continuing		Hunter Regulated River Water Source. High security. Share component: 130ML.
WAL 36702	Continuing		Jerrys Water Source. Share component: 116ML.
WAL 36703	Continuing		Jerrys Water Source. Share component: 150ML.
WAL 29566	Continuing		Jerrys Water Source Aquifer Share component: 358ML.
WAL 41501	Continuing		Sydney Basin-North Coast Groundwater Source. Share component: 100ML.
WAL 41552	Continuing		Sydney Basin-North Coast Groundwater Source. Share component: 511ML.
WAL 41553	Continuing		Sydney Basin-North Coast Groundwater Source. Share component: 81ML.
WAL 41529	Continuing		Sydney Basin-North Coast Groundwater Source. Share component: 400ML.
Note 1: Underground mining operations approved to 31 December 2035. Note 2: See **Figure 2.1**.			

This Annual Review has been prepared to fulfil the annual reporting requirements of DA 309-11-2001-i 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 Plans for LW201-204 and LW205-208, and 2009 Conservation Agreement (for Southern Woodlands Conservation Area) are also included in the scope of this report.

In November 2021 a modification application was lodged with (then) DPIE for modification DA309-11-2001-i to provide for access to and mining of existing approved, but unmined, coal from the adjoining Ravensworth Mine Complex via connection with the existing Ashton underground workings. As part of the modification, an extension to the period for mining operations was sought to 31 December 2035. The application was approved on 6 July 2022. Following receipt of approval, applications were lodged for the partial transfer of the relevant Mining Leases for the ACOL-operated RUM. These were approved and registered on 22 December 2022.

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 18 December 2024 (renewed 9 Sept 2022), and Exploration Licence 5860, granted on 22 May 2001 with a current expiry date of 22 May 2026.

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), Middle Liddell (ML), 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) 206B and 207A within the ULLD, and commencement of continued development of the PG seam above LW 403 in preparation for the integration with the ACOL-operated RUM (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 729,318t of Run of Mine (ROM) coal was mined from underground operations during the reporting period and a total of approximately 380,316t 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]	2,093,565	729,318	2,644,289
Coarse Reject (t)	None specified	842,048	338,461	1,112,084
Fine Reject (Tailings) (t)	None specified	297,894	99,162	325,817
Saleable Product (t)	None specified	861,936	380,316	1,206,388

Note 1: For underground operations as specified by DA 309-11-2001-i, Schedule 2, Condition 6(a).

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.

4.2 GAS MANAGEMENT

Six gas drainage borehole wells, located above LW206A and LW206B (see **Figure 4.1**), were constructed during the reporting period. The gas drainage plant functioned throughout the reporting period, although low methane concentrations and low gas flows reduced the ability to undertake flaring[1] continuously.

Greenhouse gas emissions were reported as required by the National Greenhouse Gas and Energy Reporting (NGER) requirements (see Section 6.5). Details on measures implemented during the reporting period to further reduce gas emissions is also presented in Section 6.5.

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

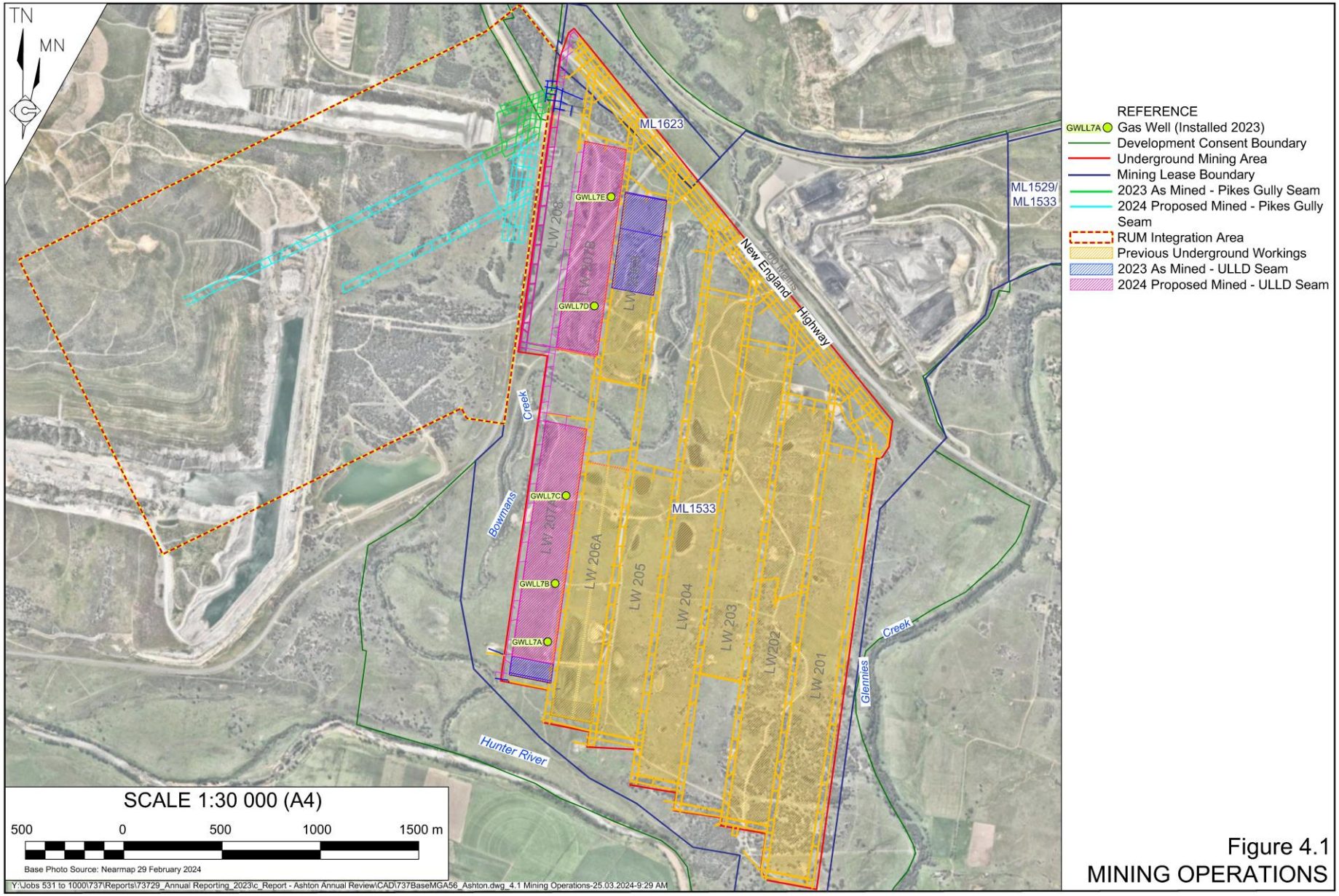


Figure 4.1
MINING OPERATIONS

4.3 OTHER OPERATIONS DURING THE REPORTING PERIOD

Ground Disturbing Works

A total of 22 internal Ground Disturbance Permits (GDPs) were applicable during the reporting period (see **Table 4.2**).

Table 4.2
Ground Disturbance Permits - 2023

Ground Disturbance Permit No.	Purpose	Rehabilitation Status
209	Desilt and embankment repair of 3x surface dams within SEOC area	Closed / works not undertaken
210	APlus contractor laydown pad (Lemington Rd)	Closed / works not undertaken
211	Construction of U/S and D/S block bank for Western Diversion of Bowmans Creek	Rehabilitation complete / permit closed
212	Construction of 3x gas well pads, access tracks, pipeline trenching (GWLL7A-7B-7C)	Works commenced 2023
213	VCA access track maintenance along P130 boundary	Rehabilitation complete / permit closed
214	LW206B sump subsidence crack repairs near U/S blockbank (eastern BCD)	Rehabilitation complete / permit closed
215	Miscellaneous signpost installs - permanent water bodies	Rehabilitation complete / permit closed
216	LW207A/LW207B - Known area PAD clearance for predicted crack zones	Approved / works not commenced
217	Gas Drainage Plant access track repairs	Rehabilitation complete / permit closed
218	Construction of access tracks, pipeline trenching and Riser #1B	Approved / works not commenced
219	Construction of 1x gas well pad, access track, pipeline trenching (GWLL7D)	Rehabilitation complete / permit closed
220	Construction of 1x gas well pad and access track (GWLL7E)	Rehabilitation complete / permit closed
221	Glennies Creek pump access track (from church to TEOM)	Rehabilitation complete / permit closed
222	Install 3x flag poles adjacent to mine access gate	Rehabilitation complete / permit closed
223	LW206B nitrogen injection hole (southern end) + subsidence repairs	Approved / works not commenced
224	Hunter River line hardstand area (LW205/LW206A)	Approved / works not commenced
225	2x Nitrogen T-Pieces into unused gas drainage network	Approved / works not commenced
226	RUMEx staple shaft	Approved / works not commenced
227	Dairy Lane Riser to Gas Drainage Plant - 710mm	Permit drafted / approval pending
228	LW6B/LW206B subsidence repair sump (adj. to BCD E U/S block bank)	Approved / works not commenced
229	LW6B/LW206B test piezometers (x5)	Rehabilitation complete / permit closed
230	N2 plant connection to gas drainage network	Rehabilitation complete / permit closed

Environmental Monitoring and Community Liaison

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.

The community consultative committee continued to meet during the reporting period. Details of these meetings and other community liaison activities are summarised in Section 9.

Operational Rehabilitation Reform

During the reporting period the Rehabilitation Objectives (RObjs) and Final Landform and Rehabilitation Plan (FLRP), previously prepared in accordance with the Operational Rehabilitation Reforms and amendments to the *Mining Regulation 2016*, were approved by the Resources Regulator on 3 October 2023. The Rehabilitation Management Plan was updated to reflect the approved RObjs and FLRP in November 2023.

Update of Management Plans

Following approval of DA 309-11-2001-i MOD11, a review process was commenced for the various management plans required by the development consent to reflect the modified operations and to incorporate the ACOL-operated RUM. Updated versions of the Environmental Management Strategy, Air Quality and Greenhouse Gas Management Plan, Heritage Management Plan, and Noise Management Plan were approved by the Department of Planning and Environment (DPE) in April 2023.

An updated versions of the Water Management Plan was submitted to the (then) DPE for approval in November 2022 and remains under assessment.

4.4 NEXT REPORTING PERIOD

The activities proposed for 2024 will principally involve a continuation of activities undertaken during the previous twelve months, including a continuation of operations within the ACOL-operated RUM. The following provides a summary of the planned activities.

Exploration

It is not anticipated that further exploration will be undertaken during the next reporting period.

Mining

During the next reporting period, mining will focus upon continued longwall mining within Panels LW207A and LW207B within the ULLD seam and continued mine development within LW403 within the Pikes Gully Seam (see **Figure 4.1**). It is estimated that in the order of 2,644,289t of ROM coal will be extracted during the next reporting period.

Gas Drainage

Construction of two gas risers is planned to be undertaken during the next reporting period for LW208 together with additional poly pipe installations for gas management.

Rehabilitation

Rehabilitation activities planned for the 2024 reporting period include the rehabilitation of any subsidence impacts and completion of rehabilitation for remaining ground disturbances outlined in **Table 4.2** where able. Ongoing remedial treatment of previously repaired 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.

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.

Environmental Management Plans

Subject to approval by the Department of Planning, Housing and Infrastructure (DPHI), the updated Water Management Plan and Biodiversity Management Plan will be finalised and implemented. All other management plans will continue to be reviewed at least annually and updates sought if required.

5. ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

The 2022 Annual Review was submitted to the Resources Regulator and the DPE on 31 March 2023. DPE responded 20 September 2023 confirming that the Annual Review was considered to generally satisfy the conditions of the approval, however, the following action was required for subsequent Annual Reviews.

"*While the Annual Review includes information on management and monitoring of waste, it has neglected to report on waste minimisation, which is a requirement of the consent. Future Annual Reviews, under the provisions of Schedule 3, Condition 39 (d) of the consent, must also report on the minimisation of waste generated by the development.*"

Further discussion in relation to waste minimisation during the reporting is presented in Section 6.9 (being noted that there were no new opportunities for further waste minimisation identified during the reporting period).

The Resources Regulator acknowledged receipt of the 2022 Annual Review on 31 March 2023 with no actions or follow up required.

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 and no community noise complaints were received for the mine during the reporting period.	Monitoring implies management measures are currently adequate.	No additional management action required. Continue proactive management approach.
Blasting	No exceedance of applicable blast criteria.	No surface blasting during reporting period.	Not applicable – no surface blasting	As no surface blasting planned for the next reporting period, no specific actions are required.
Air Quality	No exceedances of the applicable air quality criteria.	No exceedances of the 24 hour PM_{10} criteria recorded and no community air quality 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 are planned.	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 and controlled grazing to be investigated. Ongoing pest and weed control. Revised monitoring locations have been implemented in response to progression of mining.
Heritage	Management in accordance with approved Aboriginal Heritage Management Plan, including salvage.	Archaeological investigations and salvages undertaken in accordance with management plan, Aboriginal Heritage Impact Permits, and in consultation with Aboriginal Community. No complaints. A heritage incident was reported, and corrective response measures implemented.	Continued implementation of the approved Heritage Management Plan and procedures for ground disturbance permits.	No additional management action currently required.
Subsidence	Subsidence management in accordance with approved Subsidence Management Plan / Extraction Plan.	Subsidence impacts generally within predicted levels in accordance with the Extraction Plan. Minor rehabilitation and maintenance works completed to address impacts.	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 (M1 - predominantly used to monitor for noise and air quality impacts in adverse weather conditions and determine temperature inversion stability class) and the M2 Repeater Station (the main monitoring site) (see **Figure 6.1**).

A summary of rainfall data since the commencement of operations is presented in **Table 6.2** whilst monthly wind roses for the reporting period are presented in **Figures 6.2** and **6.3**.

Table 6.2
Monthly Rainfall Records

	Average Monthly Rainfall (mm)												
Period	**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	727.0
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
2020	*62.0*	*169*	*108.2*	*71.2*	*30.0*	43.8	121.4	39.2	53.6	126.2	29.6	142.2	996.4
2021	*78.4*	*149.8*	*272.4*	*27.6*	*25.4*	66.0	24.6	34.0	38.0	79.0	296.0	114.6	1205.8
2022	*66.6*	*112.8*	*393.6*	*38.7*	*38.8*	11.2	250.8	76.6	90.2	144.4	85.2	32.2	1341.1
2023	**68.2**	**110.2**	**97.2**	**53.4**	**7.0**	**10.8**	**10.4**	**29.4**	**0.2**	**28.6**	**23.8**	**56.6**	**495.8**
Average	*64.3*	*91.4*	*107.3*	*49.5*	*30.0*	*58.8*	*38.2*	*34.0*	*41.1*	*53.8*	*80.0*	*66.0*	*712.3*

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

Total rainfall during the 2023 calendar year was 495.8mm, 216.5mm below the average annual rainfall of 712.3mm.

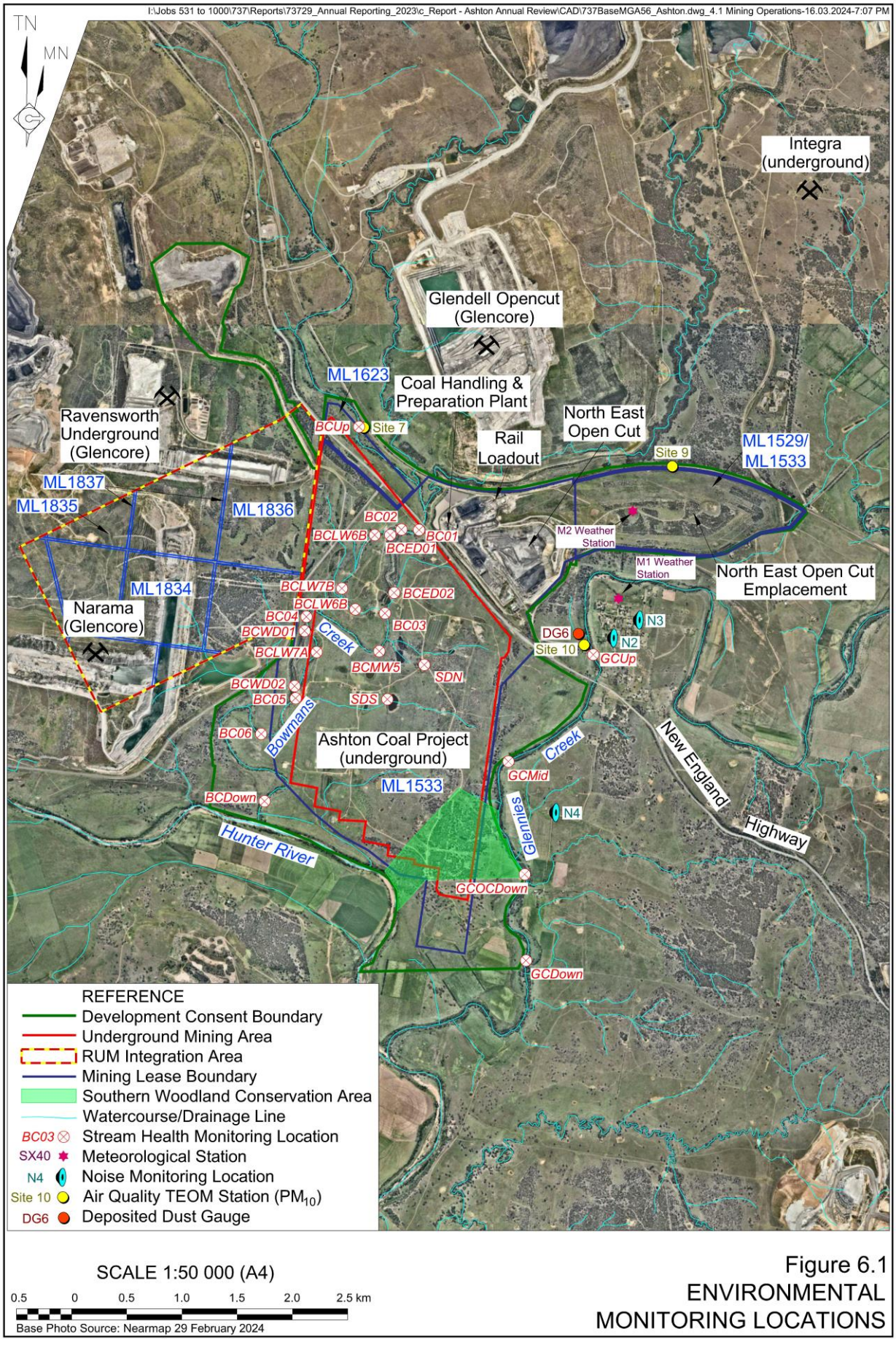


Figure 6.1
ENVIRONMENTAL MONITORING LOCATIONS

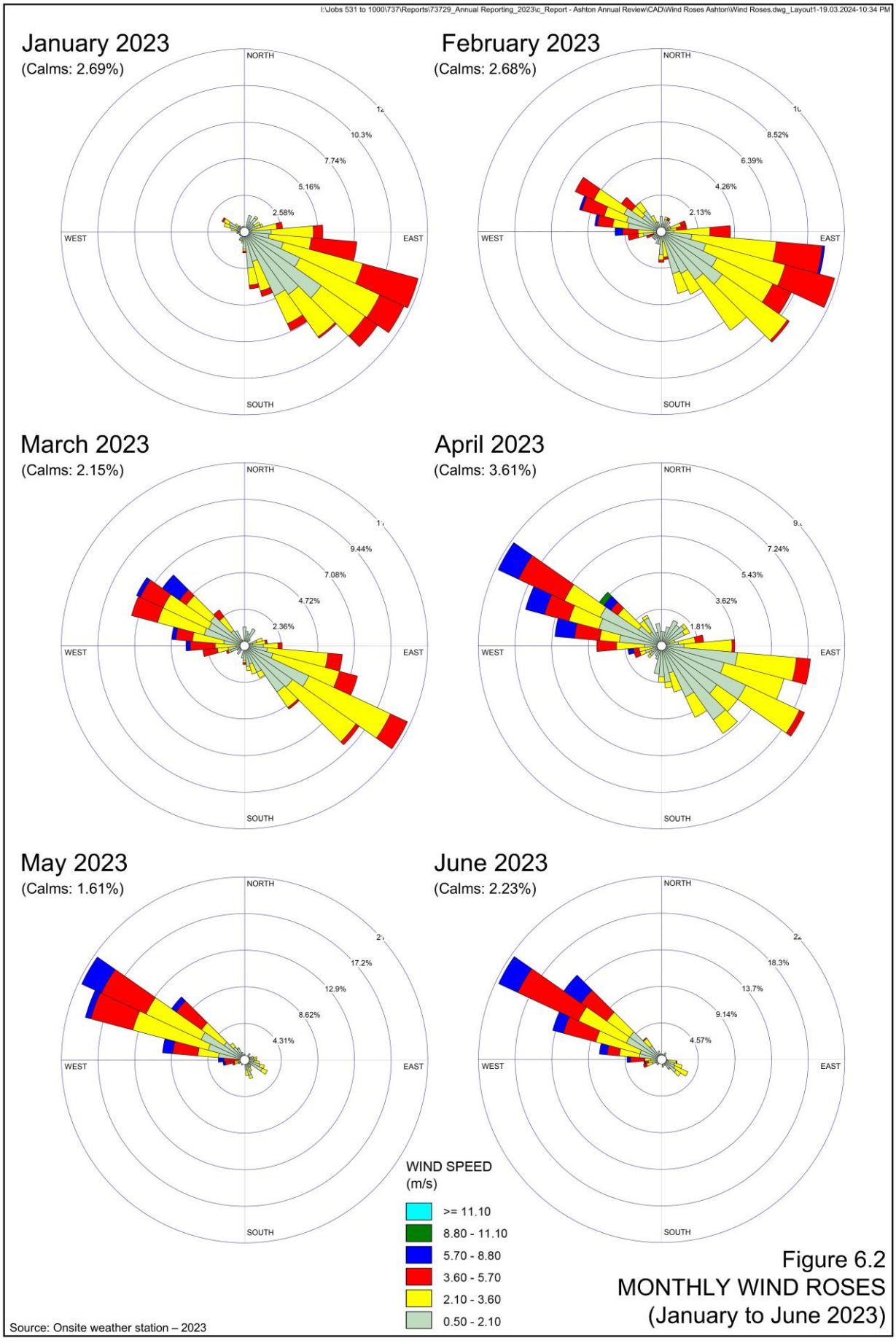


Figure 6.2
MONTHLY WIND ROSES
(January to June 2023)

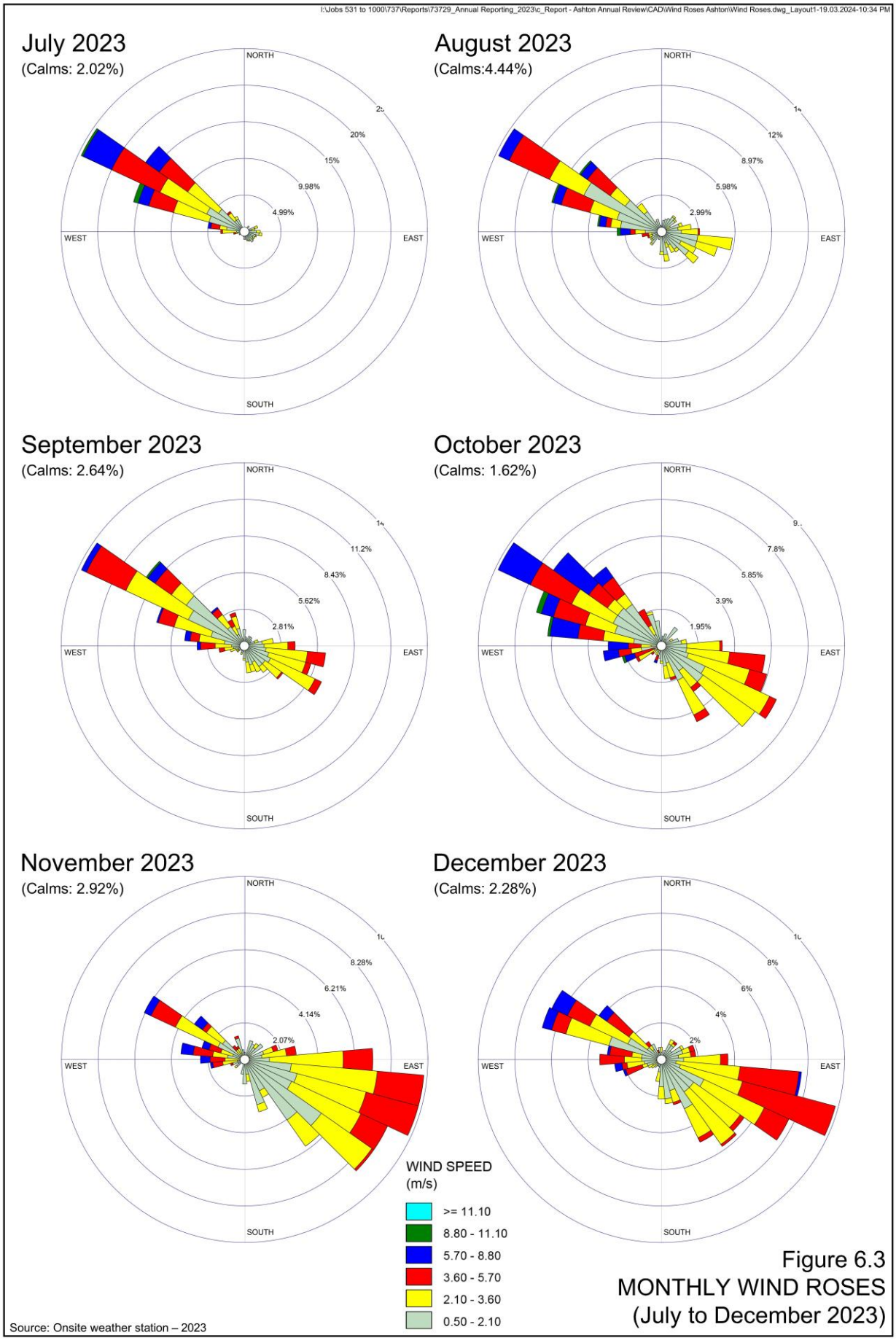


Figure 6.3
MONTHLY WIND ROSES
(July to December 2023)

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.
- Unannounced[2] attended noise monitoring – monthly night-time monitoring conducted at three attended noise monitoring locations (N2, N3 and N4) (see **Figure 6.1**).
- 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 a copy of the attended noise monitoring compliance report prepared by EMM is presented as **Appendix 1**.

The results of attended noise monitoring during the reporting period indicate that ACP operations were inaudible at all three monitoring locations during the January, February, March, April, July, October, November, and December monitoring. Operations were also inaudible at locations N2 and N4 during the May monitoring, and at location N4 during September monitoring. Noise during these monitoring events were attributable to non-ACP related road and rail traffic, wildlife, livestock and by other mines in the vicinity. During monitoring events in which operations at ACP were audible, noise remained below the applicable criteria, including night-time sleep disturbance criteria ($L_{A(1\ min)}$), at all locations.

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.

No noise complaints were received during the reporting period.

[2] ACOL are not informed of the monitoring until it is completed.

Table 6.3
Summary of Attended Noise Monitoring Results – 2023

Month	Criteria (dB)				Location			Exceedance
	Period	Day	Evening	Night	N2 (dB)[1]	N3 (dB)[1]	N4 (dB)[1]	
January	LAeq (15 min)	38	38	36	IA	IA	IA	No
	LA1 (1 min)	-	-	46	IA	IA	IA	No
February	LAeq (15 min)	38	38	36	IA	IA	IA	No
	LA1 (1 min)	-	-	46	IA	IA	IA	No
March	LAeq (15 min)	38	38	36	IA	IA	IA	No
	LA1 (1 min)	-	-	46	IA	IA	IA	No
April	LAeq (15 min)	38	38	36	IA	IA	IA	No
	LA1 (1 min)	-	-	46	IA	IA	IA	No
May	LAeq (15 min)	38	38	36	IA	<30	IA	No
	LA1 (1 min)	-	-	46	IA	<30	IA	No
June[2]	LAeq (15 min)	38	38	36	<30	<29	<27	No
	LA1 (1 min)	-	-	46	33	33	<27	No
July	LAeq (15 min)	38	38	36	IA	IA	IA	No
	LA1 (1 min)	-	-	46	IA	IA	IA	No
August[2]	LAeq (15 min)	38	38	36	<32	<32	<28	No
	LA1 (1 min)	-	-	46	<32	<32	<28	No
September[2]	LAeq (15 min)	38	38	36	32	33	IA	No
	LA1 (1 min)	-	-	46	33	34	IA	No
October	LAeq (15 min)	38	38	36	IA	IA	IA	No
	LA1 (1 min)	-	-	46	IA	IA	IA	No
November	LAeq (15 min)	38	38	36	IA	IA	IA	No
	LA1 (1 min)	-	-	46	IA	IA	IA	No
December[2]	LAeq (15 min)	38	38	36	IA	IA	IA	No
	LA1 (1 min)	-	-	46	IA	IA	IA	No

IA = Inaudible. NM=Not measurable

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℃.

Source: EMM Consulting – 2023.

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}) – a real-time tapered element oscillating microbalance (TEOM), Site 10 located at Camberwell. Two additional TEOM samplers (Sites 7 and 9) are used for operational management purposes and are not reflective of impacts on sensitive receivers (see **Figure 6.1**).

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**.

The highest insoluble solids measurements recorded during the reporting period was 1.9g/m^2/month in June 2023.

The rolling annual average deposited dust levels recorded throughout the reporting period ranged from 1.52g/m^2/month to 2.32/m^2/month, i.e. remaining below the criteria of 4g/m^2/month, and 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.

Table 6.4
Deposited Dust Monitoring Results – Sampling Point D6 – 2023

Month	Sampling Period		Dust Deposition Rate (g/m²/month)			Comments
	Start Date	End Date	Insoluble	Rolling Annual Average	Ash	
January	30/12/2022	30/01/2023	1.20	2.32	1.00	-
February	30/01/2023	1/03/2023	1.40	2.31	0.90	-
March	1/03/2023	30/03/2023	1.80	2.18	1.20	-
April	30/03/2023	1/05/2023	1.60	2.09	1.00	-
May	1/05/2023	1/06/2023	1.40	1.88	1.10	-
June	1/06/2023	3/07/2023	1.90	1.88	1.20	-
July	3/07/2023	1/08/2023	1.70	1.96	1.20	-
August	1/08/2023	1/09/2023	1.40	1.86	1.10	-
September	1/09/2023	3/10/2023	1.60	1.86	1.20	-
October	3/10/2023	1/11/2023	1.50	1.73	1.00	-
November	1/11/2023	1/12/2023	1.30	1.55	0.80	-
December	1/12/2023	29/12/2023	1.40	1.52	0.90	-
Minimum			***1.20***	***1.52***	***0.80***	**-**
Maximum			***1.90***	***2.32***	***1.20***	**-**

Source: Ashton Coal Operations Pty Limited.

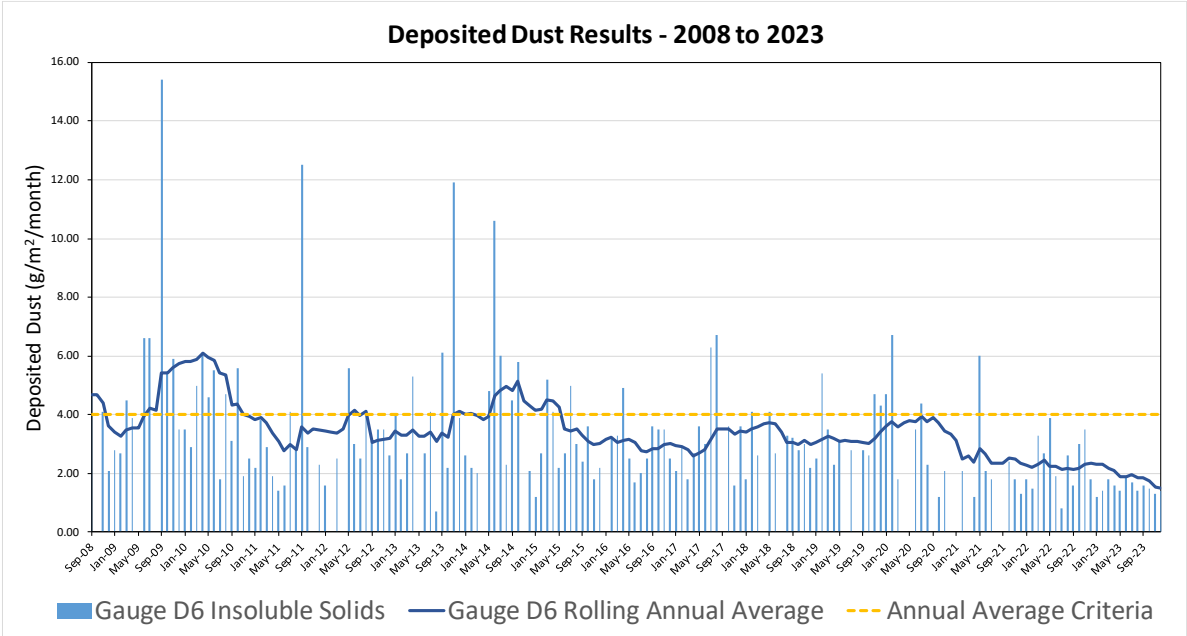


Figure 6.4
DEPOSITED MONITORING RESULTS

Suspended Particulates – PM_{10} and TSP

Table 6.5 provides a summary of the PM_{10} monitoring results for the reporting period and **Figures 6.5** to **6.7** present the PM_{10} data for the reporting period and the long-term monitoring data for each ACP TEOM. The highest recorded 24-hour average PM_{10} concentration during the reporting period ranged between 64.1µg/m^3 and 68.1µg/m^3, with the highest value measured on 8 March 2023 at monitoring Site 7. All monitoring locations recorded maximum suspended particulate concentrations above the 50µg/m^3 24-hour development consent criteria during the reporting period. These elevated concentrations are generally consistent with similarly elevated PM_{10} levels recorded at the Upper Hunter Air Quality Monitoring Network (UHAQMN) station at Camberwell on these days (refer to **Table 6.6)**.

Table 6.5
Summary of PM_{10} Monitoring Results – 2023

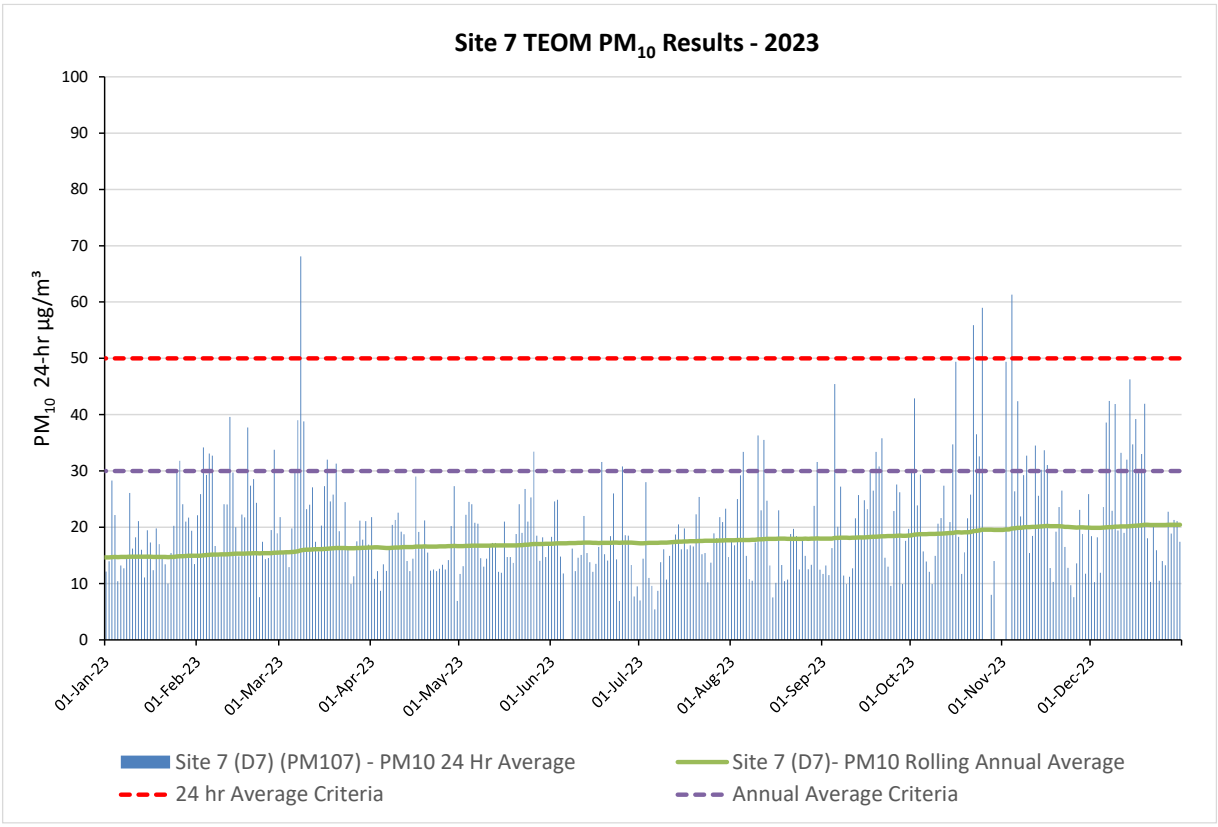
Monitoring Site	Minimum 24-hr µg/m^3	Maximum 24-hr µg/m^3	Short-Term Criteria µg/m^3	Annual Average 2023 µg/m^3	Annual Average Criteria µg/m^3
Site 7^	5.4	68.1	50	20.4	30
Site 9^	8.0	64.1		21.2	
Site 10^	6.5	65.5		19.7	
UHAQMN*	7.5	72.5		20.9	
* Provided as reference (includes all days) ^ Ashton results exclude extraordinary events as defined in DA 309-11-2001-i (note: there was one Upper Hunter Declared Extraordinary day declared by DPE during the reporting period)					
Source: Ashton Coal Operations Pty Limited.					

As Site 10 is representative of PM_{10} at sensitive receivers, all PM_{10} results above 50µg/m^3 at Site 10 are reported as an incident and investigated. The investigation includes a review of prevailing wind conditions, the activities occurring on site and the potential contribution from upwind sources to determine the likelihood of the ACP contributing to elevated levels above the criteria. The investigation also includes a detailed review of site operations to ensure that adequate dust controls were being implemented on site including use of water trucks, water sprays on the product stockpile gantries, rotary breaker and ROM coal stockpile discharge points.

During the reporting period, there were 3 days when the 24-hour PM_{10} results were above 50µg/m^3 at Site 10 (refer to **Table 6.6**). One Upper Hunter Declared Extraordinary days occurred during the reporting period. Investigations confirmed that, in each instance, ACP was not a substantial contributor to PM_{10} levels in Camberwell Village and that all reasonable and feasible avoidance measures are being employed. No further actions were required.

Table 6.6
24-hour PM_{10} Exceedance Investigation Outcomes – 2023

Date	Total PM_{10} (µg/m^3) (24hr average) at Site 10 (Camberwell Village)	Potential ACP PM_{10} (µg/m^3) (24hr average) Contribution at Site 10 (Camberwell Village)	Comments
08/03/2023	65.5	6.0	ACOL not a substantial PM_{10} contributor (UHAQMN = 72.5ug/m^3)
19/09/2023	52.0	17.6	ACOL not a substantial PM_{10} contributor (UHAQMN = 47.0ug/m^3)
31/10/2023	52.7	14.1	ACOL not a substantial PM_{10} contributor (UHAQMN = 12.4ug/m^3)
Source: Ashton Coal Operations Pty Limited.			



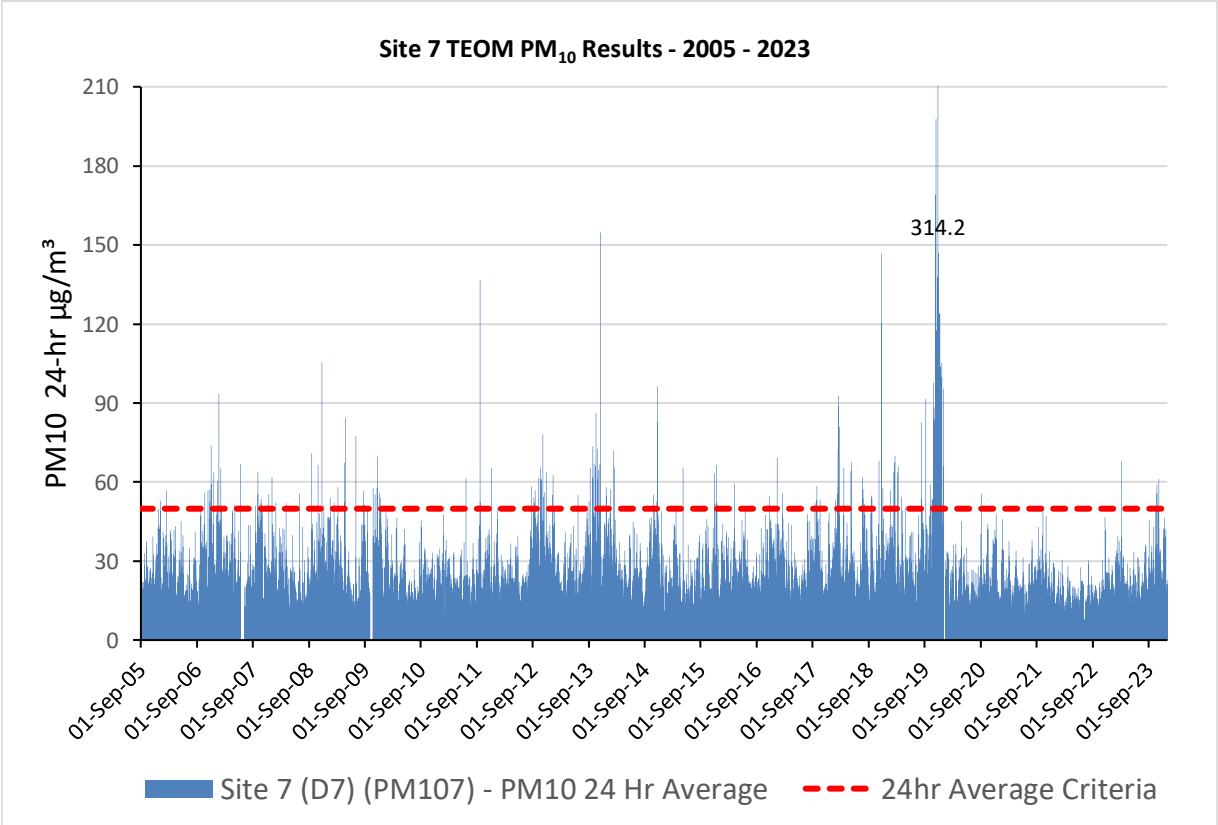
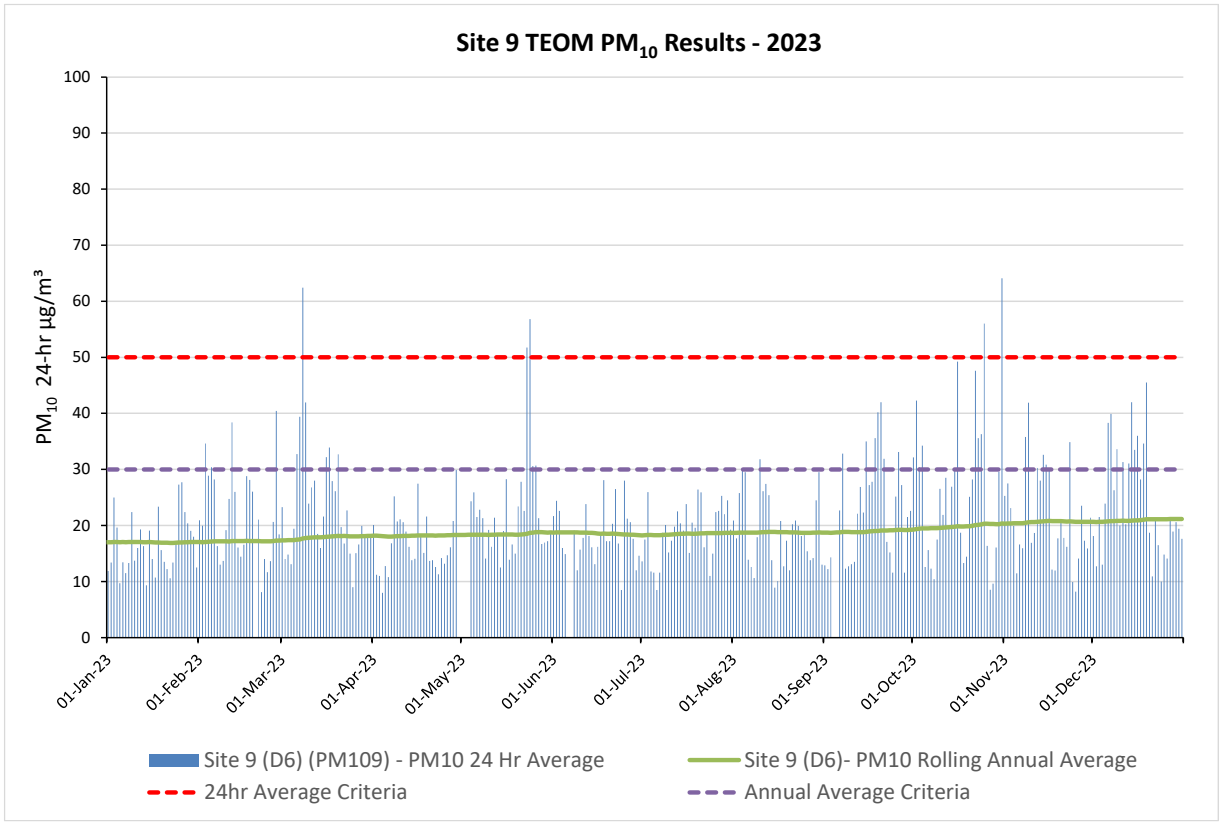


Figure 6.5
PM_{10} MONITORING RESULTS – SITE 7



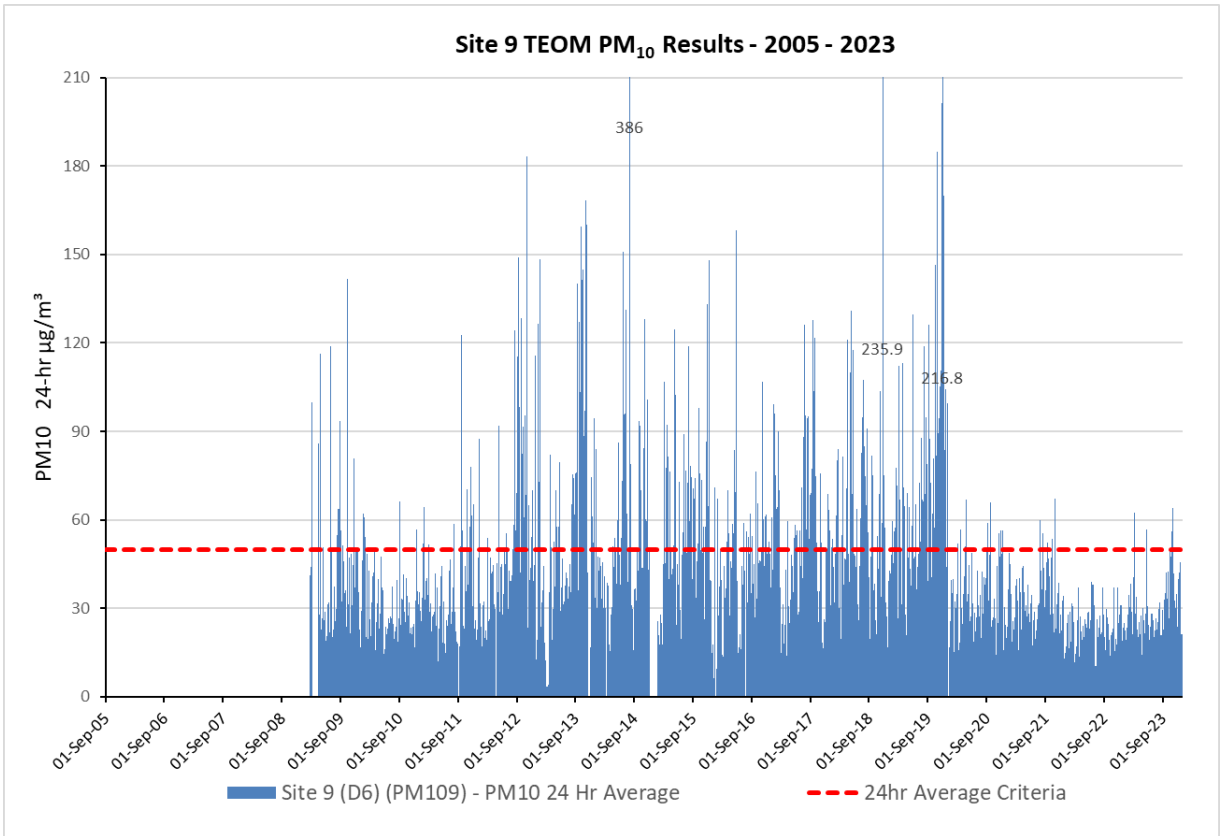
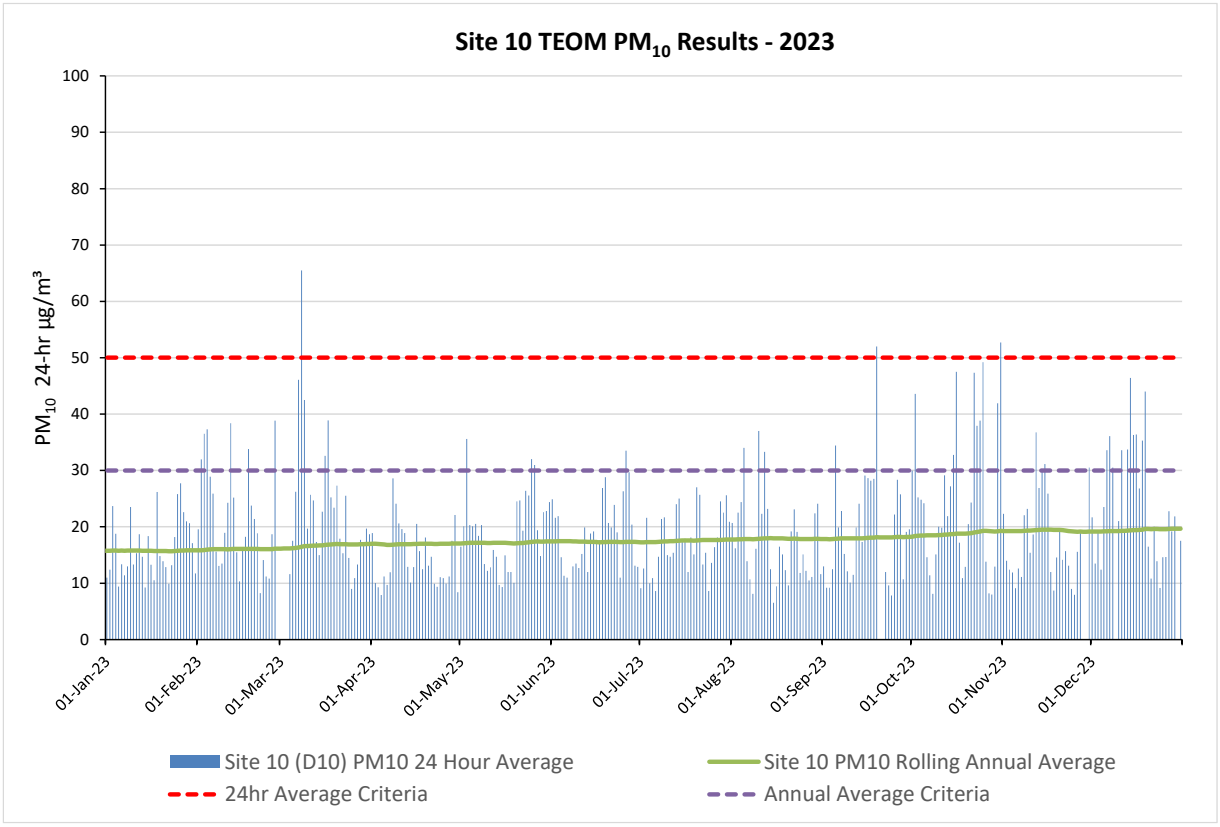


Figure 6.6
PM_{10} MONITORING RESULTS – SITE 9



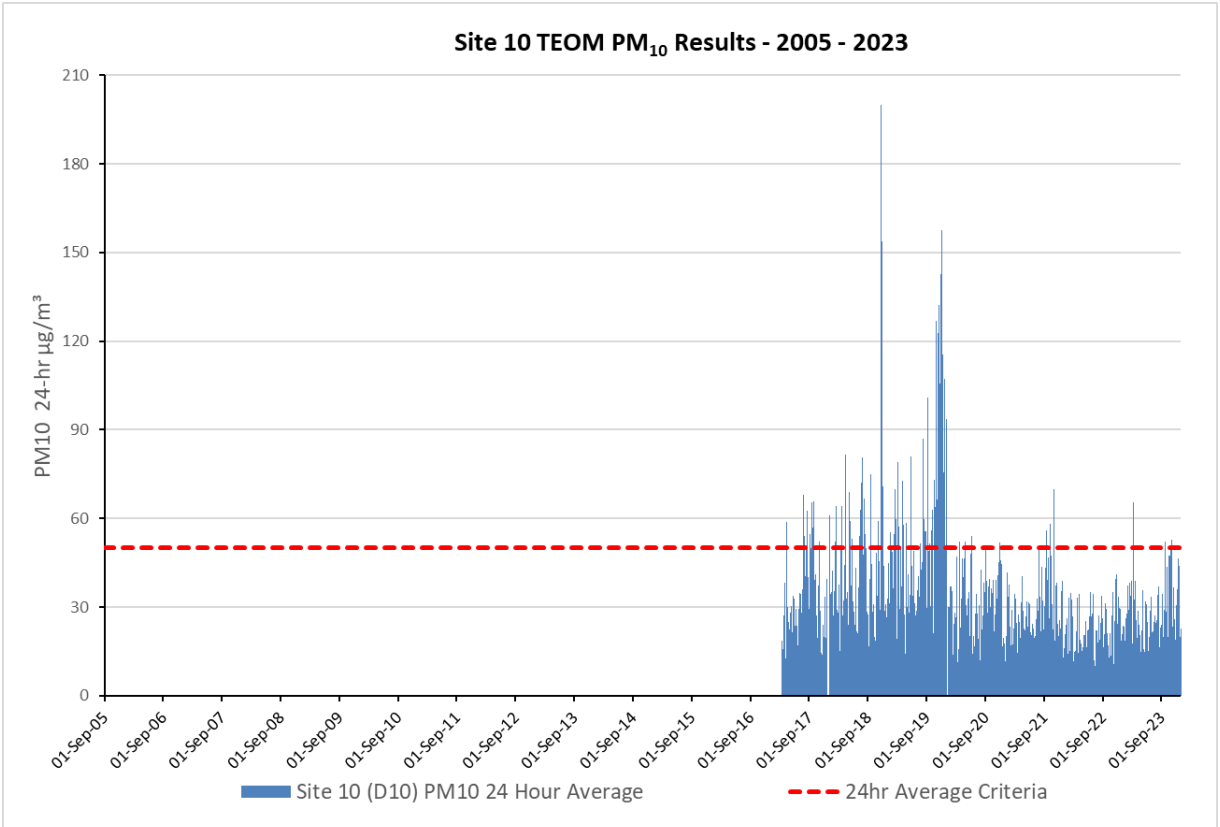


Figure 6.7
PM_{10} MONITORING RESULTS – SITE 10

The rolling annual average PM_{10} concentrations for each monitoring location ranged between 14.7µg/m^3 and 21.2µg/m^3 during the reporting period and was therefore below the annual average criteria value of 30µg/m^3. The annual average PM_{10} during the reporting period for all ACP monitoring sites was also generally consistent with or lower than that recorded at the DCCEEW operated Upper Hunter Air Quality Monitoring Station at Camberwell, which recorded an annual average PM_{10} of 20.9µg/m^3.

As TSP is proportionally calculated from the annual average PM_{10} result at Site 10, the annual TSP remained below the annual average criteria of 90µg/m^3.

Greenhouse Gas

Emissions During the Reporting Period

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 2022-2023 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 381,866t$CO_{2\text{-}e}$ (tonnes CO_2 equivalent) compared to 596,235t$CO_{2\text{-}e}$ for the previous 2021-2022 reporting period. This decrease in Scope 1 emissions was a result of improvements in gas management methods during the underground mining process and a lower mining rate during this period. Scope 2 emissions associated with the ACP during the 2022-2023 reporting period totalled 31,654t$CO_{2\text{-}e}$ compared to 35,442t$CO_{2\text{-}e}$ during the previous 2021-2022 reporting period.

Table 6.7
ACP Greenhouse Gas Emissions – 2017/2018 to 2022/2023

Greenhouse Gas Emission Type	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022	2022/2023
Scope 1 (t$CO_{2\text{-}e}$)	259,148	216,181	196,641	411,570	596,235	381,866
Scope 2 (t$CO_{2\text{-}e}$)	35,506	35,738	32,982	39,761	35,442	31,654
Total (t$CO_{2\text{-}e}$)	294,654	251,919	229,623	451,331	631,677	413,520
Source: Yancoal Australia Limited – National Greenhouse and Energy Reporting Scheme Results 2022/2023.						

Performance, Energy Efficiency and Emission Reductions

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. During the 2022/2023 reporting period, a concentrated effort was made to prioritise sealing in areas of completed mining, to further reduce GHG emissions. Specific measures during the reporting period were as follows.

- Sealing of MG105 panel and MG104-106 roadways in ULD Seam resulting in increased resistance between interconnected goaves (ULD to ULLD) minimising gas migration between seams and gas leakage in ULLD seam returns.

- Completion of construction works in the ULD seam in preparation for sealing the ULD Mains inbye of 13-14c/t A-E hdgs. This has provided for the ability to re-balance the ULD seam (vent pressure) comparatively to the ULLD seam returns to minimise air/gas migration between the ULD and ULLD seams. The re-balancing has minimised the differential pressure between both seams and reduced seal pressure in ULLD seam, reducing seal emissions.
- Sealing of LW201 X-Block resulting in considerable emissions reduction in this area due to a bad leak under 6c/t A-B MG201 Seal.
- Completion of repair works on leaking seals in LW203 X-Block roadways in ULLD Seam.
- Re-stabilisation of sealed area atmospheres in ULD and ULLD sealed goaves (due to balancing) resulting in the stopping of N2 injection into ULD & ULLD sealed areas, which further reduces the risk of gas migration between seams.

These emission reduction measures further build upon the reduction measures completed during previous reporting years and discussed in the respective Annual Reviews.

Comparison of Predicted Emissions

Due to the significant changes in assessment and reporting requirements for GHGs, and the numerous modifications to approved operations that have occurred over the life of the Mine, a direct comparison of predicted vs. reported emissions is not considered practicable or informative. **Table 6.8** presents a summary of the key modelling results from all air quality and greenhouse gas assessments undertaken over the life of the Mine.

Table 6.8
Predicted Average Annual Emissions

Source	Emission Source	Averaging Period (years)	Greenhouse Gas Emission by Type (CO_{2-e})			
			Scope 1	Scope 2	Total Scope 1 and 2	Scope 3
Holmes (2001)	Entire Project	20	27,600t (diesel) 4,455t (explosives) Fugitive emissions not calculated	37,000t	69,055t	4.28Mt
PAE Holmes (2009)	SEOC Only	7	50,160t (diesel) 1,730t (explosives) 132,428t (fugitive)	9,140t	193,5487t	4.83Mt
PAE Holmes (2011)	Gas Drainage Project – Stage 1	Not Specified	1,128 (diesel) 328,173 (gas venting)	-	329,301t	86t
PAE Holmes (2012)	Gas Drainage Project – Stage 2	Not Specified	270,480t to 708,259t (pending proportion flared)	-	270,480t to 708,259t	-

Reportable Incidents

No reportable incidents were recorded during the reporting period.

Further Improvements

The emission reduction benefits from the improvements to underground mine sealing and the previously upgraded flaring system will be reviewed during the next reporting period and the effectiveness of existing controls and management measures further considered.

6.6 BIODIVERSITY

Environmental Management

Biodiversity at the ACP site is managed under the Ashton Coal 2020 Biodiversity Management Plan (BMP) together with the 2012 Plan of Management Voluntary Conservation Area for the Southern Woodland Conservation Area (SWCA). Key biodiversity 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.

Biodiversity Offsets

Schedule 3 Condition 27 of Development Consent DA 309-11-2001-i requires the establishment of the following biodiversity offsets.

- Southern Conservation Area (existing vegetation and vegetation to be established) – minimum size 190ha.
- Bowman Creek Riparian Area (riparian and woodland vegetation) – minimum size 60ha.
- North East Open Cut Rehabilitation Area (woodland vegetation to be established) – minimum size 100ha.

As part of the biodiversity offset strategy, a Voluntary Conservation Agreement covering the Southern Woodland Conservation area was established between ACOL and the Minister for the Environment under the *National Parks and Wildlife Act 1974* on 16 September 2010. This conservation agreement provides for in perpetuity conservation of 65.45ha.

As outlined within the approved Biodiversity Management Plan, the conservation area is augmented by approximately 125ha of revegetation corridors and 66ha of Bowmans Creek Riparian corridor. Whilst not subject to specific instrument of long-term protection, management of these areas is consistent with the conservation measures implemented for the Voluntary Conservation Agreement. In total these areas equate to ~256ha, i.e. exceeding the minimum 250ha requirement for the Southern Conservation Area and Bowman Creek Riparian Area.

The North East Open Cut has been completed with ~140ha of rehabilitated area currently consisting of ~68ha of rehabilitated exotic pasture and ~71ha of native trees and shrubs. Areas of exotic pasture are planned to be progressively converted to woodland habitat with approximately 15ha of exotic pasture areas planned to be converted into areas of eucalypt woodland habitat over the next 5 years. These rehabilitation areas are not subject to a specific instrument of long-term protection, however, rehabilitation monitoring is undertaken in accordance with the requirements of the approved Biodiversity Management Plan.

A summary of biodiversity monitoring completed for these areas is provided as follows whilst Section 8.1 provides further discussion on rehabilitation activities and associated monitoring of rehabilitation.

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. This monitoring complements the rehabilitation monitoring of Bowmans Creek Diversion and North East Open Cut (NEOC), and the mining impacted "Farmland" above 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.

Where relevant, monitoring has been compared to completion / performance criteria developed for the ACP site and outlined within the BMP.

Flora and Fauna Monitoring

Bi-annual fauna monitoring was undertaken during the reporting period by Umwelt Environmental and Social Consultants in June 2023 and January 2024. 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 survey for bi-annual fauna monitoring includes ten survey transect sites, of which four sites consist of remnant vegetation ('control' sites), four sites are located over previously undermined areas ('impact' sites), and two sites are within rehabilitated areas.

A total of 107 fauna species were recorded as a result of the bi-annual fauna monitoring program, including 33 mammals, 63 birds, 7 amphibians and 11 reptiles. The following 13 threatened species were recorded during the 2023 fauna monitoring surveys, an increase of 7 species compared to the previous reporting period (6).

- Grey-crowned babbler (*Pomatostomus temporalis temporalis*)
- Speckled warbler (*Pyrrholaemus sagittatus*)
- Spotted harrier (*Circus assimilis*)
- White-bellied sea-eagle (*Haliaeetus leucogaster*)
- Brush-tailed phascogale (*Phascogale tapoatafa*)
- Eastern coastal free-tailed bat (*Micronomus norfolkensis*)
- Little bentwinged-bat (*Miniopterus australis*)
- Large bentwinged-bat (*Miniopterus orianae oceansis*)
- Southern myotis (*Myotis Macropus*)
- Eastern cave bat (*Vespadelus troughtoni*)
- Masked owl (*Tyto novaehollandiae*)
- Latham's snipe (*Gallinago hardwickii*)

All of the above species are listed as vulnerable under the NSW *Biodiversity Conservation Act 2016*, with the exception of Latham's snipe which has recently been listed as vulnerable under the Commonwealth *Environmental Protection Biodiversity Conservation Act* 1999. All species have previously been identified as occurring at the ACP site. A total of 30 threatened species have been recorded at the ACP site since monitoring commenced in 2006.

During the 2023 reporting period, the following nine 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*)
- Pig (*Sus scrofa*)
- Feral cat (*Felis catus*)
- Common starling (*Sturnus vulgaris*)
- Common myna (*Sturnus tristis*)

Analysis of the fauna monitoring results indicated that species diversity was similar between the control (72 species) and impact (78 species) monitoring sites. Long-term species diversity is shown on **Figure 6.8**. Species richness for mammals, amphibians and reptiles displayed minor variation from the previous reporting period. However, bird species richness declined by approximately 39% and 32% for impact and control sites, respectively. Comparisons among species groups indicated that fluctuations in species richness is generally comparable between impact and control types for all fauna types. These trends are generally consistent with previous monitoring and are most likely explained by local environmental and ecological factors outside of the influence of mining activity.

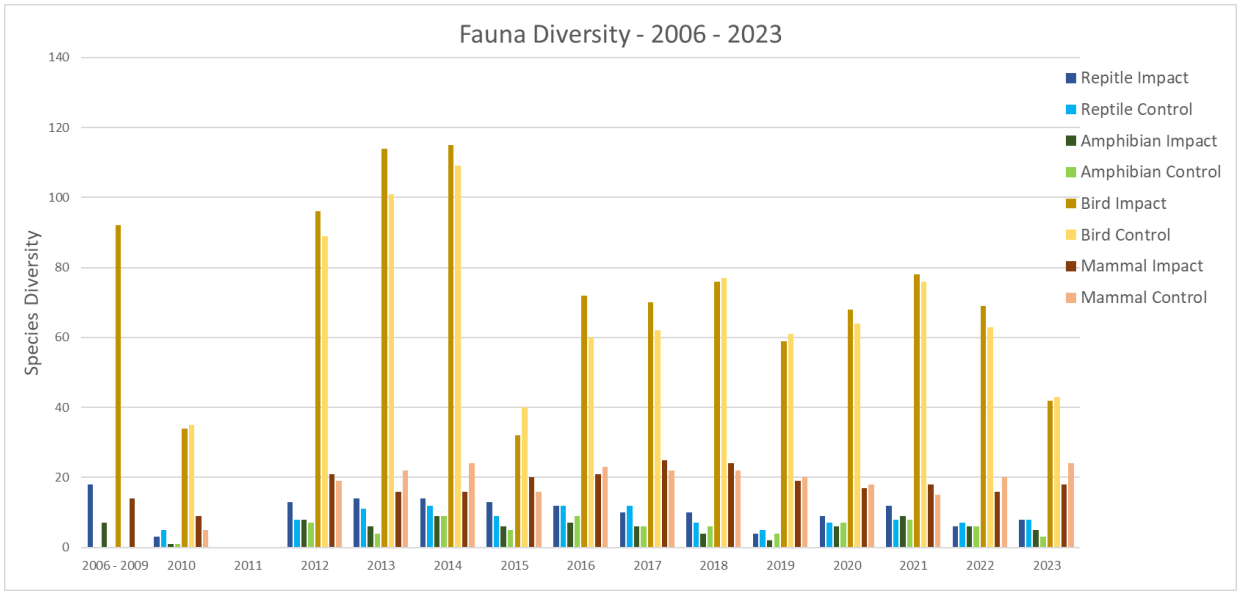


Figure 6.8
FAUNA DIVERSITY 2006 - 2023

Nest box inspections indicated that 34 of the 39 nest boxes installed in the SWCA remain in a moderate to good condition, and are sufficient to support roosting and nesting of arboreal species. One species, the common brushtail possum, was directly observed to be using nest boxes during the fauna surveys, with 19 possums found to be occupying nine boxes on two occasions. Another species, the brush-tailed phascogale, was indirectly observed to be using next boxes based on the contents of nest material and observation of scats.

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. Observed inter-year and inter-seasonal variation is consistent with expected results for dynamic ecological systems responding to regional-level climate patterns. Furthermore, the results of the fauna monitoring program indicate compliance with the relevant performance criteria outlined in the BMP and no further actions are required to address BMP compliance.

Aquatic Ecology – Bowmans Creek and Glennies Creek

Biannual monitoring of aquatic ecology was undertaken by Marine Pollution Research Pty Ltd in autumn (5 to 17 May 2023) and spring (6 to 8 November 2023).

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 eleventh year of monitoring for the Bowmans Creek Diversion which was completed in 2012.

Established sites are included in monitoring programs based on the progression of mining, and additional sites may be added or removed, if required. During the reporting period, one existing and two additional monitoring locations were included in the monitoring program, as follows.

Construction on the lower eastern diversion channel (EDC) block bank was completed in November 2022 and the lower western diversion channel (WDC) block bank construction commenced April 2023. Accordingly, there was one additional Bowmans Creek monitoring site brought online for the Autumn 2023 survey to provide baseline data for the block bank works and the current progression of longwalls, as follows.

- An inline creek monitoring site immediately upstream of the WDC block bank (BC4).

In addition to the above, two additional sites were sampled where waterbodies were established within subsidence depressions during spring 2022 and as follows.

- A subsidence depression overlying the northern limit of LW205 (SDLW5N).
- A subsidence depression overlying the southern limit of LW205 (SDLW5S).

Two ‘interim’ monitoring sites were established due to lack of water at all set locations within Bowmans Creek and the EDC, as follows.

- BC4.5 in place of BC4, located approximately 70m downstream from BC4 at the junction of Bowmans Creek and upstream end of WDC.
- BCED0 in place of BCWD1, located at the junction of Bowmans Creek and upstream end of EDC.

Lastly, existing sampling locations at similar subsidence depressions for LW203 and LW204 were renamed from SDN and SDS to SDLW3N and SDLW204S, respectively.

Monitoring locations currently include a total of 20 sites where monitoring may occur, as follows.

- Eighteen sites within Bowmans Creek, of which 14 are currently utilised as part of the monitoring program.
- Two sites within the Bowmans Creek Diversion channels, with one site per each of the two diversion channels.
- Two sites within Glennies Creek.
- Four sites within waterbodies established within subsidence depressions, which for reporting purposes are included with Bowmans Creek.

Habitat Condition

Aquatic habitat conditions during the 2023 sampling period showed as-predicted trends in response to reduced rainfall compared to previous reporting periods, with several fixed monitoring locations recorded as dry and unable to be sampled.

Aquatic habitat conditions for each active monitoring site, measured using the Riparian Channel Environment habitat scoring system (RCE index), are presented in **Table 6.9**.

For those sites which were sampled, all sites were found to be in 'good' condition (i.e. >70%) with the exception of BC6 (64.4% in spring) and BCDown (67.3% in autumn to 62.5% in spring). BC6 during spring sampling was noted as being in an alternate sampling location (previously recorded as BC6.5) as the remainder of the BC6 site was dry. Availability of suitable sample locations within BC6 was low, and high turbidity with no flow was recorded. There were once again minor score increases in the BCDown RCE score compared to the previous reporting period to due to improvements in sediment and detrital composition.

With the exception of site BC6 during spring, habitat condition scores during both the autumn and spring sampling rounds were generally consistent with or higher than the long term mean for all monitoring sites.

Subsidence dam monitoring sites recorded relatively low scores, ranging from 49.0% for SDLW3N during spring to 27.9% for SDLW5N during both monitoring events. Aquatic and edge habitats are dominated by dead grass structures as a relic of the submerged pasture cover, however, aquatic flora was identified as occurring within the 'older' sites at SDLW3N and SDLW4S. As the RCE method is more suited to lotic waterways (creeks and rivers), sites contained within lentic systems (ponds and lakes), especially artificial channels (e.g., farm dams) often perform poorly for the RCE channel related categories.

Habitat condition scores recorded at Glennies Creek monitoring sites (GCUp and GCMid) are consistent with those recorded for the previous reporting period, showing a more-stabilised recovery from the lower scores recorded throughout spring 2018 to spring 2019. Habitat conditions at these sites are generally dependent upon water levels, with upstream dam water releases providing relatively stable flow rates during the reporting period.

Table 6.9
Monitoring Site RCE Index Score – 2014 to 2023

Year	Period	Site RCE Index Score (% Condition)[1]																					
		BCUp	BC1	BCLW7B	BCLW6B[2]	BCED1[3]	BCED0	BCED2[3]	BC3	BC4	BC4.5	BCMW5	BCLW7A[2]	BCWD1	BCWD2[3]	BC5	BC6	BCDown	SDLW3N	SDLW4S	SDLW5S	SDLW5N	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				75.0		Dry		72.1	70.2					73.1	73.1
	Spring	76.0	76.9		Dry	Dry			Dry				75.0		Dry		Dry	70.2					71.2	71.2
2019	Autumn	Dry	73.1		Dry	Dry			Dry				Dry		Dry		Dry	49.0					71.2	71.2
	Spring	Dry	76.0		Dry	Dry			Dry				Dry		Dry		Dry	52.9					71.2	71.2
2020	Autumn	76.9	74.0		74	77.9		78.8	76.9			74.0	74.0		Dry		76.9	52.9					73.1	73.1
	Spring	76.9	75.0		73.1	80.8		79.8	77.9			74.0	74.0		80.8		76.0	52.9					73.1	73.1
2021	Autumn	76.9	76.0		73.1	81.7		78.8	76.0			74.0	72.1		80.8		76.0	53.8					73.1	73.1
	Spring	75.0	76.0		73.1	79.8		78.8	76.0			74.0	72.1		80.8		74.0	53.8					73.1	73.1
2022	Autumn	77.9	74.0		73.1	81.7		79.8	75.0			77.9	74.0		81.7		73.1	57.7					73.1	73.1
	Spring	77.9	74.0	74.0	72.1	79.8		78.9	72.1			-	74.0	78.8	81.7	72.1	73.1	57.7	42.3	41.3			73.1	73.1
2023	Autumn	77.9	73.1	Dry	Dry	81.7		81.7	Dry				72.1	80.8	Dry	74.0	73.1	67.3	48.1	34.6	42.3	27.9	73.1	73.1
	Spring	76.9	74.0		Dry	Dry	81.7	Dry	Dry	Dry	71.2		Dry	Dry	Dry	Dry	64.4	62.5	49.0	34.6	42.3	27.9	73.1	73.1
Minimum		74.0	73.1	74.0	68.3	74.0	81.7	78.8	72.1	-	71.2	74.0	71.2	78.8	75.0	72.1	64.4	49.0	42.3	34.6	42.3	27.9	71.2	71.2
Maximum		78.8	77.9	74.0	74.0	81.7	81.7	81.7	78.8	-	71.2	77.9	76.0	80.8	81.7	74.0	76.9	76.0	49.0	41.3	42.3	27.9	74.0	74.0
Mean		77.2	75.2	74.0	71.4	77.6	81.7	79.5	77.0	-	71.2	74.8	73.4	79.8	78.5	73.1	73.7	63.9	46.5	36.8	42.3	27.9	72.9	72.9

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: Modified after Table 5 of Marine Pollution Research Pty Ltd (2023a and 2023b).

Stream Health – Aquatic Fauna

Table 6.10 and **Table 6.11** present the long term macroinvertebrate diversity and SIGNAL Index scores respectively for monitoring locations within Bowmans Creek (including the subsidence pond locations) and Glennies Creek. In accordance with sampling triggers outlined in the BMP, 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 11 sites sampled in autumn (BCED2 and BC5), and for one subsidence pond site sampled in spring (SDLW3N). Low values likely reflect a reduction in of macroinvertebrate assemblages likely associated with reduced rainfall, with 4 and 10 monitoring sites being recorded as Dry during autumn and spring monitoring events, respectively. Notwithstanding, macroinvertebrate diversity levels during the autumn sampling round for the remaining monitoring sites were either consistent with or higher than those reported during the previous reporting period.

Site SIGNAL scores recorded for Bowmans Creek were 'In' at all sites sampled during both autumn and spring (excluding Dry sites). For Glennies Creek, all macroinvertebrate diversities and SIGNAL scores were 'In' during both seasonal sampling periods, except for GCUp during autumn where a 'Low' SIGNAL score was reported. The general consistency or improvement in SIGNAL scores compared to the previous reporting periods likely reflect a gradual recolonisation by more sensitive taxa due to sustained water levels, with complete recolonisation likely to take time due to the need for adult stages of these taxa to recolonise upstream areas by aerial means.

In summary, the 'Low' trigger value recorded for monitoring site GCUp within Glennies Creek during the reporting period is attributable to natural variation and natural environmental responses to prevailing climatic conditions. As such, no further action was required under the BMP TARP.

In addition to aquatic macroinvertebrates, eight native fish species and two pest species were recorded within both Bowmans Creek and Glennies Creek during the reporting period, as follows.

Native Species

- Flathead gudgeons (*Phylipnodon grandiceps*)
- Firetail gudgeons (*Hypseleotris galii*)
- Striped gudgeon (*Gobiomorphus australis*)
- Gudgeon sp, (*Gobiomorphus*) and (*Hypseleotris sp.*)
- Long-finned eel (*Anguilla reinhardtii*)
- Australian smelt (*Retropinna semmoni*)
- Eel-tailed catfish (*Tandanus tandanus*)
- Mullet (*Mugil cephalus*)

Pest Species

- Plague minnow (*Gambusia holbrooki*
- Carp (*Cyprinus carpio*)

Tadpoles were also observed within Bowmans Creek during spring.

Table 6.10
Stream Health Monitoring – Macroinvertebrate Diversity

Year	Period	Macroinvertebrate Diversity (No.)																												
		Bowmans Creek Sites^																				Summary		Glennies Creek Sites^					Summary	
		BC Up	BC1	BCLW7B	BCLW6B	BCED0	BCED1	BCED2	BC3	BC4	BC4.5	BCLW7A	BCWD1	BCWD2	BC5	BC6	BC Down	SDLW3N	SDLW4S	SDLW5S	SDLW5N	*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	18		-	-	-		-	21	-	-	-	-	16	-	-	-	-	***37***	***18.8***	21	20	21	22	20	***34***	***20.8***
2009	Autumn	23	12	24	24		-	-	-		-	21	-	-	-	-	22	-	-	-	-	***44***	***19.8***	22	24	23	27	24	***41***	***24.0***
	Spring	-	15	12	12		-	-	23		-	29	-	-	-	-	25	-	-	-	-	***46***	***21.2***	21	-	20	-	23	***33***	***21.0***
2010	Autumn	-	12	14	14		-	-	12		-	26	-	-	-	-	22	-	-	-	-	***40***	***17.5***	18	-	25	-	22	***36***	***22.0***
	Spring	18	-	19	19		-	-	-	24	-	-	-	-	-	22	12	-	-	-	-	***39***	***19.2***	9	-	30	22	-	***34***	***20.3***
2011	Autumn	20	-	19	19		-	-	-	21	-	-	-	-	-	18	21	-	-	-	-	***33***	***20.0***	-	-	27	23	-	***34***	***25.0***
	Spring	22	-	21	21		-	-	-	20	-	-	-	-	-	17	19	-	-	-	-	***37***	***19.8***	20	-	27	22	-	***35***	***23.0***
2012	Autumn	26	-	19	19		-	-	-	25	-	-	-	-	-	24	17	-	-	-	-	***39***	***22.2***	14	-	17	18	-	***26***	***16.3***
	Spring	35	22	17	17		-	-	-	24	-	35	-	-	-	31	23	-	-	-	-	***52***	***26.7***	26	-	28	24	-	***41***	***26.0***
2013	Autumn	27	23	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	9	-	-	-	-	***18***	***11.0***	20	-	19	-	-	***25***	***19.5***
2020	Autumn	15	20	-	16		21	22	20		-	7	-	Dry	-	15	9	-	-	-	-	***28***	***16.2***	22	-	25	-	-	***31***	***23.5***
	Spring	25	23	-	20		22	21	21		-	21	-	21	-	20	20	-	-	-	-	***39***	***21.5***	26	-	32	-	-	***36***	***29.0***
2021	Autumn	18	23	-	18		20	18	19		-	10	-	19	-	21	13	-	-	-	-	***40***	***18.1***	23		20			***35***	***21.5***
	Spring	24	19	-	18		26	29	20		-	15	-	23	-	20	19	-	-	-	-	***44***	***20.5***	20		29			***32***	***24.5***
2022	Autumn	19	22	-	17		23	21	25		-	21	-	22	-	17	12	-	-	-	-	***52***	***19.9***	23		20			***28***	***21.5***
	Spring	22	23	25	15		18	19	27			24	21	17	20	26	14	28	21	-	-	***47***	***20.8***	27		27			***34***	***27.0***
2023	Autumn	29	23	Dry	Dry		25	18	Dry	-		30	19	Dry	14	26	27	22	18	19	17	***56***	***22.2***	23		30			***35***	***21.5***
	Spring	32	26	Dry	Dry	28	Dry	Dry	Dry	Dry	25	Dry	Dry	Dry	Dry	19	31	20	18	19	13	***55***	***23.1***	24		25			***33***	***24.5***
LTM[1]		***23.2***	***18.8***	***19.2***	***17.3***	***-[4]***	***22.5***	***19.7***	***22.2***	***23.2***	***-[4]***	***21.8***	***20.0***	***21.4***	***17.7***	***21.6***	***18.9***	***25.0***	***19.5***	***-[4]***	***-[4]***	***41***	***20.2***	***20.8***	***-[4]***	***22.6***	***-[4]***	***-[4]***	***31***	***21.7***
SD LTM[2]		***5.3***	***3.9***	***4.0***	***4.3***	***-[4]***	***3.3***	***1.6***	***4.1***	***2.1***	***-[4]***	***6.3***	***1.4***	***2.3***	***3.2***	***4.6***	***5.3***	***4.2***	***2.1***	***-[4]***	***-[4]***	***9.2***	***3.3***	***3.9***	***-[4]***	***4.6***	***-[4]***	***-[4]***	***5.7***	***3.1***
Status[3]	Autumn	***High***	***High***	***-***	***-***	***-***	***In***	***Low***	***-***	***High***	***-***	***High***	***In***	***-***	***Low***	***In***	***High***	***In***	***In***	***-***	***-***	***High***	***In***	***In***	***-***	***High***	***-***	***-***	***In***	***In***
	Spring	***High***	***High***	***-***	***-***	***-***	***-***	***-***	***-***	***-***	***-***	***-***	***-***	***-***	***-***	***In***	***High***	***Low***	***In***	***-***	***-***	***High***	***In***	***In***	***-***	***In***	***-***	***-***	***In***	***In***

^ See **Figure 6.1**.
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.

Source: Modified after Tables 8 and 10 of Marine Pollution Research Pty Ltd (2023a and 2023b).

Table 6.11
Stream Health Monitoring – SIGNAL Scores

Signal Score																																
		Bowmans Creek Sites^																				*Summary*		Glennies Creek Sites^						*Summary*	
Year	**Period**	**BCUp**	**BC1**	**BCLW7B**	**BCLW6B**	**BCED0**	**BCED1**	**BCED2**	**BC3**	**BCE4**	**BC4.5**	**BCLW7A**	**BCWD1**	**BCWD2**	**BC5**	**BC6**	**BC Down**	**SDLW3N**	**SDLW4S**	**SDLW5S**	**SDLW5N**	***Creek Score***	***Mean Site***	**GC Up**	**GCOC Up**	**GC Mid**	**GCOC Down**	**GC Down**	***Creek Score***	***Mean Site***
2007	Autumn	2.17	-	-	-	-	-	-	-	-	2.93	3.24	-	-	-	-	3.33	-	-	-	-	***2.95***	***2.92***	3.71	-	3.81	-	3.58	***3.71***	***3.70***
	Spring	3.57	-	-	-	-	-	-	-	-	4.31	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	-	-	-	-	-	-	-	-	4.17	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	3.89	-	-	-	-	-	4.00	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	3.50	-	-	-	-	-	3.76	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	3.82	-	-	-	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	2.83	-	-	-	4.09	-	-	3.63	-	-	3.65	-	3.90	-	-	-	-	***3.61***	***3.58***	4.00	-	4.25	-	3.68	***3.98***	***3.98***
	Spring	3.33	-	3.84	3.84	-	-	-	-	3.50	-	-	-	-	-	3.52	3.67	-	-	-	-	***3.58***	***3.59***	3.22	-	3.61	3.55	-	***3.53***	***3.46***
2011	Autumn	3.60	-	3.47	3.47	-	-	-	-	3.62	-	-	-	-	-	3.44	3.60	-	-	-	-	***3.58***	***3.57***	-	-	3.81	3.74	-	***3.78***	***3.78***
	Spring	3.86	-	3.35	3.35	-	-	-	-	4.05	-	-	-	-	-	4.06	3.68	-	-	-	-	***3.79***	***3.80***	4.10	-	3.80	4.05	-	***3.97***	***3.98***
2012	Autumn	3.85	-	3.33	3.33	-	-	-	-	3.45	-	-	-	-	-	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	4.00	-	-	-	-	4.18	-	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	3.45	-	-	-	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	-	-	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	-	-	3.71	-	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	-	-	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	2.75	-	-	-	-	***3.42***	***3.42***	4.12	-	3.61	-	-	***3.86***	***3.87***
2020	Autumn	3.15	3.38	-	3.23	-	3.22	3.11	3.06	-	-	2.00	-	Dry	-	3.17	2.50	-	-	-	-	***3.07***	***2.98***	3.65	-	4.00	-	-	***3.84***	***3.83***
	Spring	3.73	3.76	-	3.17	-	3.75	3.37	3.35	-	-	3.25	-	3.89	-	3.39	3.32	-	-	-	-	***3.50***	***3.49***	4.17	-	3.94	-	-	***4.04***	***4.05***
2021	Autumn	4.18	3.73	-	3.53	-	3.63	4.18	4.00	-	-	3.50	-	4.32	-	4.33	3.91	-	-	-	-	***4.08***	***3.90***	3.90	-	3.95	-	-	***3.93***	***3.90***
	Spring	3.59	3.58	-	3.38	-	3.42	3.59	3.75	-	-	3.62	-	3.91	-	3.90	3.63	-	-	-	-	***3.62***	***3.61***	4.05	-	3.92	-	-	***3.99***	***3.99***
2022	Autumn	3.63	3.68	-	3.56	-	4.09	4.05	3.88	-	-	3.61	-	3.65	-	3.47	3.67	2.83	2.85	-	-	***3.73***	***3.71***	3.70	-	4.05	-	-	***3.82***	***3.87***
	Spring	4.23	4.26	3.40	3.20	-	4.78	3.95	4.30	-	-	3.68	4.05	4.71	4.30	4.00	4.07	-	-	-	-	***4.07***	***4.07***	3.54	-	3.70	-	-	***3.62***	***3.62***
2023	Autumn	3.78	3.68	Dry	Dry	-	4	3.94	Dry	3.83		3.45	3.74	Dry	3.46	3.65	3.92	3.44	3.07	3.2	3.07	***3.58***	***3.58***	4.00	-	4.11	-	-	**3.59**	**3.59**
	Spring	3.97	3.50	Dry	Dry	3.19	Dry	Dry	Dry	Dry	3.19	Dry	Dry	Dry	Dry	3.88	3.66	3.00	3.33	3.27	3.44	***3.44***	***0.26***	3.50	-	4.04	-	-	**3.45**	**3.45**
LTM[1]		3.65	3.62	3.54	3.32	***-[4]***	3.69	3.71	3.65	3.76	***-[4]***	3.43	***-[4]***	3.77	***-[4]***	3.61	3.60	***-[4]***	***-[4]***	***-[4]***	***-[4]***	***3.58***	***3.58***	3.83	3.90	3.88	3.83	3.70	3.84	3.84
SD LTM[2]		0.40	0.31	0.33	0.31	***-[4]***	0.38	0.42	0.39	0.33	***-[4]***	0.42	***-[4]***	0.37	***-[4]***	0.30	0.38	***-[4]***	***-[4]***	***-[4]***	***-[4]***	***0.26***	***0.26***	0.28	0.08	0.26	0.36	0.21	0.20	0.20
Status[3]	Autumn	In	In	-	-	-	In	In	-	In	-	In	-	-	-	In	In	-	-	-	-	In	In	In	-	In	-	-	In	In
	Spring	In	In	-	-	-	-	-	-	-	-	-	-	-	-	In	In	-	-	-	-	In	In	Low	-	In	-	-	In	In

^See **Figure 6.1**

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.

Source: Modified after Tables 9 and 11 of Marine Pollution Research Pty Ltd (2023a and 2023b).

Vegetation - Bowmans Creek Riparian Zone

Monitoring of the Bowman Creek riparian vegetation was undertaken during the reporting period between 15 May to 25 May 2023 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 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 6.12 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, with both the reference and monitoring sites showing similar responses to regional-level extreme meteorological conditions. Although some sites on the natural creek channel had also been affected by the floods, all monitoring sites were ecologically more functional than the reference sites, except Q3, Q7 and Q10 which were slightly lower than one or more of the casuarina reference sites this year. The lowest landscape function was recorded for the casuarina reference site CC3.

The stability of the Casuarina reference sites is showing signs of recovery following a declining trend since 2019, as a direct result of the extreme flood events over the past few years. This year there has been an increase in stability with the stability ranging from 60.4 to 63.3 in 2022, to 68.7 to 71.8 in 2023. Increased stability is attributed to drier conditions and increased groundcover. In general, Casuarina monitoring sites were observed to have limited change in stability with indices ranging from 66.5 (C2) to 71.9 (C1). Three sites (C2, C3, and C4) where only slightly lower than the stability of the reference sites, which ranged from 68.7 to 71.8.

Stability within the woodland sites compared to Casuarina sites is generally more stable in the long term, and less impacted from extreme weather events such as flooding. During 2023, stability of the woodland reference sites was higher than any Casuarina sites and ranged from 72.2 to 74.0. Stability of woodland monitoring sites ranged from 66.5 (R3) to 73.4 (R5).

High ecosystem function at creek diversion sites (C) suggest that diversion sites are performing as good or better than most natural creek (Q) and all reference (CC) monitoring sites. For River Red Gum, reference sites RWood02 and RRG01 had the highest (181) and lowest (157) levels of ecosystem function, respectively. For River Red Gum monitoring sites, ecosystem function ranges from 176.0 at R3 to 167.6 at R1.

Other performance targets which have not yet been achieved are primarily dependent upon community maturity, with performance indicators including litter cover, canopy cover, trunk diameter and provision of wildlife habitat expected to develop over time.

Monitoring also indicated that there has been a significant increase in health condition of the population in all age cohorts for River Red Gum, with 68% of the population being assessed as being in healthy condition. The percentage of the population assessed as being in poor health declined from 24% in 2022 to 6% in 2023. Saplings were over represented as having medium to poor health compared to old growth, mature, and young trees.

Table 6.12
Bowmans Creek Riparian Zone – Completion Criteria Status

Rehabilitation Phase	Completion Criteria	Performance Indicator	Unit of Measure	Casuarina Monitoring Site									Mixed Eucalypt Monitoring Site				
				C1	C2	C3	C4	Q3	Q4	Q7	Q9	Q10	R1	R3	R5	R6	RRG01
Phase 3: Landform establishment and stability	Landform suitable for final landuse and generally compatible with surrounding topography and final landform design	Slope	< Degrees (18°)	2	2	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 4: Growth medium development	Soil properties are suitable for the establishment and maintenance of selected vegetation species	pH	pH (5.6-7.3)	6.5	6.1	6.3	6.5	NA	6.8	NA	6.7	6.9	6.3	6.4	6.6	6.0	7.4
		Organic Matter	% (>4.5)	6.3	3.7	5.0	3.1	NA	4.9	NA	5.5	4.3	3.5	3.8	5.7	5.6	3.5
		Phosphorous	mg/ kg (50)	26.3	23.3	30.1	22.8	NA	16.3	NA	13.8	18.8	16.5	50.8	43.0	13.2	23.5
Phase 5: Ecosystem & Land Use Establishment	Landform is stable and performing as it was designed to do	LFA Stability	%	71.9	66.5	67.3	67.0	76.8	74.6	66.5	71.5	71.9	68.5	66.5	73.4	70.0	71.4
		LFA Landscape organisation	%	100	100	100	100	100	100	97	100	100	100	100	96	100	80
	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	31	18	38	23	NA	44	NA	35	52	35	43	47	38	43
		Native species richness	>No./ area	3	4	14	3	NA	14	NA	8	16	12	16	19	19	12
		Exotic species richness	<No./ area	28	14	24	20	NA	30	NA	27	36	23	27	28	19	31
	Vegetation contains a density of species comparable to that of the local remnant vegetation	Density of shrubs and juvenile trees	No./ area	2	32	55	30	NA	0	NA	0	0	19	3	7	33	2
	The vegetation is comprised by a range of growth forms comparable to that of the local remnant vegetation	Trees	No./ area	1	2	6	1	NA	1	NA	1	1	3	3	3	6	2
		Shrubs	No./ area	0	0	2	0	NA	0	NA	0	0	2	1	0	1	1
		Herbs	No./ area	24	10	18	13	NA	27	NA	23	36	15	17	31	13	28
		Grasses	No./ area	3	2	8	6	NA	8	NA	7	12	9	14	6	13	6
Phase 6: Ecosystem & Land Use Sustainability	Landform is ecologically functional and performing as it was designed to do	LFA Infiltration	%	53.9	54.3	52.1	53.4	42.1	51.9	46.3	50.5	40	50.1	55.2	46.8	53.2	43.9
		LFA Nutrient recycling	%	52.2	53.1	51.6	51.6	44	49.7	39.8	49.2	38.2	48	54.3	47.4	52.2	42.1
	Ground layer contains protective ground cover and habitat structure comparable with the local remnant vegetation	Perennial plant cover (< 0.5m)	%	29.8	26.5	9.2	33	40	75.5	67.5	24.6	31.5	15.5	27.1	10	14.5	63.5
		Total Ground Cover	%	95.8	100	96.2	100	96	98	98.5	100e	96.2	97.2	98	99.5	95	98.5
	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	0.6	1	1.2	2.4	0	1.2	1.2	3.4	1	2.2	1.2	2	2
		Exotic understorey abundance	< species /m^2	3.6	2.2	4.8	2	3.6	2.6	5	5.2	7.8	6.4	4.8	3.6	4.2	5
	Native ground cover abundance is comparable to that of the local remnant vegetation	Percent ground cover provided by native vegetation <0.5m tall	%	7.5	12	14.3	33.3	54	0	23.4	13.3	30.9	8.6	35.7	17.4	27.8	23.3
	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	0	3	0	NA	0	NA	0	0	4	0	0	2	1
		Shrubs and juvenile trees >2m in height	No./ area	2	31	23	29	NA	0	NA	0	0	4	1	4	17	1
	The vegetation is developing in structure and complexity comparable to that of the local remnant vegetation	Foliage cover 0.5 - 2 m	% cover	11.5	3.6	13.5	12	0.2	17.5	4	0.5	0	6.1	0.1	4	7.1	0
		Foliage cover >6m	% cover	15.5	26	13.5	37	12	33	35	0	4.5	22.5	27	0	11	27
	Vegetation contains a diversity of maturing tree and shrubs species comparable to that of the local remnant vegetation	Tree diversity	species/ area	1	1	5	1	NA	1	NA	1	1	3	3	3	6	3

Table 6.12 (Cont'd)
Bowmans Creek Riparian Zone – Completion Criteria Status

Rehabilitation Phase	Completion Criteria	Performance Indicator	Unit of Measure	Casuarina Monitoring Site									Mixed Eucalypt Monitoring Site				
				C1	C2	C3	C4	Q3	Q4	Q7	Q9	Q10	R1	R3	R5	R6	RRG01
Phase 5: Ecosystem & Land Use Sustainability (Cont'd)	Vegetation contains a density of maturing tree and shrubs species comparable to that of the local remnant vegetation	Tree density	No./ area	33	90	50	107	NA	7	NA	2	2	14	24	6	32	6
	The vegetation is in a condition comparable to that of the local remnant vegetation.	Healthy trees	% population	69.7	32.3	29.4	36.6	NA	57..1	NA	50	20	64.3	33.3	16.7	43.8	37.5
		Medium health	% population	30.3	49.5	62.7	46.4	NA	28.6	NA	0	0	28.6	54.2	66.7	43.8	25
		Advanced dieback	% population	0	15.1	5.9	12.9	NA	14.3	NA	0	0	7.1	12.5	16.7	12.5	12.5
		Dead Trees	% population	0	3.2	2	4.5	NA	0	NA	50	80	0	0	0	0	25
		Flowers/fruit: Trees	% population	27.3	15.1	25.5	16.1	NA	42.9	NA	50	10	28.6	12.5	0	0	50

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 (2023).

River Red Gum population size has increased overall since 2017 from 80 to 155 individual specimens being identified. A reduction in total numbers compared to the previous monitoring period (157) was attributed to loss of young saplings/seedlings from flooding, and reduced detectability due to increased growth of groundcover species. Only 15% of the population were identified as bearing reproductive structures during the reporting period, a marked reduction from 2022 and 2021, with 67% and 83% of specimens being observed as bearing reproductive material, respectively.

Approximately 68% of the population consists of saplings, consistent with the previous reporting period during which saplings made up approximately 71% of the population. Overall regeneration remains limited, primarily attributed to drought and overgrazing, combined with extensive weed competition. However, consistent population age structures suggest survivability of saplings, once established, can be maintained in the short term.

Erosion and decreased soil stability associated with previous cattle presence in riparian areas has been the most significant threat to the health of riparian areas associated with Bowmans Creek. In particular, during drought conditions in 2017 and 2019, increased levels of grazing in riparian areas combined with increased vulnerability of soils and creek banks to erosion threatened rehabilitated areas as well as established remnant vegetation. Subsequently most ACOL farmland areas, including the creek were destocked in 2020 and, with improved seasonal conditions, significant understory growth of grass (and weeds) has occurred. Notwithstanding, some of the old growth trees remain susceptible to degradation as their roots remain exposed and some are on very steep sided banks and may become unstable and fall.

Removal of grazing has led to high abundance of weed species. Effects from targeted weed species controls were noted through observation of dead individuals, however, overall weed abundance remained high and some weeds, such as balloon vine (*Cardiospermum halicacabum*), have increased in abundance significantly. Dead individuals of rough-barked apple (*Angophora floribunda*) and river oak / river sheoak (*Casuarina cunninghamiana*) were observed that appear to have been killed as a result of past herbicide application.

However, stream vegetation has been observed to recover during the reporting period in sections where damage from grazing and flooding was not as pronounced, including in the eastern and western creek diversions which remain intact and appeared to be fully functional riparian ecosystems. Any future grazing to manage understorey weeds and increasing fuel loads will be carefully controlled to avoid overgrazing.

Exotic species richness was higher than that of native species at all sites, and the understory for all sites was dominated by exotic species. Fourteen priority and declared weed species were 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 22 May and 23 May 2023. Monitoring methods included the use of the Biometric Assessment Method in areas of subsidence repair, NSW Biodiversity Conservation Division monitoring forms and photo points for three established sites (SVCA01, SVCA02 and 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 6.13 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 SVCA03 met almost all of the specified completion criteria although native species richness was low for all sites, with only SVCA02 meeting the minimum observed native richness value for woodland ecosystems. LFA stability was generally consistent with reference sites. SCVA01 and SCVA03 were within and above the refence range values, respectively, and SCVA02 was only 0.1% lower than the lower range value from reference sites. Low values were recorded for SCVA03 for vegetation diversity, density, and ecosystem composition; however LFA infiltration and LFA Nutrient Cycling were within range for SVCA01, SVCA02 and SVCA03. Most relevant completion criteria were also met at site SVCA04 with the exception of observed incidences of subsidence cracking and low native ground cover abundance.

Subsidence crack treatment works involving clearing, excavation and backfilling were undertaken at sites SVCA05 and SVCA06 in 2018. These two sites displayed generally comparable results for all criteria, with the exception of observed subsidence cracking at SVCA05. LFA stability and landscape organisation at both sites was less than the minimum observed values within woodland ecosystem sites, yet relatively similar to other monitoring locations. However, it is noted that SCVA05 failed to meet almost all relevant criteria, apart from native groundcover abundance and ecosystem structure, largely due to recent earthworks relating to subsidence repair. It is anticipated that these sites will develop towards the completion criteria as they mature.

Further incidences of subsidence cracking and/or development of sink holes within previously rehabilitated areas highlight the importance of re-inspection and potential for additional rehabilitation. Soil analyses indicate that the soils were typically within local or desirable levels although sulfur levels were slightly elevated in most SVCA sites, and phosphorous was low in all sites except SCVA02 and SCVA03.

Nine priority and declared weed species were recorded across the SVCA monitoring sites, including many priority weed species identified as occurring within one or more woodland reference sites. Exotic perennial grasses considered to be environmental weeds were also recorded in increasing patches throughout the SVCA, ACOL farmland and roadside areas.

Table 6.13
Southern Woodland Conservation Area – Completion Criteria Status 2023

Rehabilitation Phase	Aspect or Ecosystem Component	Completion Criteria	Performance Indicators	Primary Performance Indicators	Unit of Measure	Woodland Ecosystem Range 2023		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	0	0	0.1	0	0
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)	5.6	6.1	6.0	5.8	6.1	6.1	6.6	6.2
			Organic Matter	Organic Matter levels are typical of the surrounding landscape, increasing or fall within desirable ranges provided by the agricultural industry	% (>4.5)	4.6	5.7	6.5	8.2	5.6	4.8	5.7	6.4
			Phosphorous	Available Phosphorus is typical of the surrounding landscape or fall within desirable ranges provided by the agricultural industry	mg/kg (50)	14.4	16.6	10.2	15.0	15.7	10	14.1	10.3
Phase 4: Ecosystem & Land Use 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	%	72.2	74.0	72.5	72.1	76.4	82.1	66.3	70.5
			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	%	94	100	100	100	100	100	61	97
	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	5	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	81	100	99	96	0	NA	NA	NA
			Total species richness	The total number of live plant species is comparable to the local remnant vegetation	No./area	60	64	55	57	32	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	41	44	37	41	14	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	18	21	18	16	18	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	33	160	155	83	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	33	129	154	80	0	NA	NA	NA

Table 6.13 (Cont'd)
Southern Woodland Conservation Area – Completion Criteria Status 2023

Rehabilitation Phase	Aspect or Ecosystem Component	Completion Criteria	Performance Indicators	Primary Performance Indicators	Unit of Measure	Woodland Ecosystem Range 2023		SVCA01	SVCA02	SVCA03	SVCA04	SVCA05	SVCA06
						Lower	Upper						
Phase 4: Ecosystem & Land Use 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	4	4	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	27	36	28	21	15	NA	NA	NA
			Grasses	The number of grass species comprising the vegetation community is comparable to the local remnant vegetation	No./area	15	20	12	17	10	NA	NA	NA
Phase 5: Ecosystem & Land Use 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	%	43.3	54.7	49.5	57.3	57.8	59.9	39.4	46.6
			LFA Nutrient recycling	LFA nutrient recycling index is comparable to or trending towards the local remnant vegetation	%	46.4	52.4	49.9	54.9	53	54.9	36.4	45.1
	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	%	32	71	32	10.8	40	50	17.3	30
			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	%	96	100	99	98.5	100	100	67.5	96
	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	8	11	6.6	5.6	4	5.6	4.6	6.8
			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	2	4	2	0.8	3	2.2	1.8	3.4
	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	%	71	90	84.2	87.2	52.3	76.2	82.8	76
	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	11	24	118	38	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	7	35	22	31	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	0	21	7	3	0	NA	NA	NA

Table 6.13 (Cont'd)
Southern Woodland Conservation Area – Completion Criteria Status 2023

Rehabilitation Phase	Aspect or Ecosystem Component	Completion Criteria	Performance Indicators	Primary Performance Indicators	Unit of Measure	Woodland Ecosystem Range 2023		SVCA01	SVCA02	SVCA03	SVCA04	SVCA05	SVCA06
						Lower	Upper						
Phase 5: Ecosystem & Land Use 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	2	0.1	0	0.7	1	0	1
			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	1	14	4.5	0.5	0	9	0	8
			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	0	28	19.2	32	0	19	7.5	4
	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	17	81	29	24	0	NA	NA	NA
	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	23	53	28	42	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	11	0	29	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 (2023)

The following recommendations were also provided.

1. Weed Control

   Glennies Creek - Weeds of most concern include Vine weeds such as Madeira Vine (*Anredera cordifolia*) and Balloon Vine (*Cardiospermum grandiflorum*). A targeted control program should focus on these two species as they have the potential to smother vegetation, damaging canopy species and limiting native species re-establishment within the lower stratum.

   Hunter River – Weeds including Castor Oil Plant (*Ricinus communis*), Kikuyu (*Cenchrus clandestinus*), Coolatai Grass (*Hyparrhenia hirta*) should be treated once a revegetation and bush regeneration plan is developed and implementation commenced.

   Open Pastures – Weed control as for the Hunter River area with an aim to revegetate with species associated with the adjacent vegetation communities.

   Remnant Vegetation - Scattered occurrences of African Boxthorn (*Lycium ferocissimum*), African Olive (*Olea europaea* subsp. *Cuspidata*), Green Cestrum (*Cestrum parqui*) and three Pear varieties (*Opuntia stricta, O. humifusa, O. aurantiaca*) were present all within remnant vegetation. A weed control program should focus on the removal of these species in a manner that will not result in off-target damage to any native vegetation.

2. Fences

   The fence along the northern boundary of the conservation area is barbed wire. It is recommended that this and any other barbed wire boundary fences be upgraded to "fauna friendly" fences in accordance with the BCT guide.

3. Revegetation

   There is opportunity to undertake strategic revegetation works to increase native canopy and shrub cover which will improve connectivity and provide additional measures to supress groundcover weed species. Two specific areas were identified, namely open pasture areas, and an area adjacent the Hunter River. A revegetation plan should be developed prior to any works occurring in these areas.

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 15 and 25 May 2023.

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 6.14 presents an overview of the performance of each monitoring site against the relevant completion criteria. In summary, the highest ecosystem function for woodlands was recorded at the reference site SVCA04. Notwithstanding the above, there was little difference in ecological function between the remaining woodland sites with all sites except UGWood01, UGWood02 and SVCA05 being more functional than the RWood01 reference site this year which had a score of 161.9. With scores of 161.2 and 159.8 sites UGWood01 and UGWood02 were however only negligibly lower. SVCA05 had the lowest ecosystem function for all sites with a score of 142.1.

Table 6.14
Farmland – Completion Criteria Status 2023

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	1	0	1	0	1	0
		Sum of subsidence cracks width	m	0	0	0	1.20	0	2	0	1.5	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)	5.7	6.2	5.9	6.1	6.4	6.0	5.4	5.6	5.8
		Organic Matter	% (>4.5)	5.8	5.1	5.7	4.8	6.6	4.7	4.5	3.9	6.3
		Phosphorous	mg/kg (50)	101.7	58.7	28.5	9.3	144.0	44.4	17.1	14.0	15.8
Phase 4: Ecosystem & Land Use Establishment	Landform is stable and performing as it was designed to do	LFA Stability	%	80.7	76.3	78.5	78.1	78.1	76	70.8	68.3	74.5
		LFA Landscape organisation	%	100	100	100	100	100	100	98	93	100
	Pasture productivity is comparable to analogue sites.	Green Dry Matter Biomass	kg/ha	>3000	>3000	>3000	>3000	>3000	>3000	NA	NA	NA
Phase 5: Ecosystem & Land Use Sustainability	Landform is ecologically functional and performing as it was designed to do	LFA Infiltration	%	57.4	55.6	59.1	46.2	54.8	53.7	45.8	45.9	45.5
		LFA Nutrient recycling	%	56.9	54	53.6	48.8	55.2	55.4	44.6	45.6	47.6
	Ground layer contains protective ground cover and habitat structure comparable with the local remnant vegetation	Perennial plant cover (< 0.5m)	%	58.5	31.5	59	47.5	35	26	12.5	19.5	27
		Total Ground Cover	%	99	100	99	99.5	100	100	91	90	97.5
	Vegetation contains a diversity of species per square meter comparable to that of the local remnant vegetation	Native understorey abundance	> species/m2	1.2	2.0	3.0	7	1.8	1.8	2.6	3.8	3
		Exotic understorey abundance	< species/m2	3.4	5.2	6.2	3.4	6	5.2	2.4	2	3.4
	Native ground cover abundance is comparable to that of the local remnant vegetation	Percent ground cover provided by native vegetation <0.5m tall	%	16.7	27.4	25	63.6	26.7	31.3	60.4	61.9	67.9
	The vegetation is developing in structure and complexity comparable to that of the local remnant vegetation	Foliage cover 0.5 - 2 m	% cover	6.2	16	5.5	0	7.5	7.1	1.5	16.3	2
		Foliage cover 2 - 4m	% cover	0	0	0	0	0	0	12.5	15	2.1
		Foliage cover 4 - 6m	% cover	0	0	0	0	0	0	7.5	9.5	3
		Foliage cover >6m	% cover	0	0	0	0	0	0	0	7	1

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 (2023)

For grasslands, the most ecologically functional site was UGPast01 with a total sum of LFA indices of 195. Almost all sites scored either within or greater than reference sites for ecosystem function, except for UGPast04 which had the lowest score 173.1. All other underground monitoring sites were more functional than RGrass01 this year, which had the lowest score of 180.9. The historical data indicated that the ecological capacity of three pasture sites affected by underground mining had improved since 2007.

Native species were more diverse than exotic species in all woodland sites and compared to the reference sites there was an acceptable diversity of exotic species this year. In woodlands affected by underground mining, changes in native plant cover were relatively minor. Exotic species were more abundant at all underground monitoring sites except for UGPast04. Perennial groundcover was less than criteria at all woodlands sites and UGPast02; however, the lowest recorded perennial groundcover was recorded at reference site SVCA02 (10.8%).

Soil characteristics in the underground woodland and grasslands sites were similar to the reference sites and/or desirable agricultural guidelines in most cases, except the soils in UGWood01 which were acidic (pH 5.4). All underground woodland and grasslands sites had acceptable sodium levels and were non sodic. The results of the soil analyses also indicate that the soils in the farmland and SVCA areas tended to have significantly to excessively high concentrations of iron including all reference sites, suggesting iron naturally occurs in high levels in the local area. Sulfur levels were also elevated in numerous sites.

Subsidence impacts over several years near UGWood01 and UGWood02 have resulted in vegetation loss and/or reduction in health, including loss of larger specimens. Significant surface cracking near SVCA04 was also observed. No obvious signs of subsidence were observed in UGWood03, SVCA02 and SVCA06, however, significant ponding was observed downslope of the monitoring areas. No new surface cracking was observed at any pasture site, however, surface cracking previously observed at UGPast04 and UGPast06 remained constant with the previous monitoring period.

Ten priority and declared weed species were recorded across the underground mining monitoring sites, with the most common species being Galenia (*Galenia pubescens*) and Fireweed (*Senecio madagascariensis*). No threatened species were recorded in the range of monitoring sites.

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.

- Strategic grazing management will be reintroduced to effectively manage weed biomass and fuel loads.
- Within the Bowmans Creek Riparian corridor, investigations will be undertaken to identify crucial erosion areas and where rehabilitation and restoration works are required.

- Habitat enhancement plantings, particularly within the narrow casuarina woodland areas, will also be considered. Plantings will include a high proportion of shrubs, native grasses, and reeds to aid with erosion control.
- 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 also 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. Weed control within the SWCA will focus upon the species and locations as identified and recommended by the BCT audit.

The previous BCT recommendations relating to fencing will also be reviewed and a plan of action and timeline developed for implementation. Recommendations relating to weed control have been implemented with weed control remaining ongoing.

6.7 HERITAGE

Management of heritage was undertaken in accordance with the April 2023 Heritage Management Plan. The following heritage inspections and salvage works were undertaken by Stratum Archaeology Pty Ltd during the reporting period in accordance with Aboriginal Heritage Impact Permits.

- Inspections were undertaken for:
  - LW207A gas drainage infrastructure (three pads and access/pipelines);
  - a construction block bank across Bowmans Creek for the Western Diversion Channel (part of the Bowmans Creek diversion project) located within the creek bed);
  - LW207B gas drainage infrastructure (two pads and access/pipelines – GWLL7D & GWLL7E); and
  - revised gas drainage pipeline (GWLL7C to existing gas drainage pipeline network).
- Annual inspection of archaeological sites outlined within the Heritage Management Plan.
- Desktop due diligence reviews of pipeline trenching in previously cleared areas.
- Archaeological Salvage Excavation undertaken at AHIMS Site 37-3-0799

  Salvage works were undertaken in this location due the area being predicted to be impacted by subsidence ponding and subsidence cracking. A total of >10,000 artefacts were recovered from approximately 200m^2.

All works were undertaken with representatives for ACOL Registered Aboriginal Parties and all recovered artefacts were placed in the ACOL secure temporary artefact storage room at the ACOL administration building.

Additional archaeological due diligence inspections were also undertaken during the reporting period for a range of ground disturbing activities such as installation of geotechnical drill holes etc. In response to requests made by Registered Aboriginal Parties at the ACOL Aboriginal Community Consultative Forum (ACCF), security cameras were installed at the ACOL temporary artefact storage facility.

Ongoing consultation with the Aboriginal community also continued through the ACCF, of which two meetings were held during the reporting period in June and December 2023. During the 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.

One reportable heritage incident occurred during the reporting period (Cultural Heritage Incident 19.05.23). On 17 May 2023, a grader operator was grading several roads within ML 1533. The grader operator graded the track leading down to the Hunter River Pump station without instructions to do so. The grader was driven through extant artefact sites. The Site, The ACOL South Track, had been identified as having artefacts of moderate significance. Any artefacts are expected to have been pushed up into the graded windrow.

The grader operator was not instructed to grade the track; if the grader operator was instructed, then a ground disturbance permit would have been required that would have identified the artefacts and prevented the grading of the track. The surface grader operator was run through the ground disturbance training module with a specific note that all grading expressly requires the use of the ground disturbance permit process.

The (then) DPE was notified of the incident and acknowledged receipt of the notification. DPE provided no comments on the incident.

Currently no further improvements or changes to heritage management are planned during the next reporting period.

6.8 SUBSIDENCE

Environmental Management

To date, six 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 (LW1 to LW8) and ULD seam (LW101 to LW106A) since completed. Second workings within LW206A and LW206B were completed 16 October 2022 and 6 March 2023 respectively. Longwall extraction of LW207A commenced 30 May 2023 and is yet to be completed.

Subsidence monitoring was undertaken in accordance with the *Ashton Coal Mine Longwalls 205 to 208 Extraction Plan – October 2020* 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 6.15** summarises the maximum incremental and cumulative subsidence parameters for each of the monitoring locations relevant during the reporting period.

Subsidence monitoring indicated that no exceedance of the incremental and cumulative subsidence predictions occurred at the locations monitored during the reporting period. Furthermore, no significant cracking was observed on Lemington Road during the reporting period. All observed cracking was in accordance with modelling/expectations and was on Ashton owned land, and therefore was not a public safety issue. All observed surface cracking was remediated on an as needs basis and access tracks remediated and re-graded to remain serviceable. Pumping of water where ponding of water was observed as a consequence of subsidence in areas which were typically flat prior to mining operations, was conducted as needed to maintain access to services and infrastructure on site.

Table 6.15
Subsidence Monitoring Results

Location	Maximum Subsidence (m)	Maximum Tilt (mm/m)	Subsidence Attributable to Longwall (m)	Results Consistent with Extraction Plan Predictions
LW206B				
Lemington Road	0.10	-2.2	0.04	Yes
LW6 CL3	3.40	-50.0	1.97	Yes
LW6 CL4	3.14	-69.1	1.84	Yes
XL12	3.40	-68.0	1.94	Yes
XL13	3.11	69.0	1.81	Yes
LW207A				
XL5	5.63	71.4	2.83	Yes
LW7 CL1-PG	1.75	-22.9	-0.45	Yes
Source: Ashton Coal Operations Pty Limited (2023) – bi-monthly subsidence monitoring reports.				

Works were undertaken to reduce water flow to the face of LW207B during bolt up. Excavation occurred along the zero chainage line down to 6m on the surface to seal subsidence cracks below the base of the alluvium soil.

No impacts were recorded for the Ausgrid 11kV power lines and poles.

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 approved Extraction Plans 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, effluent, 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, hydraulic hose and chemical anchors.
- Non-Hazardous (Disposal) – diesel particulate filters and mixed solid waste.

As part of ACOL's Environmental Management Strategy and as outlined in the current RMP 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 6.16** together with the proportion of waste recycled. The proportion of waste recycled decreased from 47.26% in 2022 to 40.79% in 2023, with an approximately 9% reduction in the total volume of waste.

Table 6.16
Approximate Waste Volumes 2018 to 2023

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Waste Class	Waste Stream	Total Volume (kg)[1]					
		2018	2019	2020	2021	2022	2023
Hazardous (Recycled)	Sludge	3,078	10,071	11,944	13,158	17,646	9,268
	Paint	-	-	-	-	-	1,850
	Effluent (Off Site)	-	-	16,000	-	-	500
	Empty Drums	3,562	2,060	914	3,759	3,527	3,590
	Lead Acid Batteries	438	1,032	408	696	1,038	2,660
	Oil Filters	5,325	1,345	2,202	2,500	2,011	1,056
	Oily Water (Off Site)	19,258	66,942	59,167	72,284	96,987	68,627
	Waste Coolant	-	1,370	-	3,506	-	4,800
	Waste Grease	624	286	290	346	326	1,320
	Waste Oil	23,662	21,100	37,802	32,900	43,100	34,064
	Coagulant	-	1,936	-	-	-	
	Activated Carbon	150	-	-	-	-	
	eWaste	-	-	-	-	-	770
	Sub-total	**56,097**	**106,142**	**128,727**	**129,149**	**164,635**	**128,505**
Non-Hazardous (Recycled)	Paper and Cardboard	6,685	6,710	7,605	11,481	9,537	6,815
	Confidential Documents	605	288	418	187	165	453
	Scrap Steel	145,760	149,440	157,380	214,080	271,210	209,236
	Timber (Uncontaminated)	12,200	9,340	920	13,060	3,340	8,140
	Sub-total	**165,250**	**165,778**	**166,323**	**238,808**	**284,252**	**224,644**

Table 6.15 (Cont'd)
Approximate Waste Volumes 2018 to 2023

Waste Class	Waste Stream	Total Volume (kg)[1]					
		2018	2019	2020	2021	2022	2023
Hazardous (Disposal)	Medical and Sanitary Waste	261	465	293	270	477	290
	Hydraulic Hose	1,282	-	2,006	794	-	210
	Asbestos	-	2,200	-	-	-	
	Oily Rags	499	580	378	466	246	222
	Chemical Anchors	1,039	1,050	669	585	1,239	1,654
	Sub-total	**3,081**	**4,295**	**3,346**	**2,115**	**1,962**	**2,376**
Non-Hazardous (Disposal)	Diesel Particulate Filters	10,563	17,145	22,321	28,857	43,721	38,791
	Mixed Solid Waste	364,132	379,920	398,252	466,169	455,211	464,501
	Treated Timber	-	-	-	-	-	4,340
	Sub-total	**374,695**	**397,065**	**420,573**	**495,026**	**498,932**	**507,632**
Total Waste		**599,123**	**673,280**	**718,969**	**865,098**	**949,781**	**861,307**
Recycled Waste		**221,347**	**271,920**	**295,050**	**367,957**	**448,887**	**351,299**
Recycled Waste (%)		**36.95%**	**40.39%**	**41.04%**	**42.53%**	**47.26%**	**40.79%**
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.							

Reportable Incidents and Further Improvements

There were no reportable incidents relating to waste during the reporting period. During the reporting period an electronics bin was established for the recycling of eWaste with 770kg of eWaste recycled. No additional opportunities for further waste minimisation or recycling were identified during the reporting period. Notwithstanding, waste volumes will continue to be monitored into the future and opportunities to minimise waste or increase recycling implemented, where appropriate.

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 2022/2023 water year (i.e. 1 July 2022 to 30 June 2023).

Table 7.1
Water Take – 2022/2023 Water Year

WAL	Reference Number (Security Level)	Water Sharing Plan, Source and Management Zone	Entitlement (ML)	Passive Take / Inflows (ML)	Active Pumping (ML)	Total (ML)
Surface Water						
984	20AL201282 (General Security)	Hunter Regulated Water Sharing Plan, surface water, zone 3A (Glennies Creek)	9	50.31	274.13	324.44
997	20AL201311 (High Security)	Hunter Regulated Water Sharing Plan, surface water, zone 3A (Glennies Creek)	11			
8404	20AL200491 (High Security)	Hunter Regulated Water Sharing Plan, surface water, zone 3A (Glennies Creek)	80			
15583	20AL204249 (General Security)	Hunter Regulated Water Sharing Plan, surface water, zone 3A (Glennies Creek)	354			
		Total	***454***			
1120	20AL201624 (High Security)	Whole Water Source (Hunter Regulated River Water Source)	3	2.58	1.32	3.90
1121	20AL201625 (General Security)	Hunter Regulated Water Sharing Plan, surface water, zone 1B (Hunter River from Goulburn River Junction to Glennies Ck Junction)	335			
19510	20AL211015 (High Security)	Hunter Regulated Water Sharing Plan, surface water, zone 1B (Hunter River from Goulburn River Junction to Glennies Creek Junction)	130			
		Total	***468***			
23912	20AL211423 (Unregulated)	Hunter Unregulated and Alluvial Water Sources 2009, surface water, Whole Water Source (Jerry's Water Source) (Bowmans Creek)	14	48.26	0	48.26
36702	20AL212975 (Unregulated)	Hunter Unregulated and Alluvial Water Sources 2009, Surface water, Jerry's Management Zone (Jerry's Water Source) (Bowmans Creek)	116			
36703	20AL212976 (Unregulated)d	Hunter Unregulated and Alluvial Water Sources 2009, Surface water, Jerry's Management Zone (Jerry's Water Source) (Bowmans Creek)	150			
		Total	***280***			
29566	20AL212287 (Unregulated)	Hunter Unregulated and Alluvial Water Sources 2009, Aquifer, Jerry's Management Zone (Jerry's Water Source)	358	72.35	0	72.35
1358	20AL203056 (Supplementary)	Hunter Regulated Water Sharing Plan, surface water, zone 3A (Glennies Creek)	4	0	0	0
6346	20AL203106 (Supplementary)	Hunter Regulated Water Sharing Plan, surface water, zone 1B (Hunter River from Goulburn River Junction to Glennies Creek Junction)	15.5	0	0	0

Table 7.1 (Cont'd)
Water Take – 2021/2022 Water 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	1,086.03	0	1,086.03
41552	20AL219014		511			
41529	20AL818991		400			
41553	20AL219015		81			
		Total	***1092***			
		Total 2022/2023		***1,259.53***	***275.45***	***1,534.98***
		*Total 2021/2022**		*485.50*	*318.80*	*804.30*
		Total 2020/2021		*399.45*	*470.10*	*869.55*
		Total 2019/2020		*121.92*	*378.46*	*500.38*
		Total 2018/2019		*173.57*	*248.10*	*421.67*
		Total 2017/2018		*53.01*	*262.33*	*315.34*

Source: Ashton Coal Operations Pty Limited.
*Typographical error amended from 2022 Annual Review.

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 WALs.

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 – 2023 Calendar Year

Page 1 of 2

Input / Output	Component	Sub – Component	Water Volume (ML)[1]
2023 Inputs	Surface Water	Precipitation and Runoff	368.9
		Rivers and Creeks	228.4
		External Surface Water Storages	0.0
	Groundwater	Aquifer Interception	1,612.8
		Bore Fields	0.0
		Entrainment	34.6
	Third Party Water	Contract / Municipal	0.8
		Waste Water	0.0
		Total Inputs	**2,245.5**

Table 7.2 (Cont'd)
Input / Output Water Balance – 2023 Calendar Year

Input / Output	Component	Sub–Component	Water Volume (ML)[1]
2023 Outputs	Surface Water	Discharge	0.0
		Environmental Flows	0.0
	Groundwater	Seepage	1,344.6
		Reinjection	0.0
	Supply to Third Party		0.0
	Other	Evaporation	163.8
		Entrainment	211.2
		Other (e.g. ventilation moisture loss)	186.4
	Total Outputs		**1,906.0**
Total Inputs minus Total Outputs			340.0
Storage at the Start of 2023			3,546
Storage at the End of 2023			4,078
Overall Water Imbalance			193.0

Note 1: Volumes represent a combination of measured, simulated and estimated volumes with variable levels of confidence (low to high).

Source: ATC Williams.

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 sixteen (16) 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 7.3** 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 7.3**) must be exceeded on three consecutive readings, or differ significantly from the preceding three readings, before an action response is required. **Table 7.4** provides a summary of instances during the reporting period where trigger levels were exceeded on three (or more) occasions.

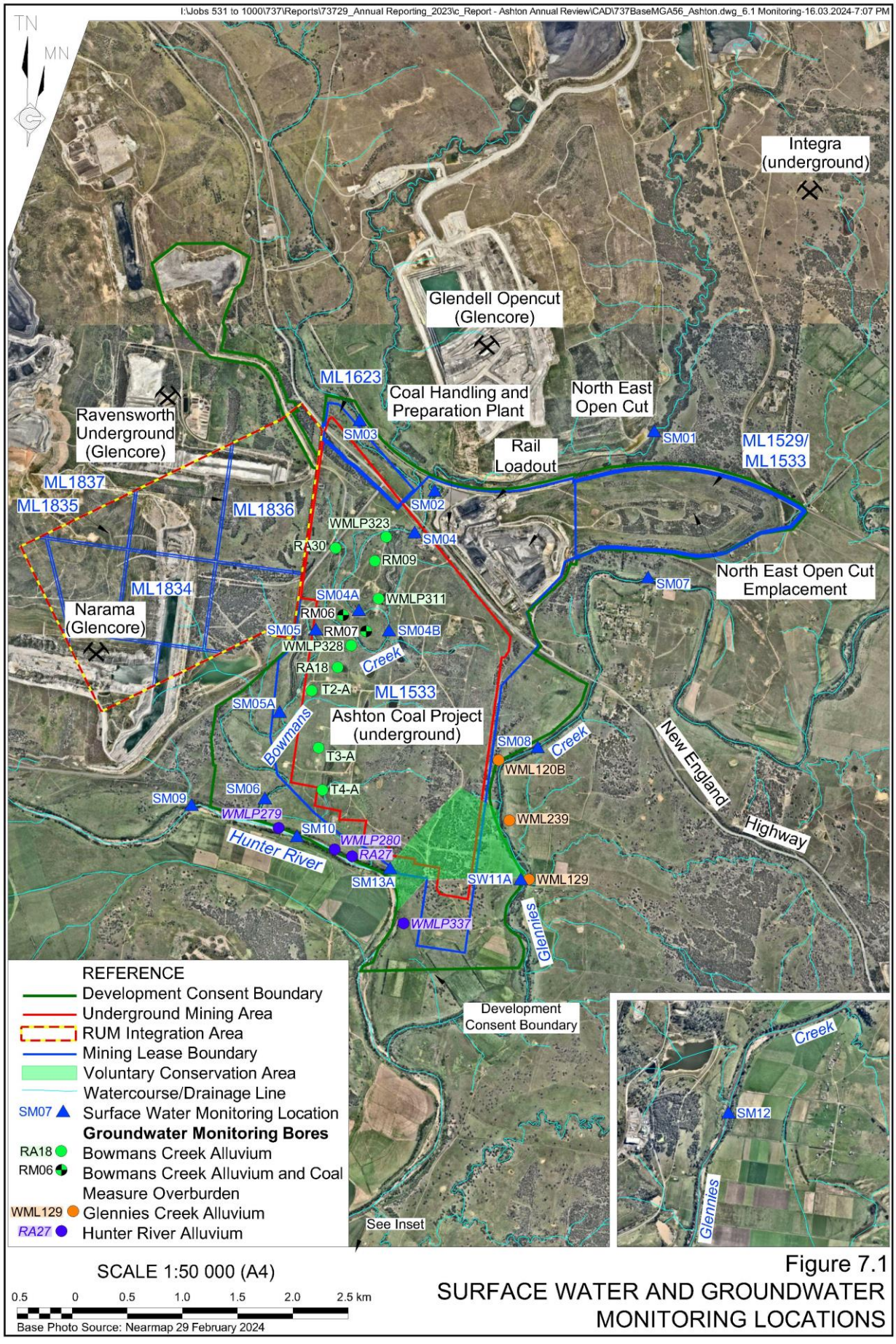


Figure 7.1
SURFACE WATER AND GROUNDWATER MONITORING LOCATIONS

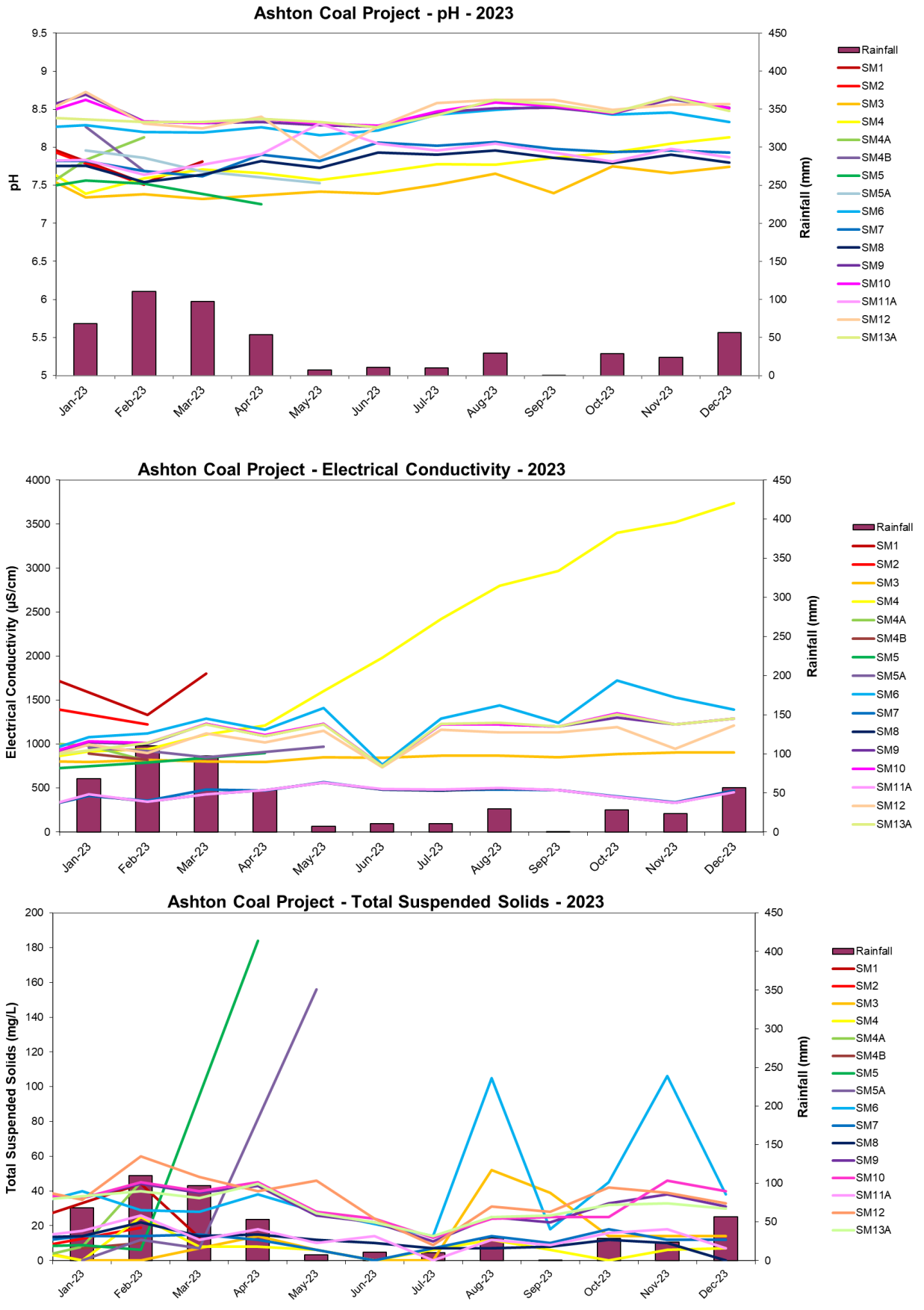


Figure 7.2
SURFACE WATER QUALITY MONITORING RESULTS – 2023

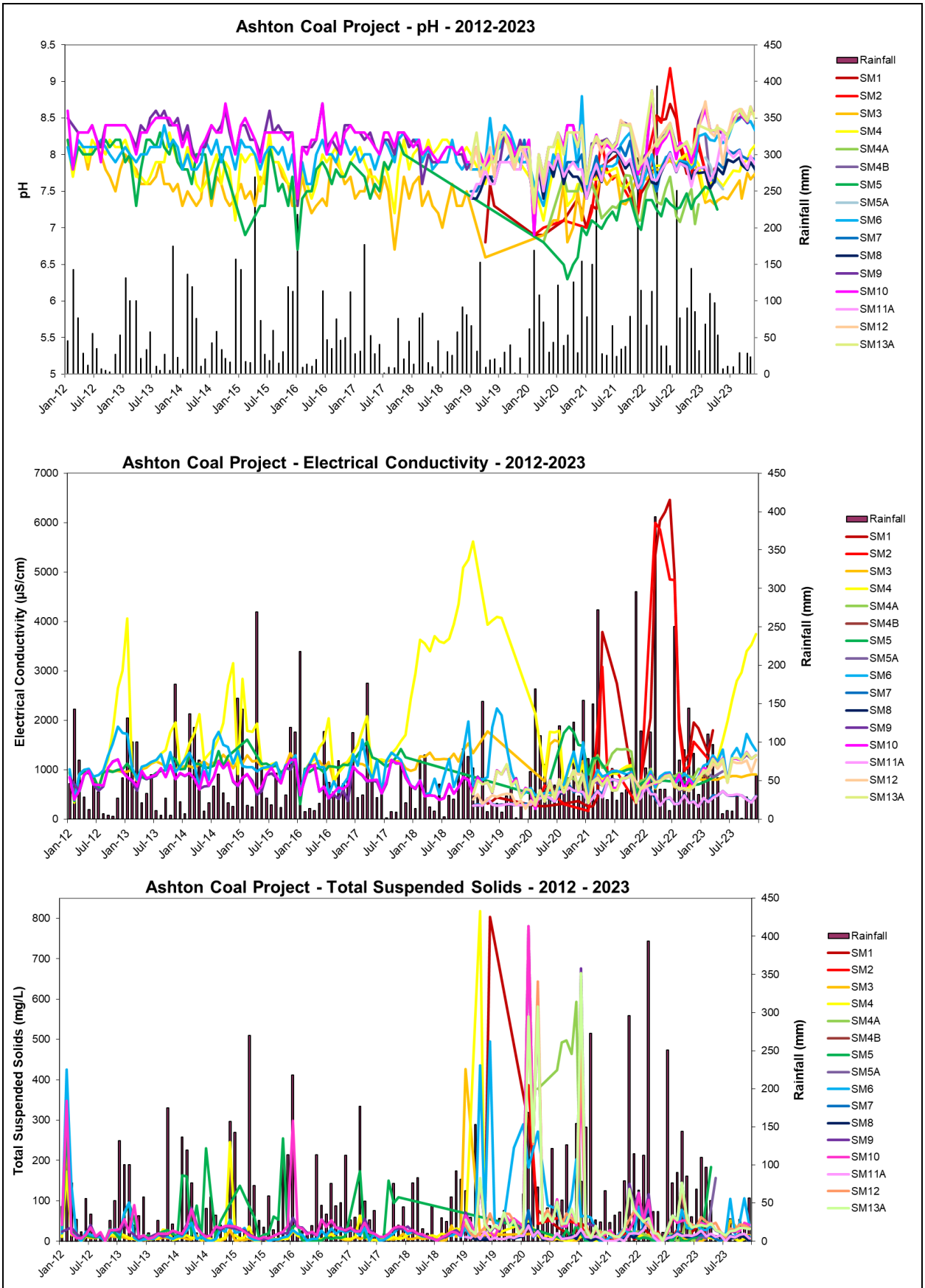


Figure 7.3
SURFACE WATER QUALITY MONITORING RESULTS – 2012 TO 2023

Table 7.3
Surface Water Monitoring Summary - 2023

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	7.5-7.8 (7.7)	<6.97 - >7.70 [<6.60 - >8.00]	1330-1800 (1565)	>1,198 [>1,811]	929-1100 (1015)	>794 [>1,193]	13-44 (29)	>122 [>273]
SM2	7.5*	<6.87 - >7.63 [<6.60 - >7.90]	1220*	>1,144 [>1,803]	800*	>732 [>1,105]	19*	>116 [>116]
Bowmans Creek								
SM3	7.3-7.8 (7.5)	<7.42 - >7.88 [<7.20 - >8.10]	793-907 (849)	>1,440 [>1,620]	440-676 (505)	>878 [>965]	6-52 (20)	>20 [>62]
SM4	7.4-8.1 (7.8)	<7.71 - >8.09 [<7.4 - >8.4]	914-3740 (2217)	>3,656 [>10,790]	566-2600 (1320)	>2,270 [>6,331]	6-25 (9)	>37 [>104]
SM4A	7.8-8.1 (8.0)	<7.67 - >8.01 [<7.40 - >8.30]	809-984 (897)	>1,140 [>1,796]	480-638 (559)	>653 [>1,067]	8-45 (27)	>19 [>44]
SM4B	7.7-8.3 (8.0)	NYA	822-894 (858)	NYA	511-534 (523)	NYA	7-10 (8.5)	NYA
SM5	7.3-7.6 (7.4)	<7.66 - >7.97 [<7.50 - > 8.10]	749-898 (811)	>1,542 [>1,796]	460-518 (483)	>891 [>1,031]	6-184 (66)	>20 [>31]
SM5A	7.5-8.0 (7.8)	NYA	848-968 (924)	NYA	486-599 (547)	NYA	7.0-156 (58)	NYA
SM6	8.2-**8.5** (8.3)	<7.84 - >8.23 [<7.60 - >8.40]	767-1720 (1286)	>1,108 [>1,831]	405-1060 (721)	>642 [>810]	14-106 (42.5)	>26 [>60]
Glennies Creek								
SM7	7.6-8.1 (7.9)	<7.66 - >8.03	341-569 (452)	>577	202-309 (259)	>342	6-18 (12)	>19
SM8	7.5-8.0 (7.8)	<7.62 - >7.96	331-564 (446)	>562	167-294 (253)	>334	7-22 (12)	>22
SM11A	7.6-8.3 (7.9)	<7.74 - >8.02	332-561 (447)	>564	212-301 (257)	>332	7-26 (15)	>20
Hunter River								
SM9	8.3-**8.7** (**8.4**)	<8.00 - >8.32	748-**1300** (**1147**)	>942	375-**796** (**639**)	>541	11-**44** (31)	>34
SM10	8.3-**8.7** (**8.5**)	<8.00 - >8.32	747-**1350** (**1154**)	>942	380-**826** (**646**)	>526	13-46 (33)	>42
SM12	7.9-**8.7** (**8.4**)	<7.84 - >8.24	**733-1210** (**1057**)	>728	376-**752** (**588**)	>415	9-60 (36)	>36
SM13A	**8.3-8.7** (**8.4**)	<8.02 - >8.32	746-**1340** (**1164**)	>927	376-**811** (**646**)	>516	14-44 (30)	>41

( ) = Average [ ] = no / low flow trigger value NS – Not Sampled (Dry) ^ See **Figure 7.1** ***** Single data point

NYA – Not Yet Available. Sites SM4B and SM5A have recently been established and insufficient data is available to set appropriate trigger levels. Once sufficient data has been collected, trigger levels will be set and the WMP updated as appropriate.

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.

Table 7.4
Consecutive Surface Water Trigger Level Exceedances

Parameter	Monitoring Location[1]	Period
pH	SM6	Jul - Nov
	SM9	Jul – Dec
	SM10	Jul – Dec
	SM12	Jan – Dec (exc. May)
	SM13A	Jan – Dec (exc. Jun)
EC	SM9	Jan – Dec (exc. Jun)
	SM10	Jan – Dec (exc. Jun)
	SM12	Jan - Dec
	SM13A	Jan – Dec (exc. Jun)
TDS	SM9	Jan – Dec (exc. Jun)
	SM10	Jan – Dec (exc. Jun)
	SM12	Jan – Dec (exc. Jun)
	SM13A	Jan – Dec (exc. Jun)
TSS	SM9	Jan - Apr

Note 1: see **Figure 7.1**.

In summary, three (or more) consecutive exceedances of pH, EC, TSS or TDS trigger values were recorded across five monitoring sites on 14 occasions during the reporting period. For monitoring sites SM12 and SM13A, the period of pH levels in exceedance of trigger levels extended for the entire reporting period excepting May (for SM12) and June (for SM13A). For monitoring sites SM9, SM10 and SM13A, the period of EC and TDS levels in exceedance of trigger levels extended for the entire reporting period excepting June.

In accordance with the Water Management Plan the trigger level exceedances were investigated. Investigations were undertaken as an external assessment by ATC Williams. The following presents a summary of the key findings of the ATC Williams assessments.

- Exceedances of the pH and TSS trigger levels at the Hunter River monitoring sites are likely caused by upstream influences and relate to period of low and high river flow. This is supported by the low variability in pH and TSS with distance along the Hunter River, including upstream locations, for both lower and higher pH levels. Events of higher and lower pH and TSS are linked to periods of low and high flows. No data indicates mining-related effects.
- Exceedances of the pH impact criteria for Bowmans Creek monitoring site SM6 are likely the result of backwater influence from the Hunter River. This is supported by the similar pH values recorded at Hunter River monitoring sites SM9 and SM10. No data indicates mining-related effects.

Reportable Incidents

As the external assessment of trigger action response levels determined water quality was not affected by the ACP, in accordance with the approved WMP, the exceedance of trigger levels was not reportable. No reportable incidents occurred during the reporting period.

Further Improvements

Exceedances of trigger levels will continue to be investigated in accordance with the WMP and additional water quality sample locations (SM4B and 5A) have been established to ensure representative water quality samples of water flow in Bowmans Creek. These additional sites have been reflected in the updated Water Management Plan submitted to DPE (now DPHI) for approval with approval pending. The surface water monitoring program was also reviewed in consideration of the ACOL-operated RUM.

The updated water quality monitoring program will be reported in future Annual Reviews following approval of the updated Water Management Plan by DPHI.

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 from the AGE report summarised in the following sections.

Groundwater Levels

Monitoring results for BCA bores indicated that groundwater levels generally decreased throughout the reporting period. Groundwater levels decreased below established triggers in T2A (Sep and Oct 2023) and WMLP328 (July to Dec 2023). These triggers were investigated by AGE and it was concluded that decreased groundwater levels are attributed to below average rainfall during the second half of 2023, and no mining impacts outside of predictions were noted.

Monitoring results for GCA bores indicated that groundwater levels were relatively stable. WMLP343 was unable to be sampled for most of 2023 due to sediment buildup in the screen interval. Airlift development is planned in 2024 to remove the sediment buildup. Groundwater levels at all GCA bores remained above the relevant groundwater level trigger values during the reporting period.

Groundwater levels recorded for HRA bores decreased throughout 2023, however remained above the relevant groundwater level trigger values during the reporting period. Decreased groundwater levels are attributed to below average rainfall during the second half of 2023.

Monitoring results for Coal Measures Overburden (CMOB) bores showed varying trends throughout the reporting period. Groundwater elevation in bores WMLP324, WMLP325, WMLP327, T2P and T3P decreased throughout the reporting period, with the exception of WMLP324 and WMLP325 showing increases in response to prolonged periods of rainfall during August. Groundwater elevation in WML115B decreased overall from January to July 2023, after which water would only be registered intermittently at the base of the bore.

Groundwater results recorded during the reporting period for longwall specific monitoring bores indicated that water levels decreased overall in bores adjacent to panels LW206A/206B.

Vibrating wire piezometer (VWP) readings in sensors at 30m and 59m remained relatively stable in bore WMLP269 throughout the reporting period. However, no data has been recorded in the deeper sensors since July 2021, likely due to fracturing of strata in which the deeper sensors are located. A replacement VWP nearby to WMLP269 is planned in 2024 to record pressure head data down to the Lower Barrett Coal Seam.

Groundwater elevations in Coal Measure bores were stable throughout the reporting period.

Groundwater Quality

Multiple bores (WMLP311, WML113C, WML129, WML120B, WMLP336, WMLP337) recorded isolated exceedances of groundwater pH trigger values during the reporting period, however only WMLP349 and WMLP358 exceeded pH trigger values on three or more consecutive occasions. Investigation by AGE identified no potential environmental harm or likely impact from mining operations and found that derived pH triggers were representative of drought conditions.

As previously recorded, pH within alluvial bores was slightly acid to slightly alkaline and groundwater within Coal Measure and CMOB bores was generally neutral to slightly alkaline within the following ranges.

- BCA – pH 6.20 (PB1) to pH 8.41 (WML115C).
- GCA – pH 5.97 (WMLP358) to pH 8.03 (WML129).
- HRA – pH 5.93 (WMLP336) to pH 7.54 (RA27).
- Coal Measure – pH 6.62 (WMLP302) to pH 7.99 (WML262).
- CMOB - pH 6.39 (T2P) to pH 7.40 (T3P).

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

- BCA – 453.1µS/cm (Ashton Well) to 3,779µS/cm (RM02).
- GCA – 333.9µS/cm (WML129) to 5,831µS/cm (GM3A).
- HRA – 521.7µS/cm (WMLP280) to 2,860µS/cm (WMLP337).
- Coal Measure – 250.7µS/cm (WML261) to 4,824µS/cm (RSGM1).
- CMOB – 532.2µS/cm (T4P) to 2,002µS/cm (T3P).

Groundwater EC levels recorded for GCA bores were relatively stable throughout the reporting period, with the exception of WML120B, WML129 and WMLP349. Groundwater EC in WML120B decreased throughout the year, increasing slightly between October and November. EC values in WML120 increased overall throughout the year. EC in WMLP349 was variable but increased overall throughout the year.

EC levels within BCA bores were overall stable throughout the reporting period, except bore WMLP311 which recorded steadily increasing EC values throughout 2023 and began to exceed the derived trigger threshold from October onwards.

EC in HRA bores showed varying trends throughout the reporting period. Aside from WMLP279 in which groundwater EC exceeded the derived trigger threshold in February 2023, no groundwater EC exceedances were detected in HRA bores during 2023.

Multiple bores exceeded EC trigger levels during the reporting period (WMLP279, WMLP311, WMLP346, WMLP349, WMLP348), however, only WMLP349 and WMLP358 exceeded the trigger levels on three consecutive occasions. The investigation by AGE concluded that the variability in rainfall recharge during the time period used to derive the triggers was not representative of average long-term rainfall variation at ACOL. This indicated that the derived triggers may not adequately capture natural environmental variation in this bore. It was recommended that revised triggers be developed to include the latest data collected, which better represents seasonal variability. An investigation into groundwater EC exceedances is underway to determine the cause for consistently elevated values.

Coal Measure EC levels were variable throughout the reporting period. Groundwater EC in WML183 remained stable until May 2023, increased until August and declined thereafter. EC in RSGM1 EC decreased from the beginning of the year until August, increasing thereafter. EC values in all other Coal Measure bores remained stable. Groundwater EC levels within CMOB monitoring bores remained generally stable throughout 2023, with values in WMLP325 and T4P fluctuating throughout the year. No other prevailing trends were evident.

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 and ARMCANZ, 2000). There were no exceedances for any of the analytes assessed, with the exception of phosphorous (P), which was below the lower trigger level concentration (0.8-12 mg/L P) in multiple bores. The ANZECC and ARMCANZ (2000) guideline outlines that the value or range for P should be determined specific to a site. Currently no site-specific analysis has been conducted at the ACP to define an appropriate P trigger.

Generally, the site has experienced minimal impacts to the BCA, and no mining impacts to the GCA and HRA alluvial aquifers and impacts are within predictions in the coal measures.

Reportable Incidents

No reportable incidents occurred during the reporting period. Whilst the trigger action response within the WMP was enacted for groundwater levels in T2A and WMLP328 and elevated pH and EC results within multiple bores, these were subsequently investigation by AGE. AGE concluded that decreased groundwater levels are attributed to below average rainfall and not mining impacts. For groundwater quality, investigations recommended revised pH and EC triggers be derived for GCA monitoring bores using the latest data collected which better represent seasonal climate variability.

Further Improvements

Monitoring will continue in accordance with the current Water Management Plan (WMP). The groundwater monitoring program will be amended to reflect the ACOL-operated RUM in accordance with the updated Water Management Plan, following approval by DPHI. Review of pH and EC trigger levels will also be undertaken and updates proposed as appropriate.

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

Mine Area Type	Previous Reporting Period (Actual) 2022 (ha)	This Reporting Period (Actual) 2023 (ha)	Next Reporting Period (Forecast)[3] 2024 (ha)
Total mine footprint[1]	1,326.4[4]	1,326.4[4]	1,326.4[4]
Total active disturbance[1]	189.0	244.6	244.6
Land being prepared for rehabilitation	0	0	0
Land under active rehabilitation[1]	737.8	738.5	738.5
Completed rehabilitation[2]	0	0	0

Note 1: Includes subsidence remediation areas.
Note 2: Areas which have been formally relinquished or signed off by the relevant agency.
Note 3: Estimates of additional areas of subsidence remediation have not been included within forecast values.
Note 4: Includes the ACOL-operated RUM.

During the reporting period, the key rehabilitation works related to the remediation of surface cracking associated with LW206B. Rehabilitation of other disturbance associated with the various minor surface disturbing activities, as outlined in the Ground Disturbance Permits (see Section 4.3) will be undertaken during future reporting periods.

No permanent buildings were structurally altered, renovated or removed during the reporting period and no rehabilitation trials or research was undertaken during the reporting period. A summary of rehabilitation monitoring and activities is provided as follows.

North-east Open Cut Rehabilitation

Monitoring of NEOC rehabilitation was undertaken between 15 to 25 May 2023 by DnA Environmental. Revised completion and performance criteria were developed during the 2021 reporting period in consideration of relevant rehabilitation guidelines and have subsequently been utilised for performance evaluation.

Monitoring of the NEOC rehabilitation area includes assessment of areas rehabilitated to *mixed woodland habitat* (formerly "Trees Over Grass") and *exotic pastures*. 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.

During the 2019 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.*

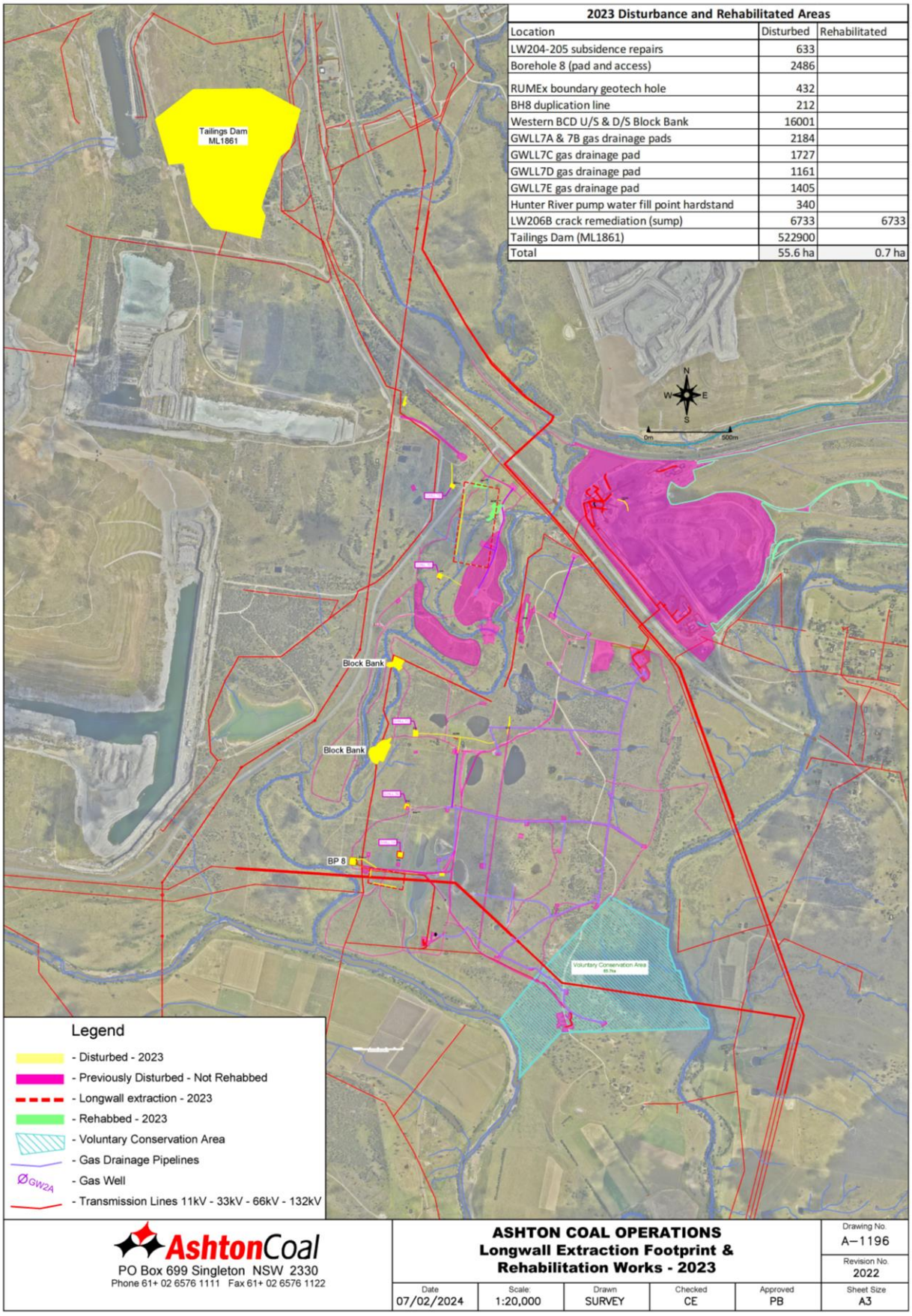


Figure 8.1
REHABILITATION ACTIVITIES – UNDERGROUND AREA (1 JANUARY – 31 DECEMBER 2023)

To reflect significant rehabilitation progress and ecosystem development, monitoring methodology were revised during the 2020 reporting period. In summary, the monitoring methodology was reduced from quadrat based to transect based surveys for all rehabilitation sites on the NEOC in 2020, with these methodologies (quadrat versus transect) being undertaken during Autumn in alternating years. During the 2023 reporting period, full quadrat monitoring was undertaken.

It is intended to convert approximately 15ha of exotic pasture areas into areas of eucalypt woodland habitat over a five-year period (subject to suitable meteorological conditions). This updated rehabilitation strategy has been reflected within the Rehabilitation Management Plan (RMP).

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 2023. Rehabilitation performance is compared against the RMP proposed completion criteria using performance indicators obtained from non-mining-disturbed reference sites. Three mixed eucalypt woodland and three native grassland reference sites were established in 2019. 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 2023 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. They were, however, dominated by exotic understorey species and during the 2023 reporting period most sites had a slightly higher diversity of exotic species compared to the reference sites. Some parts of the woodland rehabilitation may have low perennial groundcover due to the high densities of trees, while some areas may also be affected by adverse soil chemistry and/or disturbance by macropods, especially when conditions have been dry. Notwithstanding the above, DnA Environmental state that there is little need for management intervention of the existing woodland habitats of the NEOC, particularly in the light of the revised rehabilitation objectives.

Observations in the vicinity of rehabilitation habitat structures (large upside-down tree trunks) show a high abundance of native species known to be dispersed by birds. In particular, *Einadia nutans* (climbing saltbush) and *Enchylaena tomentosa* (ruby saltbush) were in high abundance in the immediate vicinity of the erected trunk, however, weed species (e.g. *Solanum sp.*, *Lycium ferocissimum*) may also be introduced in these areas. DnA Environmental suggest that additional habitat structures such as trees, logs, rock piles and nest boxes would likely increase available habitat within the NEOC.

Table 8.2
North East Open Cut Rehabilitation Area – Rehabilitation Sites Completion Criteria Status 2023

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 3: Landform Establishment	Landform suitable for final land use 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
		Cross-sectional areas of rills	m^2	0	0	0	0	0	0	0
Phase 4: Growth Medium Development	Soil properties are suitable for the establishment and maintenance of selected vegetation species	pH	pH (5.6-7.3)	6.8	6.6	8.08	7.0	8.1	8.8	8.8
		EC	dS/m (<0.150)	0.056	0.119	0.236	0.123	0.147	0.151	0.135
		Organic Matter	% (>4.5)	5.1	9.0	12.3	8.9	7.0	4.9	5.4
		Phosphorous	mg/kg (50)	10.1	344.4	124.3	52.8	99.1	12.1	8.5
		Nitrate	mg/kg (>12.5)	3.6	11.1	15.1	5.5	1.0	1.4	0.3
		Cation Exchange Capacity (CEC)	Cmol+/kg (>14)	12.9	15.5	29.0	16.7	21.7	18.5	14.2
		Exchangeable Sodium Percentage (ESP)	% (<5)	0.9	1.0	2.2	0.7	1.0	2.0	4.0
Phase 5: Ecosystem & Land Use Establishment	Landform is stable and performing as it was designed to do.	LFA Stability	%	74.6	70.0	73.5	79.9	67.6	69.4	62.6
		LFA Landscape organisation	%	98	100	97	100	96	96	100
	Vegetation contains a diversity of species comparable to that of the local remnant vegetation	Diversity of shrubs and juvenile trees	Species/area	4	2	0	1	5	4	11
			% population	88	100	0	100	100	100	98
		Total species richness	No./area	43	33	22	29	37	31	44
		Native species richness	>No./area	15	10	3	7	16	16	22
		Exotic species richness	<No./area	28	23	19	22	21	15	22
	Pasture productivity is comparable to analogue sites.	Green Dry Matter Biomass	kg/ha	>3000	1000	>3000	>3000	NA	NA	NA

Table 8.2 (Cont'd)
North East Open Cut Rehabilitation Area – Rehabilitation Sites Completion Criteria Status 2023

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 5: Ecosystem & Land Use Establishment (Cont'd)	Vegetation contains a density of shrubs and juvenile trees (<5cm dbh) comparable to the local remnant vegetation	Total density of shrubs or juvenile trees	No./area	8	2	0	1	29	10	82
		Density of eucalypts / Corymbia	No./area	0	0	0	0	24	6	67
		Density of acacias	No./area	7	2	0	1	0	0	2
		Density of other endemic shrubs	No./area	0	0	0	0	5	4	11
		Density of exotic / non endemic species	No./area	1	0	0	0	0	0	2
		The percentage of eucalypts / Corymbia	% population	0	0	0	0	83	60	82
		Total density of endemic shrubs and/or juvenile trees	No./area	7	2	0	1	29	10	80
	The vegetation is comprised by a range of growth forms comparable to that of the local remnant vegetation	Trees	No./area	1	0	0	0	5	7	7
		Shrubs	No./area	4	2	0	1	1	1	4
		Sub-shrubs	No./area	5	5	4	4	3	4	4
		Herbs	No./area	25	23	15	21	18	15	17
		Grasses	No./area	5	2	2	3	9	4	10
		Reeds	No./area	1	0	0	0	1	0	1
		Vines	No./area	0	0	0	0	0	0	1
		Ferns	No./area	1	1	0	0	0	0	0
		Cactus	No./area	1	0	1	0	0	0	0
		Aquatic	No./area	0	0	0	0	0	0	0
Phase 6: Ecosystem & Land Use Development	Landform is ecologically functional and performing as it was designed to do	LFA Infiltration	%	51.6	50.3	54.5	61.7	52.5	46.8	52.2
		LFA Nutrient recycling	%	54.8	48.3	52.0	61.8	49.7	46.6	52.1

Table 8.2 (Cont'd)
North East Open Cut Rehabilitation Area – Rehabilitation Sites Completion Criteria Status 2023

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 6: Ecosystem & Land Use Development (Cont'd)	Ground layer contains protective ground cover and habitat structure comparable with the local remnant vegetation.	Litter cover	%	63.5	38.5	65.0	43.5	80.0	73.5	90
		Annual plants	<%	10.5	9.5	2.5	3.5	0	0	1
		Cryptogram cover	%	0.5	0	0	0	0	0	0
		Rock	%	0.5	0	0	0	0	0	4.5
		Log	%	0	0	0	0	0	0	0
		Bare ground	<%	1	2	2.5	0	0	0	2
		Perennial plant cover (< 0.5m)	%	24	50	30	53	20.0	26.5	2.5
		Total Ground Cover	%	99.0	98.0	97.5	100	100e	100	98
	Vegetation contains a diversity of species per square meter comparable to that of the local remnant vegetation.	Native understorey abundance	>species/m^2	1.4	1.0	0	0.6	0	0.2	1.4
		Exotic understorey abundance	<species/m^2	6.4	5.4	3.0	3.8	3.2	1.6	2
	Native groundcover abundance is comparable to that of the local remnant vegetation.	Percent groundcover provided by native vegetation <0.5m tall.	%	13.6	11.7	0	9.8	0	3.8	31.8
	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	3	0	0	0	5	7	12
		shrubs and juvenile trees 0.5 - 1m in height	No./area	2	1	0	1	3	2	11
		shrubs and juvenile trees 1 - 1.5m in height	No./area	0	1	0	0	0	1	4
		shrubs and juvenile trees 1.5 - 2m in height	No./area	2	0	0	0	3	0	9
		shrubs and juvenile trees >2m in height	No./area	1	0	0	0	18	0	46

Table 8.2 (Cont'd)
North East Open Cut Rehabilitation Area – Rehabilitation Sites Completion Criteria Status 2023

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 6: Ecosystem & Land Use Development (Cont'd)	The vegetation is developing in structure and complexity comparable to that of the local remnant vegetation.	Foliage cover 0.5m – 2m	% cover	3	0	0	0	2.5	0	2.0
		Foliage cover 2m – 4m	% cover	1	0	0	0	17.0	1.0	9.5
		Foliage cover 4m – 6m	% cover	0	0	0	0	12.0	9.0	12.5
		Foliage cover >6m	% cover	0	0	0	0	10	2	11
	Vegetation contains a diversity of maturing tree and shrubs species comparable to that of the local remnant vegetation	Tree diversity	Species/area	1	0	0	0	4	6	7
			%	100	0	0	0	100	100	100
	Vegetation contains a density of maturing tree and shrubs (>5cm dbh) species comparable to the local remnant vegetation	Total live tree and mature shrub density	No./area	1	0	0	0	27	11	61
		Density of eucalypts / Corymbia	No./area	1	0	0	0	27	11	54
		Density of acacias	No./area	0	0	0	0	0	0	0
		Density of other endemic shrubs	No./area	0	0	0	0	0	0	7
		Density of exotic / non endemic species	<No./area	0	0	0	0	0	0	0
		The percentage of eucalypts / Corymbia	% population	100	0	0	0	100	100	89
		Average dbh	cm	27	0	0	0	11	18	10

Table 8.2 (Cont'd)
North East Open Cut Rehabilitation Area – Rehabilitation Sites Completion Criteria Status 2023

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 6: Ecosystem & Land Use Development (Cont'd)	The vegetation is in a condition comparable to that of the local remnant vegetation.	Live trees	% population	100	0	0	0	90.0	100	98.4
		Healthy trees	% population	100	0	0	0	53.3	54.5	53.2
		Medium health	% population (if greater than dieback)	0	0	0	0	16.7	45.5	37.1
		Advanced dieback	<% population	0	0	0	0	20	0	8.1
		Dead Trees	<% population	0	0	0	0	10	0	2
		Mistletoe	% population	0	0	0	0	0	0	0
		Flower/fruit	% population	100	0	0	0	13	0	16
		Hollows	% population	0	0	0	0	0	0	0

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 (2023)

Due to the age of the woodland rehabilitation and positive monitoring results, DnA Environmental suggest that monitoring effort and rehabilitation objectives in existing woodland and pasture rehabilitation areas could be revised, 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.

Pest and Weed Control

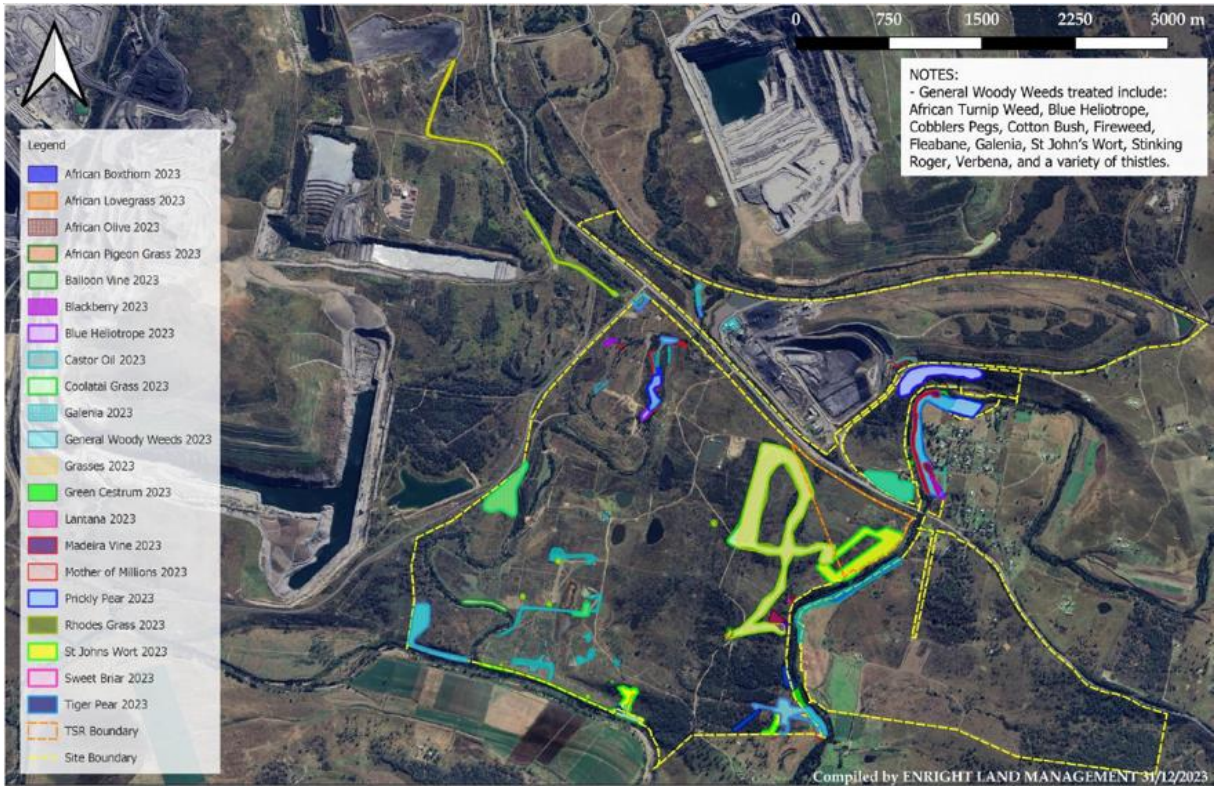
A programmed range of pest and weed control activities were also undertaken across ACP rehabilitation areas, biodiversity conservation areas and buffer land during the reporting period. Pest control activities during the reporting period targeted feral pigs, rabbits and hares, wild dog and foxes.

Two 1080 baiting programs were undertaken during Autumn and Spring 2023. The baiting program accounted for a total of 19 wild dogs and 90 foxes. A feral pig management program involving cage trapping was implemented throughout 2023 in response to observed feral pigs and feral pig wallows on site. A total of 33 feral pigs were trapped and dispatched during the reporting period.

ACOL maintains an open range shooting program at the ACP site as part of a kangaroo culling program approved and licenced by the NSW National Parks and Wildlife Service; however, no kangaroo culling activities were undertaken during the reporting period.

Swallow populations within the workshop and store buildings at Ashton Coal were controlled using the open range shooting method, conducted under a National Parks and Wildlife Service permit. A total of 470 swallows were dispatched during the reporting period.

Active weed control treatment was also completed across land owned by ACOL, targeting African boxthorn (*Lycium ferocissimum*) (14ha), African olive (*Olea europaea* subsp. *cuspidata*) (26ha), African love grass (*Eragrostis Curvula*) (39ha), African pigeon grass (*Setaria sphacelata*) (39ha), balloon vine *(Cardiospermum grandiflorum)* (1ha), blackberry (*Rubus fruticosus*) (<1ha), blue heliotrope (*Heliotropium amplexicaule*) (19ha), castor oil (*Ricinus communis*) (10ha), coolatai grass (*Hyparrhenia hirta*) (39ha), galenia (*Galenia pubescens*) (54ha), green cestrum (*Cestrum parqui*) (17ha), lantana (*Lantana camara*) (11ha), mother of millions (*Kalanchoe daigremontiana*) 7ha), madeira Vine (*Anredera cordifolia*) (3ha), prickly pear (*Opuntia stricata*) (20ha), rhodes grass (*Chloris gayna*) (39ha), St John's wort (*Hypercum perforatum*) 46ha), sweet briar (*Rosa rubiginosa*) (isolated infestations), tiger pear *(Opuntia aurantiaca*) (>2ha), general woody weeds (75ha), and general weeds. **Figure 8.2** displays the areas treated for weeds during the reporting period.



Source: ENRIGHT Land Management (2023) – Mape 1

Figure 8.2
WEED TREATMENT AREAS – 2023

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 and other minor infrastructure projects, as needed. Should favourable meteorological conditions persist, the first block of the woodlands rehabilitation conversion program may be undertaken within the NEOC 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 may also be investigated including those targeting 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

No complaints were received during the 2023 reporting period.

All previous complaints have been recorded in the complaints register (available on the Ashton Coal Website) with a summary of all complaints received over the life of the mine presented as **Figure 9.1**. There has been 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.

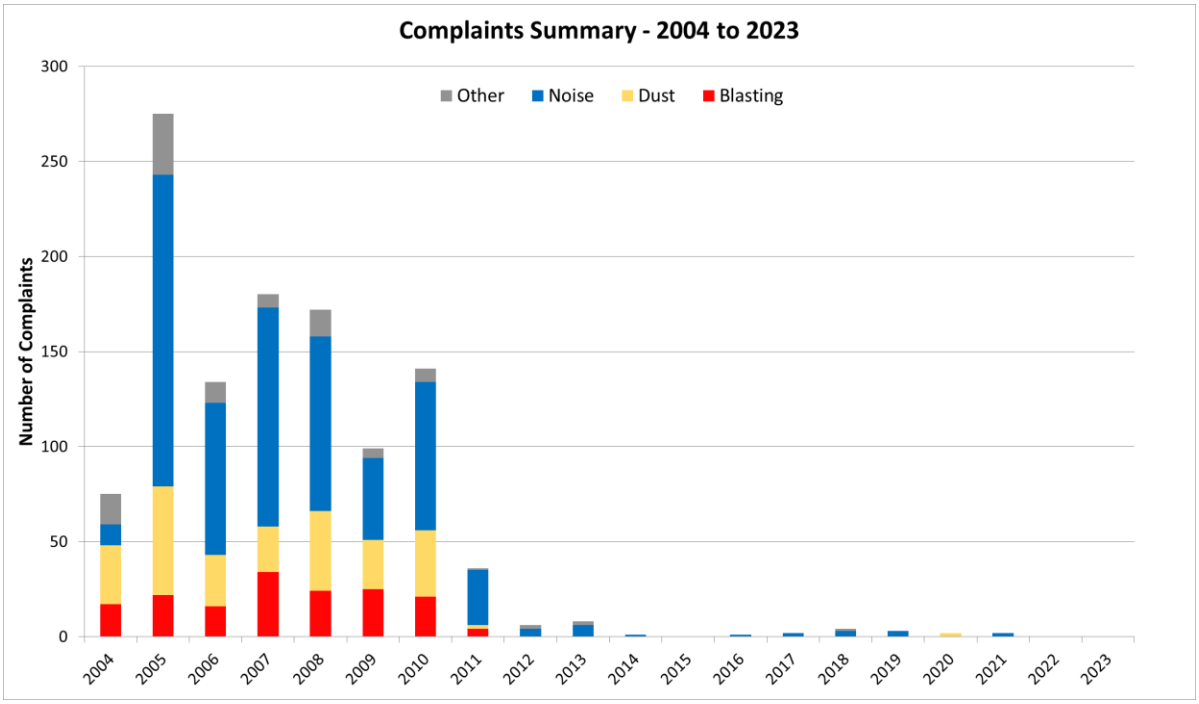


Figure 9.1
COMMUNITY COMPLAINTS – MINE LIFE

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, Mrs Debbie Richards, Mr Michael Bestic);
- a representative from Singleton Council (Clr. Godfrey Adamthwaite); and
- two representatives from ACOL (Mr Phillip Brown and Mr Michael Bartlett, Aaron McGuigan or Mr Cameron Eckersley).

The committee was chaired by Mrs Margaret MacDonald-Hill, an independent chairperson appointed as the independent Chair by the Secretary of DPE (now DPHI).

The committee held a total of three meetings during the reporting period (23 February, 13 July and 26 October 2023). 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 DPE (now DPHI) are available on the Ashton Coal website at www.ashtoncoal.com.au.

ACOL also undertakes engagement through the 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. Two meetings were held during the reporting period in June and December 2023 and regular meetings will continue during the next reporting period (see Section 6.7 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 $85,183 was allocated directly by ACOL to the following community groups and causes.

- Aberdeen Senior and Little Athletics – defibrillator
- Australian Christian College – musical instruments
- Cessnock Hornets – youth development project
- Lions Club – blanket warmer
- Mt Pleasant School – Community Appreciation Day
- Muswellbrook preschool – walkway
- Singleton Art Prize – Singleton Art Prize
- Singleton Heights Preschool – ducted air conditioning
- Singleton Mountain Bike Club – maintenance trailer
- Singleton Neighbourhood Centre – self care
- Singleton PCYC – paint main hall with mural
- Westpac Rescue Helicopter – golf day
- Witmore – window replacement
- University of Newcastle – Engineering and Science Challenge and Smart Science Tour

10. INDEPENDENT AUDIT

In accordance with the requirements of DA 309-11-2001i (MOD11), an independent environmental audit of the ACP was commenced during the 2022 reporting period with a site inspection undertaken on 18 January 2023. The audit covered the period from 31 September 2019 to 18 January 2023. The Independent Environmental Audit report was accepted by the (then) DPE in October 2023 and is available on the Ashton Coal website at www.ashtoncoal.com.au.

The next independent environmental audit is due in the 2025 reporting period.

Table 10.1 provides a summary of the 2022 Independent Audit recommendations and ACOL's response to the audit.

Table 10.1
2022 Independent Audit – Action Response Plan Status

Condition	Non-Compliance	Corrective Action	ACOL Comments	Proposed Action	Action Date	Status Update
DA 309-11-2001-i						
Schedule 3 Condition 12	Ashton exceeded the 24-hour PM10 three times between 12 September 2021 and 29 October 2021. These exceedances were reported in the 2021 annual review. The most recent modification of the development consent has now formalised that the exceedance of 24-hour PM10 criteria is only applicable if the incremental impact is due to the Ashton Coal Mine Complex on its own. Therefore, no corrective action is required.	No corrective action proposed	Modification 11 to Development Consent DA No. 309-11-2001-I approved on 6th July 2022 changed the Air Quality Criteria to report only if the incremental impact is due to Ashton Mine Complex on its own (Schedule 3 Condition 12).	Nil	Nil	No further action required.
Schedule 5 Condition 1	At the time of the audit, the approved EMS (Version F, dated September 2020) did not identify MOD11 and the updated mining leases currently applicable to the site. Following the approval of MOD11, Ashton Coal wrote to DPE informing them that a review of management plans had been undertaken and that the EMS would be updated to reflect the most recent statutory approvals relevant to the development. The EMS has been submitted to DPE and is pending approval. As no further action can be undertaken to achieve compliance with this condition, no corrective action is proposed.	No corrective action proposed.	No action required. EMS modified due to Modification 11 to Development Consent DA No. 309-11-2001-I and is currently with DPE for consideration.	Nil	Nil	The updated EMS was approved by the (then) DPE on 20.04.2023. No further action required.
Statement of Compliance Modification 6, Condition 7.1	The bed and bank of Bowmans Creek are required to be surveyed every five years. This assessment was due to be undertaken in 2022, however was delayed until 2023.	Ensure that the geomorphological assessment is undertaken in 2023.	The delay in carrying out the survey was due to unavailability of Dr Chris Gippell to undertake the work and COVID restrictions. Soil Conservation Service will now undertake the survey.	Soil Conservation Service to undertake the survey.	30.06.2023	The creek was surveyed by SEAM Spatial December 2023 and Dr Chris Gippell has undertaken the required survey and is currently preparing the report.

Table 10.1 (Cont'd)
2022 Independent Audit – Response to Audit

Condition	Non-Compliance	Corrective Action	ACOL Comments	Proposed Action	Action Date	Status Update
EPL 11879 (Cont'd)						
M2.1	A non-compliance against this condition was recorded in the 2020 and 2021 EPA Annual Return, where sampling frequency for air quality was not continuous. The auditor notes that the EPL has recently been modified to included Condition M2.4. Condition M2.4 defines continuous as 95% of the time for the annual return periods for condition M2.2. Non-compliances reported in previous annual return periods had data capture percentages above 95%, and would therefore be compliant under the current EPL and therefore no corrective action has been recommended.	No corrective action proposed.	The EPL was varied on 3 November 2022 to include Condition M2.4 which defines "continuous" to mean the operation of requirement to achieve a minimum pollutant and/or meteorological data capture rate of 95% for the duration of the Annual Return reporting period. No further action required.	Nil	Nil	No further action required.
M2.2	Condition M2.2 requires PM10 to be monitored continuously. PM10 was not monitored continuously in 2020 and 2021 due to outages and maintenance works. Refer to M2.1 for discussion regarding data capture in relation to the provisions of M2.4.		The EPL was varied on 3 November 2022 to include Condition M2.4 which defines "continuous" to mean the operation of requirement to achieve a minimum pollutant and/or meteorological data capture rate of 95% for the duration of the Annual Return reporting period. No further action required.	Nil	Nil	No further action required.
M2.3	One monthly surface water sample was unable to be collected from SM9 (EPL Point 6) in March 2021, due to boggy conditions preventing safe access to sampling location. As this has not occurred again since the non-compliance was reported, no corrective actions are proposed.	No corrective action proposed.	127mm of rainfall had fallen in the preceding 30 days prior to the sampling date. The sampling sheet has been modified to identify mandatory EPL sampling points to ensure that all required samples are undertaken.	Nil	Nil	No further action required.

Table 10.1 (Cont'd)
2022 Independent Audit – Response to Audit

Condition	Non-Compliance	Corrective Action	ACOL Comments	Proposed Action	Action Date	Status Update
EPL 11879 (Cont'd)						
M4.1	Weather monitoring was not undertaken continuously in 2020 and 2021 as per the requirements of this condition. Refer to M2.1 for discussion regarding data capture in relation to the provisions of M2.4.	No corrective action proposed.	The EPL was varied on 3 November 2022 to include Condition M2.4 which defines "continuous" to mean the operation of requirement to achieve a minimum pollutant and/or meteorological data capture rate of 95% for the duration of the Annual Return reporting period. No further action required.	Nil	Nil	No further action required.
M7.1	Data capture was not undertaken at 10-minute intervals during 2021. Refer to M2.1 for discussion regarding data capture in relation to the provisions of M2.4.		The EPL was varied on 3 November 2022 to include Condition M2.4 which defines "continuous" to mean the operation of requirement to achieve a minimum pollutant and/or meteorological data capture rate of 95% for the duration of the Annual Return reporting period. No further action required.	Nil	Nil	No further action required.
R1.5	The Annual Return for the 2019 reporting period was submitted on 31 March 2020, greater than 60 days since the reporting period finished on 31 December 2019. The Annual returns for 2020 and 2021 reporting period were submitted to the EPA within the 60 day timeframe. No corrective actions are proposed.	No corrective action proposed.		Nil	Nil	No further action required.
Standard Conditions Mining Regulation 2016 Schedule 8A Part 2						
16 (2)	The Forward Program is not on the website as per the requirements of this condition, therefore constituting an administrative non-compliance.	Publish the Forward Program on the website.	The Forward Program was submitted to the Resource Regulator on the 25th January 2023. The Forward Program is available on the website.	Nil	Nil	No further action required.

Table 10.1 (Cont'd)
2022 Independent Audit – Response to Audit

Condition	Non-Compliance	Corrective Action	ACOL Comments	Proposed Action	Action Date	Status Update
Standard Conditions Mining Regulation 2016 Schedule 8A Part 2 (Cont'd)						
16 (3)	The Forward Program is not on the website as per the requirements of this condition, therefore constituting an administrative non-compliance.		The Forward Program was submitted to the Resource Regulator on the 25th January 2023. The Forward Program is available on the website.	Nil	Nil	No further action required.
DA 309-11-2001-i						
Schedule 3 Condition 40	A bushfire management plan has been prepared for the site, however, was last updated in 2014.	Whilst not a statutory non-compliance, it is recommended that the bushfire management plan is reviewed and updated.	The Bushfire Management plan is an internal document and was in draft form having been reviewed in 2019.	Update Bushfire Management Plan	31.03.2023	The Bushfire Management Plan was further updated in October 2023.
EL 11879						
O5.1	Ashton informed the auditors that minor amendments have been made to the PIRMP. It is recommended that the PIRMP be formally updated through a new revision.	Ensure that the PIRMP is updated as per the outcomes of the PIRMP test. Publish the updated PIRMP to the project website and make available to site staff.		Update PIRMP and publish on the ACOL website	31.03.2023	The PIRMP on the Ashton website is dated 8 January 2024

11. INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

During the reporting period there were no:

- non-compliances with the mining leases or water access licences; or
- official cautions, warning letters, penalty notices or prosecution proceedings.

During the reporting period two non-compliances with Development Consent 309-11-2001-i was recorded (Schedule 3 Condition 34) in which the Heritage Management Plan is considered not to have been implemented due to the grading of extant artefact sites of moderate significance (refer to section 6.7). This non-compliance was reported to the (then) DPE as an incident and the response measures outlined. No further action was required by DPE.

A non-compliance has also been recorded against Statement of Commitment 7.1 which requires 5 yearly surveys of the diverted creek. The last survey was required during 2022 but was delayed. This non-compliance was reported through the Independent Environmental Audit (see Section 10). The survey has subsequently been completed during December 2023 with a final report to be prepared early 2024.

12. ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

Activities planned to be completed during the next reporting period are outlined in Section 4.4 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. Review the need for controlled grazing within the Bowmans Creek Riparian area to manage weeds and fuel loads and encourage natural regeneration. Implement controlled grazing if and as appropriate.	Review Annually
2. Continue planning towards (and subject to improved meteorological conditions, implementation of) program to convert areas of NEOC pasture rehabilitation to mixed eucalypt woodland.	31.12.24 (subject to meteorological conditions)
3. Undertake investigation within the Bowmans Creek Riparian corridor to identify crucial erosion areas and where rehabilitation and restoration works are required.	31.12.24
4. Plan for and, subject to improved meteorological conditions) undertaken habitat enhancement plantings, particularly within the narrow casuarina woodland areas.	31.12.24 (subject to meteorological conditions)

Appendices

Appendix 1

Noise Compliance

Assessment Report 2023

(No. of pages including blank pages = 417)

Level 3 175 Scott Street
Newcastle NSW 2300
02 4907 4800
www.emmconsulting.com.au

25 January 2024

Cameron Eckersley
Environment and Community Coordinator
Ashton Coal Operations Pty Ltd
PO Box 699
Singleton NSW 2330

Re: EPL 11879 - Noise compliance assessment report 2023

Dear Cameron,

1 Introduction

EMM Consulting Pty Limited (EMM) has been engaged by Ashton Coal Operations Pty Limited (Ashton Coal) to prepare this Noise Compliance Assessment Report for the period 1 January to 31 December 2023. The Noise Compliance Assessment Report is required as per Condition R5.1 of Environment Protection Licence (EPL) 11879 which is reproduced as follows:

> R5.1 Noise Compliance Assessment Report
>
> A noise compliance assessment report must be submitted to the EPA on an annual basis with the Annual Return as set out in Condition R1. The report must be prepared by an accredited acoustical consultant and determine compliance with noise limits at noise monitoring points specified in Condition (s) P1.4 and L4.2 to L4.4.

EMM is an accredited acoustical consultant and a member of both the Association of Australasian Acoustical Consultants (AAAC) and Australian Acoustical Society (AAS).

It is of note that EPL 11879 was not varied or amended during the 2023 reporting period.

2 Compliance

Monthly attended noise monitoring was undertaken by EMM for the period relevant to this report (refer Appendix A to Appendix L for complete noise monitoring reports).

As presented in the attached monthly reports, results of routine attended monitoring confirm that noise emissions from Ashton Coal operations satisfied the relevant EPL noise limits (Condition L4.1 of EPL 11879) at all assessment locations during the 12-month period.

3 Conclusion

Monthly attended noise monitoring undertaken during the relevant reporting period (1 January to 31 December 2023) demonstrated that noise emissions from Ashton Coal night-time operations satisfied the relevant limits at all monitoring points in accordance with EPL 11879.

We trust the preceding meets your current requirements. If you have any questions or need anything further, please do not hesitate to contact our office.

Yours sincerely

Lucas Adamson
Senior Acoustic Consultant
ladamson@emmconsulting.com.au

Review: Najah Ishac (24/1/2024)

Appendix A

Monthly attended noise monitoring report – January 2023

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Ashton Coal

Monthly attended noise monitoring - January 2023

Prepared for Ashton Coal Operations Pty Ltd

January 2023

Ashton Coal

Monthly attended noise monitoring - January 2023

Ashton Coal Operations Pty Ltd

E221164 RP1

January 2023

Version	Date	Prepared by	Approved by	Comments
V1	30/01/2023	Harry Flick	Najah Ishac	

Approved by

Najah Ishac
Director
30 January 2023

Level 3 175 Scott Street
Newcastle NSW 2300

TABLE OF CONTENTS

Appendices

Tables

Figures

1 Introduction

EMM Consulting Pty Limited (EMM) was engaged to complete monthly attended noise surveys on behalf of Ashton Coal Operations Pty Ltd (Ashton Coal).

The monitoring purpose was to address requirements of the approved Ashton Coal Noise Management Plan (NMP), prepared to satisfy the requirements of Development Consent DA 309-11-2001-I (DC) and Environment Protection License (EPL) 11879.

This report presents the results and findings of attended noise monitoring conducted on 12 January 2022.

The following material was referenced as part of this assessment:

- Department of Planning and Environment (DPE), Development Consent 309-11-2001-I, as modified on 6 July 2022 (current as of 12 January 2022);
- Environment Protection Authority (EPA), Environment Protection Licence 11879, as varied on 3 November 2022 (current as of 12 January 2022);
- Ashton Coal Project Noise Management Plan (NMP), approved by DPE on 23 September 2020 (current as of 12 January 2022);
- NSW EPA, Industrial Noise Policy (INP), 2000;
- NSW EPA, Industrial Noise Policy Application notes, 2017; and
- NSW EPA, Noise Policy for Industry (NPfI), 2017.

2 Glossary of acoustic terms

Several technical terms are discussed in this report. These are explained in Table 2.1.

Table 2.1 Glossary of acoustic terms

Term	Description
dB	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
L_{A1}	The 'A-weighted' noise level which is exceeded 1% of the time.
$L_{A1,1\ minute}$	The 'A-weighted' noise level exceeded for 1% of the specified time period of 1 minute.
L_{A10}	The 'A-weighted' noise level which is exceeded 10% of the time. It is approximately equivalent to the average of maximum noise level.
L_{A90}	Commonly referred to as the background noise level. The 'A-weighted' noise level exceeded 90% of the time.
L_{Aeq}	The energy average noise from a source. This is the equivalent continuous 'A-weighted' sound pressure level over a given period. The $L_{Aeq,15\ minute}$ descriptor refers to an L_{Aeq} noise level measured over a 15-minute period.
L_{Amin}	The minimum 'A-weighted' noise level received during a measuring interval.
L_{Amax}	The maximum root mean squared 'A-weighted' sound pressure level (or maximum noise level) received during a measuring interval.
L_{Ceq}	The equivalent continuous 'C-weighted' sound pressure level over a given period. The $L_{Ceq,15\ minute}$ descriptor refers to an L_{Ceq} noise level measured over a 15 minute period. C-weighting can be used to measure low frequency noise.
Day period	Monday – Saturday: 7 am to 6 pm, on Sundays and Public Holidays: 8 am to 6 pm.
Evening period	Monday – Saturday: 6 pm to 10 pm, on Sundays and Public Holidays: 6 pm to 10 pm.
Night period	Monday – Saturday: 10 pm to 7 am, on Sundays and Public Holidays: 10 pm to 8 am.
Temperature inversion	A meteorological condition where the atmospheric temperature increases with altitude.

It is useful to have an appreciation of decibels (dB), the unit of noise measurement. Table 2.2 gives an indication as to how an average person perceives changes in noise levels. Examples of common noise levels are provided in Figure 2.1.

Table 2.2 Perceived change in noise

Change in sound pressure level (dB)	Perceived change in noise in surrounding environment
up to 2	not perceptible
3	just perceptible
5	noticeable difference
10	twice (or half) as loud
15	large change
20	four times (or quarter) as loud

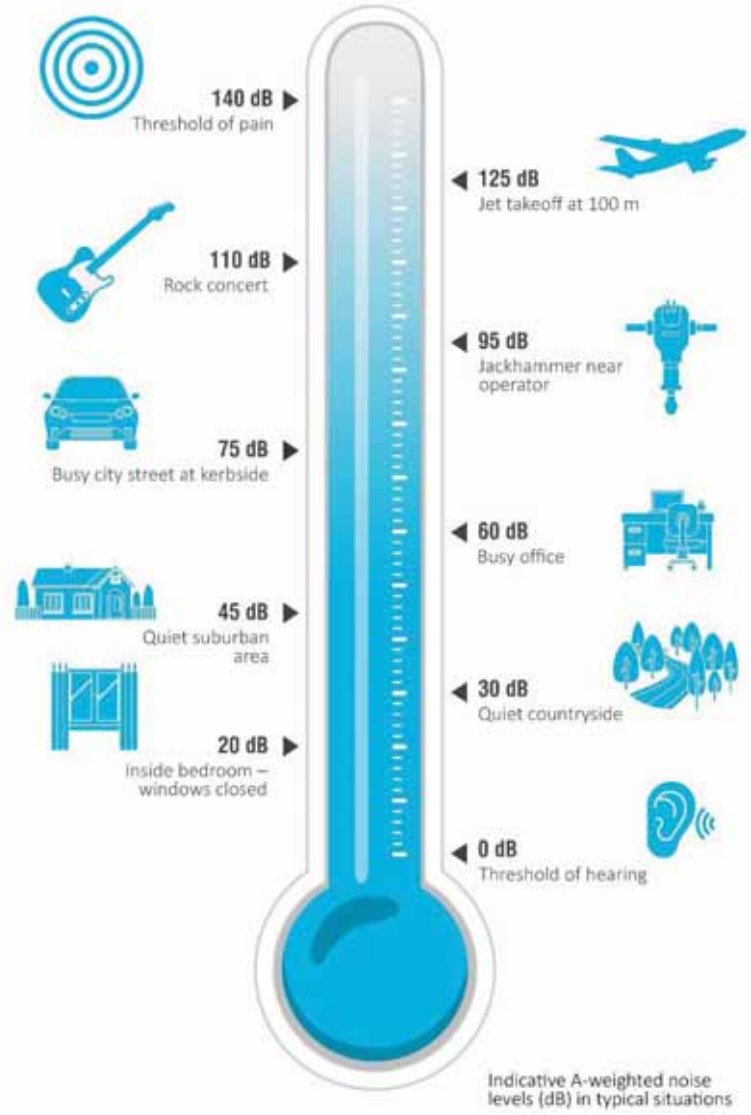


Figure 2.1 Common noise levels

3 Noise limits

3.1 Operational and sleep disturbance noise limits

Ashton Coal noise limits are provided in Table 1, Condition 2 of Appendix 6 of the DC and Condition L4.1 of the EPL. Extracts of the relevant sections of the DC and EPL pertaining to noise are provided in Appendix A and Appendix B, respectively. The approved NMP adopts three attended noise monitoring locations that are representative of residences outlined in the DC. The noise monitoring locations and relevant criteria are summarised in Table 3.1.

Table 3.1 Noise impact assessment criteria

Monitoring location	Day $L_{Aeq,15\ minute}$, dB	Evening $L_{Aeq,15\ minute}$, dB	Night $L_{Aeq,15\ minute}$, dB	Night $L_{A1,1\ minute}$, dB
N2	38	38	36	46
N3	38	38	36	46
N4	38	38	36	46

The DC and the EPL specify the following meteorological conditions under which noise limits do not apply:

- during periods of rain or hail;
- average wind speed at microphone height exceeds 5 metres per second (m/s);
- wind speeds greater than 3 m/s at 10 metres above ground level; and
- temperature inversion conditions greater than 3°C/100 m.

For this assessment, the recorded L_{Amax} has been used as a conservative estimate of the $L_{A1,1\ minute}$. The INP application notes state that the EPA accepts sleep disturbance analysis based on either the $L_{A1,1\ minute}$ or L_{Amax} metrics (EPA 2013), with use of L_{Amax} resulting in a more conservative assessment.

The DC and EPL state that modification factor corrections in the application notes to the INP (updated in 2017) shall be applied to the measured mine noise levels where applicable. The application notes to the INP state that Fact Sheet C of the NPfI (EPA 2017) now applies regarding the application of modifying factor corrections.

3.2 Cumulative noise criteria

Ashton Coal cumulative noise limits are provided in Condition 5 and Condition 6 of Schedule 3 of the DC. An extract of the conditions relevant to cumulative noise criteria is provided here.

> 5. The Applicant must implement all reasonable and feasible measures to ensure that the noise generated by the Ashton Mine Complex combined with the noise generated by other mines in the vicinity does not exceed the criteria in Table 4 at any residence on any privately-owned land or on more than 25 per cent of any privately-owned land (except for the noise affected residential receivers in Table 1).

Table 4: Cumulative Noise Criteria dB(A) $L_{Aeq\ (period)}$

Location	Day	Evening	Night
Camberwell Village	55	45	40
All other privately-owned land	50	45	40

Cumulative noise is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 8 sets out the requirements for evaluating compliance with these criteria.

> 6. If the cumulative noise generated by the Ashton Mine Complex combined with the noise generated by other coal mines in the vicinity exceeds the criteria in Table 5 at any residence on privately-owned land or more than 25 per cent of any privately-owned land (except for the noise-affected residential receivers in Table 1), then upon receiving a written request from the landowner, the Applicant must, together with the relevant mines, acquire the land on as equitable basis as possible, in accordance with the procedures in conditions 7 and 8 of Schedule 4.

Table 5: Cumulative Noise Acquisition Criteria dB(A) $L_{Aeq\ (period)}$

Location	Day	Evening	Night
Camberwell Village	60	50	45
All other privately-owned land	55	50	45

Cumulative noise is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 8 sets out the requirements for evaluating compliance with these criteria.

3.3 Modifying factors

The EPA 'Noise Policy for Industry' (NPfI, 2017) was approved for use in NSW in October 2017. For assessment of modifying factors, the NPfI immediately superseded the 'Industrial Noise Policy' (INP, 2000), as outlined in the EPA document 'Implementation and transitional arrangements for the Noise Policy for Industry' (2017). Assessment and reporting of modifying factors have been undertaken in accordance with Fact Sheet C of the NPfI.

4 Assessment methodology

4.1 Attended noise monitoring

To quantify noise emissions from Ashton Coal, 15-minute attended noise monitoring surveys were completed at representative locations as per the approved NMP. Noise monitoring locations and their coordinates are listed in Table 4.1 and are shown in Figure 4.1.

Table 4.1 Attended noise monitoring locations

Monitoring location	Description	MGA56	
		Easting	Northing
N2	Camberwell Village (west)	320297	6405670
N3	Camberwell Village (north-east)	320554	6405839
N4	South of New England Highway	319776	6404101

Attended noise monitoring is scheduled to be “unannounced” and, to EMM’s knowledge, Ashton Coal were not aware of the monitoring prior to its commencement. Noise monitoring is avoided during any scheduled downtime or major maintenance. Information provided by Ashton Coal after completion of the noise monitoring confirmed that regular operations were occurring during the monitoring period.

Where possible throughout each survey, the operator has quantified the contribution of each significant noise source. This was done by matching audible sounds with the response of the analyser (where applicable) and/or via post-analysis of data (eg low pass frequency filtering).

4.2 Instrumentation

A Brüel & Kjær 2250 Type 1 sound analyser (s/n 3029363) was used to conduct 15-minute attended measurements and record 1/3 octave frequency and statistical noise indices. The sound analyser was calibrated before and on completion of the survey using a Svantek SV-36 calibrator (s/n 86311). Instrumentation calibration certificates are provided in Appendix C.

4.3 Attended noise monitoring exceedance procedure

Ashton Coal has developed an attended monitoring exceedance procedure that is to be implemented if measurements show Ashton Coal noise emissions are above any relevant criterion. This response plan is implemented if site noise levels are determined to be above a relevant criterion which was applicable due to suitable meteorological conditions. The following noise management initiatives are implemented.

- Consultant will record the reading and advise Ashton Coal of the exceedance. Ashton Coal will implement remedial action as required.
- A follow up measurement is to be conducted (within 75 minutes after the first measurement and no earlier than 10 pm).
- If the follow up measurement indicates that site noise levels are above a relevant criterion and that noise limits are applicable, the consultant will record the result, note the site has failed and is deemed a 'noise affected night' at that location and move on to the next monitoring location. An additional monitoring test should be scheduled to be undertaken at the same location within one week.
- If the follow up measurement indicates that site noise levels are below relevant noise criteria and that noise limits are applicable, the consultant will record the result, note the site has passed and move on to the next monitoring location. An additional monitoring test should be scheduled to be undertaken at the same location within one week.

4.4 Determination of stability category

As per Condition L4.4, this assessment determined the stability categories throughout the attended monitoring period using the direct measurement method as per Fact Sheet D of the Noise Policy for Industry (2017).

The temperature lapse rate between the two weather stations (M1 – Sentinex Unit 40 located in Camberwell Village and M2 – Ashton Coal 'repeater' meteorological station located in the north-eastern open cut (NEOC) area) was calculated using the following formula:

$$\text{Temperature lapse rate} = (\Delta T) \times (100/(\Delta H))$$

Where:

- ΔT = temperature measured at M2 (at 10 metres above ground level) minus temperature measured at M1 (at 10 metres above ground level); and
- ΔH = the vertical height difference between M2 and M1 (equal to 73 metres).

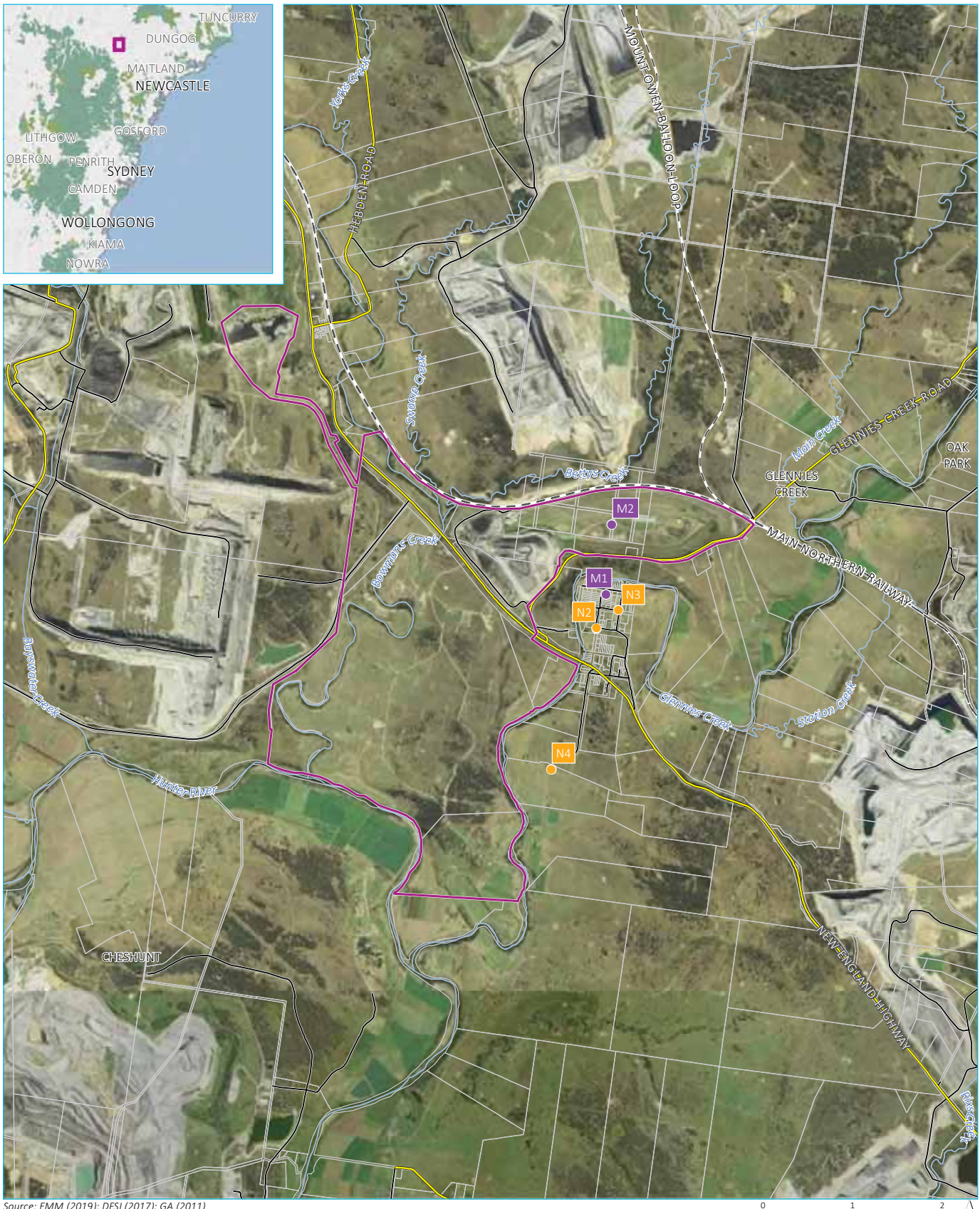
Table D2 of the NPfI (EPA 2017) is reproduced in Table 4.2 and presents the stability categories and associated ranges in temperature lapse rates.

Table 4.2 Stability categories and temperature lapse rates

Stability category	Temperature lapse rate (ΔT) (°C/100 m)
A	$\Delta T < -1.9$
B	$-1.9 \leq \Delta T < -1.7$
C	$-1.7 \leq \Delta T < -1.5$
D	$-1.5 \leq \Delta T < -0.5$
E	$-0.5 \leq \Delta T < 1.5$
F	$1.5 \leq \Delta T < 4.0$
G	$\Delta T \geq 4.0$

Source: NPfI (EPA 2017).

Other meteorological data, such as wind speed, has been sourced directly from meteorological station M2 since it is more representative of the weather conditions nearer to the Ashton Coal noise sources.



Source: EMM (2019); DFSI (2017); GA (2011)

0 1 2 km

GDA 1994 MGA Zone 56

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KEY

- Site boundary
- Noise monitoring location
- Meteorological station
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Cadastral boundary

Noise monitoring locations and Ashton colliery boundary

Ashton Coal
Monthly attended noise monitoring
Figure 4.1

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5 Review of data and discussion

5.1 Summary

Results of attended noise measurements are summarised in Table 5.1. Ashton Coal contribution and total mine noise were determined for each survey using in-field observations and post-analysis of data as required (eg removing higher frequencies that are not mine related). Attended monitoring was completed on 12 January 2022. Noise from Ashton Coal operations was inaudible during all measurements.

Meteorological data for the monitoring period was sourced from Ashton Coal's two weather stations (M1 and M2) to determine applicability of criteria in accordance with the DC and EPL. Noise limits were found to be applicable during all three measurements.

All measurements were evaluated for potential modifying factors in accordance with the NPfI. Specific methodology for assessment of each modifying factor is outlined in Fact Sheet C of the NPfI.

If applicable, modifying factors have been reported and added to measured site-only L_{Aeq} noise levels when meteorological conditions satisfied requirements for site noise criteria to be applicable. Low-frequency modifying factors have only been applied to site-only L_{Aeq} levels if Ashton Coal was the only contributing low-frequency noise source. Ashton Coal noise contributions and cumulative mine noise contributions were below (ie complied with) the relevant noise limits at all monitoring locations.

Table 5.1 Ashton Coal attended noise monitoring results – January 2022

Location	Date	Start time	Total noise levels, dB							Site contributions, dB			Noise limits, dB		Meteorological conditions[3] Limits apply? (Y/N)	Exceedance, dB	Comments
			L_{Amin}	L_{A90}	L_{Aeq}	L_{A10}	L_{A1}	L_{Amax}	L_{Ceq}	Mod. Factor[1]	L_{Aeq}	L_{Amax}[2]	L_{Aeq}	L_{Amax}[2]			
N2	12/01	22:11	39	43	50	53	57	60	54	Nil	IA	IA	36	46	2.8 m/s @ 132° E class stability -0.4°C/100m VTG Y	Nil	**Ashton Coal mine inaudible.** Traffic on the New England Highway and insects consistently audible. Trains on the main line, dogs barking and noise from a nearby horse occasionally audible.
N3	12/01	22:33	35	37	42	46	50	54	51	Nil	IA	IA	36	46	2.0 m/s @ 149° E class stability -0.3°C/100m VTG Y	Nil	**Ashton Coal mine inaudible.** Other mines in the area occasionally audible. Traffic on the New England Highway, insects, and frogs consistently audible. Trains on the main line and nearby livestock occasionally audible.
N4	12/01	22:59	29	32	36	38	42	50	49	Nil	IA	IA	36	46	2.3 m/s @ 148° E class stability 0.0°C/100m VTG Y	Nil	**Ashton Coal mine inaudible.** Other mines in the area frequently audible. Traffic on the New England Highway, power line hum, insects, and frogs consistently audible.

Notes:

1. Modifying factor correction for low frequency, tonal or intermittent noise in accordance with Fact Sheet C of the NPfI).
2. For assessment purposes the L_{Amax} and the $L_{A1,1\ minute}$ are interchangeable.
3. Meteorological data were taken as an average over 15 minutes from the Ashton Coal weather station (Refer to Section 5.1). VTG assumes the temperature sensors on the two weather stations are in proper working order and calibrated to manufacturers requirements.
4. IA = inaudible.
5. NM = not measurable.
6. N/A = not applicable.

5.2 N2 - Camberwell Village (west)

Ashton Coal operations were inaudible during the entire measurement. Typically, when this type of noise source is not audible above ambient (not withstanding insect noise and other sources of varied character), the likely level of that source is at least 10 dB below the measured background (L_{A90}) level.Given this, and the measured background noise level of 43 dB L_{A90}, the Ashton Coal $L_{Aeq,15\ minute}$ mine noise contribution was estimated to be <33 dB $L_{Aeq,15\ minute}$ and therefore below the relevant noise limit. Ashton Coal noise contributions complied with the DC and EPL noise limits.

Other noise sources included insects, traffic on the New England Highway, trains on the main line, dogs barking, and noise from a nearby horse.

Other mining operations in the vicinity were inaudible during the operator-attended noise survey at monitoring location N2. The cumulative mining noise level was estimated to be <30 dB $L_{Aeq,night}$ (ie estimated Ashton mine noise of <33 dB $L_{Aeq,15\ minute}$ less 3 dB as per NPfI methodology) which is below the relevant 40 dB $L_{Aeq,night}$ limit. A graph of the total noise levels measured in each one-third octave frequency bands is shown in Figure 5.1.

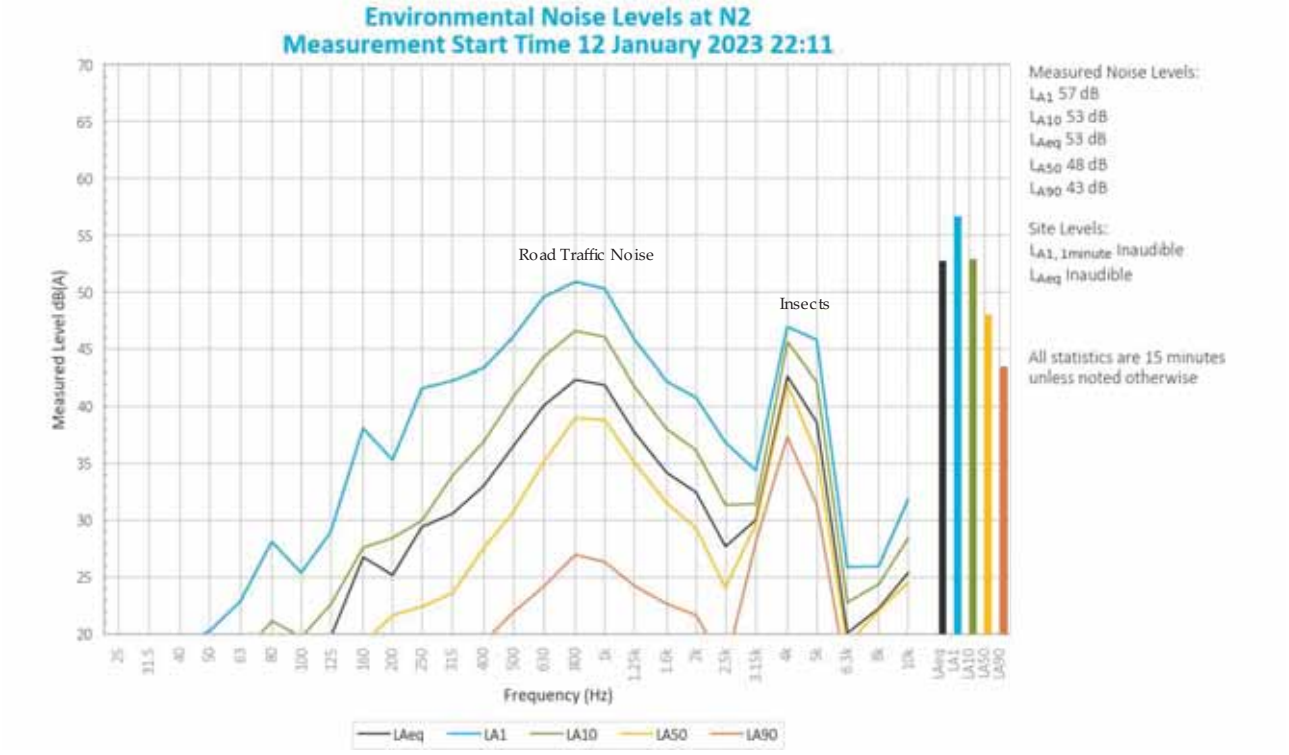

Figure 5.1 N2 total measured one-third octave band frequencies

5.3 N3 - Camberwell Village (north-east)

Ashton Coal operations were inaudible during the entire measurement. Typically, when this type of noise source is not audible above ambient (not withstanding insect noise and other sources of varied character), the likely level of that source is at least 10 dB below the measured background (L_{A90}) level.Given this, and the measured background noise level of 37 dB L_{A90}, the Ashton Coal $L_{Aeq,15\ minute}$ mine noise contribution was estimated to be <27 dB $L_{Aeq,15\ minute}$ and therefore below the relevant noise limit. Ashton Coal noise contributions complied with the DC and EPL noise limits.

Other noise sources included insects, frogs, traffic on the New England Highway, other mines in the vicinity, trains on the main line, and noise from livestock.

Other mining operations in the vicinity were frequently audible during the operator-attended noise survey at monitoring location N3. The cumulative mining noise level was estimated to be <29 dB $L_{Aeq,night}$ (ie other mine noise of <32 dB $L_{Aeq,15\ minute}$ less 3 dB as per NPfI methodology) which is below the relevant 40 dB $L_{Aeq,night}$ limit. A graph of the total noise levels measured in the one-third octave frequency bands is shown in Figure 5.2.

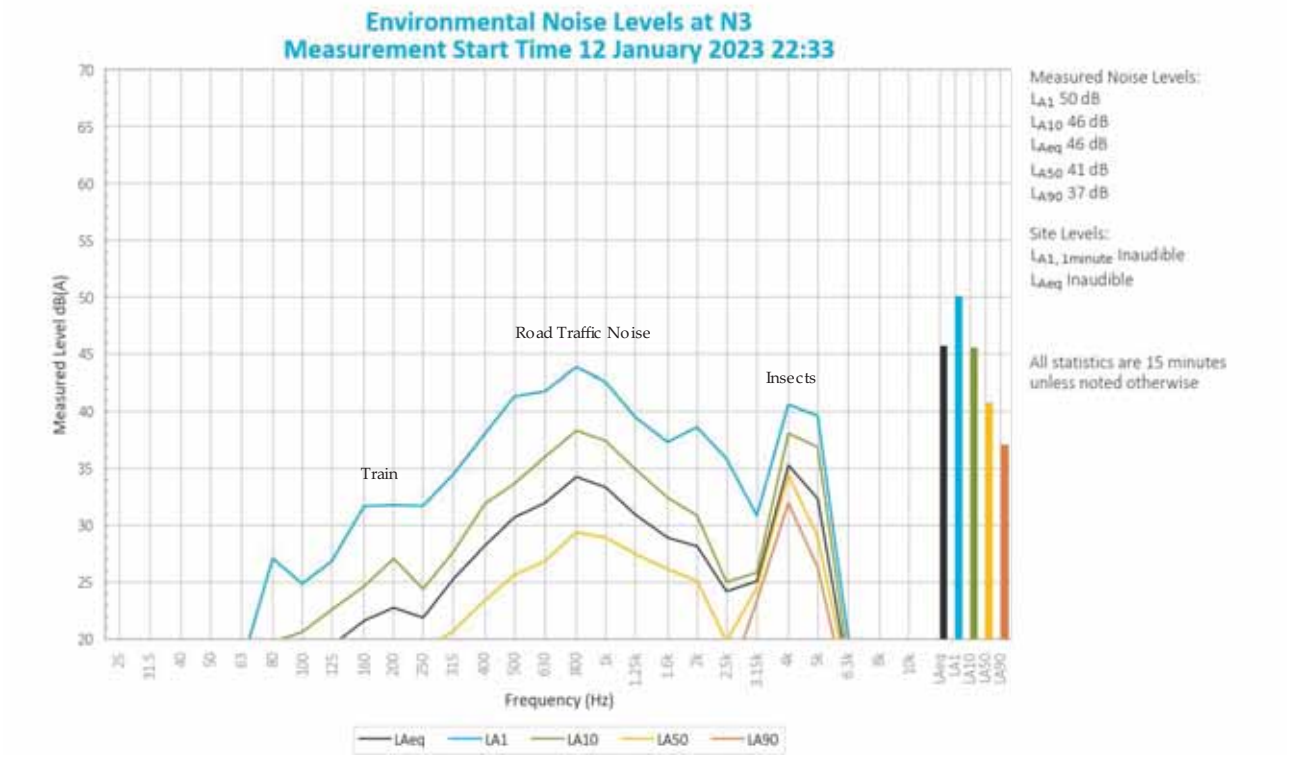

Figure 5.2 N3 total measured one-third octave band frequencies

5.4 N4 - South of New England Highway

Ashton Coal operations were inaudible during the entire measurement. Typically, when this type of noise source is not audible above ambient (not withstanding insect noise and other sources of varied character), the likely level of that source is at least 10 dB below the measured background (L_{A90}) level.Given this, and the measured background noise level of 32 dB L_{A90}, the Ashton Coal $L_{Aeq,15\ minute}$ mine noise contribution was estimated to be <22 dB $L_{Aeq,15\ minute}$ and therefore below the relevant noise limit. Ashton Coal noise contributions complied with the DC and EPL noise limits.

Other noise sources included insects and frogs, traffic on the New England Highway and a hum from a nearby powerline.

Other mining operations in the vicinity were frequently audible during the operator-attended noise survey at monitoring location N3. The cumulative mining noise level was estimated to be <25 dB $L_{Aeq,night}$ (ie other mine noise of <28 dB $L_{Aeq,15\ minute}$ less 3 dB as per NPfI methodology) which is below the relevant 40 dB $L_{Aeq,night}$ limit. A graph of the total noise levels measured in the one-third octave frequency bands is shown in Figure 5.3.

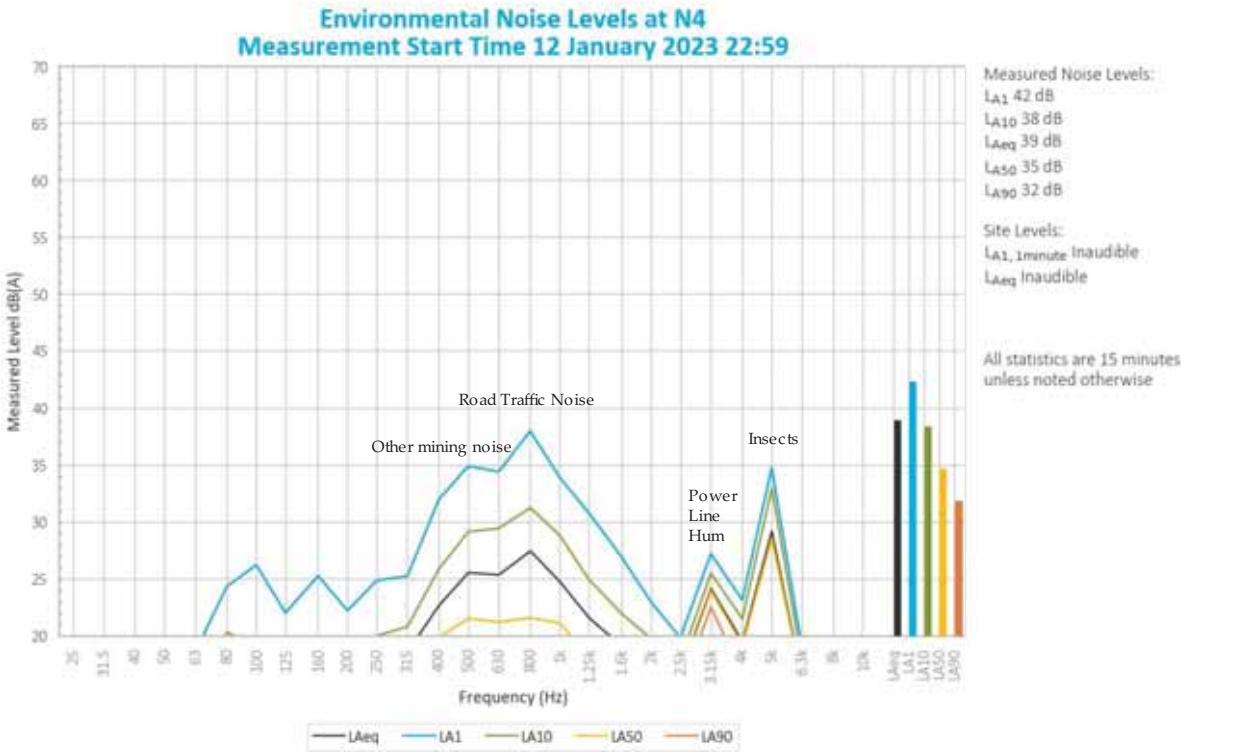

Figure 5.3 N4 total measured one-third octave band frequencies

6 Conclusion

EMM has completed a review of mine noise from Ashton Coal within the surrounding community based on attended measurements conducted on 12 January 2022.

The applicability of noise limits was assessed with reference to Ashton Coal's two meteorological stations M1 and M2 located to the east of and on the site, respectively. Noise limits were found to be applicable during all three measurements.

The assessment of noise from site included consideration of modifying factors for noise characteristics, where relevant, and in accordance with the DC and EPL.

Both Ashton Coal noise and cumulative mine noise were below (satisfied) the relevant noise limits at all monitoring locations during this round of monitoring.

References

Ashton Coal Noise Management Plan, 2017.

NSW Department of Planning, Industry and Environment, Development Consent DA309-11-2001-I, 2016.

NSW Environment Protection Authority, Environment Protection License 11879.

NSW Environment Protection Authority, Industrial Noise Policy, 2000.

NSW Environment Protection Authority, Industrial Noise Policy Application notes, 2017.

NSW Environment Protection Authority, Noise Policy for Industry, 2017.

Appendix A
Project approval extract

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APPENDIX 6

ALTERNATE NOISE CONDITIONS

NOISE

Application

1. Conditions 2 to 3 below have effect during times when open cut mining operations are not being undertaken at the Ashton Mine Complex, in the opinion of the Planning Secretary.

Noise Criteria

2. Except for the noise-affected land in Table 1 of Schedule 3, the Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 1 at any residence on privately-owned land or on more than 25 per cent of any privately-owned land.

Table 1: Noise Criteria dB(A)

Receiver No.	***Receiver***	***Day*** ($L_{Aeq\ (15min)}$)	***Evening*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{A1\ (1\ min)}$)
-	All privately-owned land	38	38	36	46

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy*. Appendix 8 sets out the requirements for evaluating compliance with these criteria.

However, these noise criteria do not apply if the Applicant has an agreement with the relevant owner/s of the residence/land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Additional Noise Mitigation Measures

3. Upon receiving a written request from the owner of any residence on any privately-owned land where subsequent operational noise monitoring shows the noise generated by the development exceeds the noise limits in Table 2, the Applicant must implement additional reasonable and feasible noise mitigation measures (such as double glazing, insulation, and/or air conditioning) at the residence in consultation with the owner.

If within 3 months of receiving this request from the landowner, the Applicant and the landowner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Planning Secretary for resolution.

Table 2: Additional Noise Mitigation Criteria dB(A) $L_{Aeq\ (15min)}$

Receiver No.	***Receiver***	***Day*** ($L_{Aeq\ (15min)}$)	***Evening*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{Aeq\ (15min)}$)
-	All privately-owned land	38	38	38

Notes:

- *Noise generated by the development is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 8 sets out the requirements for evaluating compliance with these criteria.*
- *For this condition to apply, the exceedance of the criteria must be systemic.*

APPENDIX 8

NOISE COMPLIANCE ASSESSMENT

Compliance Monitoring

1. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this approval.

2. Data collected for the purposes of determining compliance with the relevant conditions of this approval is to be excluded under the following meteorological conditions:
   a) during periods of rain or hail;
   b) average wind speed at microphone height exceeds 5 m/s;
   c) wind speeds greater than 3 m/s measures at 10 m above ground level; and
   d) temperature inversion conditions greater than 3°C/100m.

3. Unless otherwise agreed with the Planning Secretary, this monitoring is to be carried out in accordance with the relevant requirements relating for reviewing performance set out in the NSW Industrial Noise Policy (as amended from time to time), in particular the requirements relating to:
   a) monitoring locations for the collection of representative noise data;
   b) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
   c) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

4. To the extent that there is any inconsistency between the Industrial Noise Policy and the requirements set out in this Appendix, the Appendix prevails to the extent of the inconsistency.

Determination of Meteorological Conditions

5. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located in the vicinity of the site (as required by condition 18 of Schedule 3).

Appendix B
EPL extract

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14	Noise monitoring	Monitoring at coordinates 320297, 6405670 (Easting, Northing), identified as N2 on Figure 2 and representative of Noise Assessment Group 1.
15	Noise monitoring	Monitoring at coordinates 319776, 6404101 (Easting, Northing), identified as N4 on Figure 2 and representative of Noise Assessment Group 3.
32	Meteorological Station – to determine meteorological conditions for noise monitoring	Monitoring of temperature at 'M1' at coordinates 320259, 6405971 (Easting, Northing).

P1.5 For the purposes of Condition P1.1, P1.2 and P1.3, Figure 1 refers to the plan titled "Ashton Underground Mine Environment Protection licence 11879 Premises Boundary, Surface Infrastructure" dated 30/08/19 (EPA reference DOC19/761196).

P1.6 For the purpose of Condition P1.4, Figure 2 refers to the plan titled "Ashton Underground Mine Environment Protection licence 11879 Premises Boundary, Monitoring" dated 30/08/19 (EPA reference DOC19/761196).

P1.7 The datum for grid references in this Licence is the Geodetic Datum of Australia 1994 (GDA94), Zone 56.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

L2.1 Flares must be operated by the licensee such that there is no visible emission other than for a total period of no more than 5 minutes in any 2 hours, except for heat haze.

L3 Waste

L3.1 The licensee must not cause, permit or allow any waste to be received at the premises unless specified in this licence.

L3.2 The Licensee must not dispose of waste on the premises unless authorised by a condition of this Licence.

L4 Noise limits

L4.1 Noise from the premises must not exceed the noise limits specified in the table below.

Residences referenced in this table are from the consent DA 309-11-2001-i and summarised in the EPA

reference DOC19/761196.

Location	Day LAeq(15 minute)	Evening LAeq(15 minute)	Night LAeq(15 minute)	Night LAeq(1 minute)
EPA Point 13	38	38	36	46
EPA Point 14	38	38	36	46
EPA Point 15	38	38	36	46
All other privately owned residences	38	38	36	46

L4.2 For the purpose of Condition L4.1:
a) Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays,
b) Evening is defined as the period from 6pm to 10pm, and
c) Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays

L4.3 The noise emission limits identified in condition L4.1 apply under the following meteorological conditions:

a) wind speeds up to 3m/s at 10m above ground level; and
b) temperature inversion conditions up to 3 degrees C/100m.

L4.4 For the purposes of condition L4.1:

a) Data recorded by the closest and most representative meteorological station installed on the premises at EPA Identification Point 12 must be used to determine meteorological conditions; and
b) Temperature inversion conditions (stability category) are to be determined by the methods referred to in Fact Sheet D of the Noise Policy for Industry (2017) using EPA Identification Points 12 and 32.

4 Operating Conditions

O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.
This includes:
a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
a) must be maintained in a proper and efficient condition; and
b) must be operated in a proper and efficient manner.

Appendix C
Calibration certificates

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM34169

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	B & K		
Type No:	2250	**Serial No:**	3029363
Mic. Type:	4189	**Serial No:**	3260501
Pre-Amp. Type:	ZC0032	**Serial No:**	30109
Filter Type:	1/3 Octave	**Test No:**	F034175

Owner: EMM Consulting
Suite 01, 20 Chandos St
St Leonards NSW 2065

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	1002	hPa ±1 hPa	**Date of Receipt :**	02/11/2022
Temperature	24	°C ±1° C	**Date of Calibration :**	03/11/2022
Relative Humidity	35	% ±5%	**Date of Issue :**	04/11/2022

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

Jack Kielt

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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Acoustic and Vibration Measurements

Acu-Vib Electronics
CALIBRATIONS SALES RENTALS REPAIRS

Head Office & Calibration Laboratory
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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C34022

EQUIPMENT TESTED : Sound Level Calibrator

Manufacturer: Svantek
Type No: SV-36 **Serial No:** 86311
Owner: EMM Consulting
Suite 01, 20 Chandos St
St Leonards NSW 2065
Tests Performed: Measured Output Pressure level, Frequency & Distortion
Comments: See Details overleaf. All Test Passed.

Parameter	Pre-Adj	Adj Y/N	Output: (dB re 20 µPa)	Frequency (Hz)	THD&N (%)
Level1:	NA	N	94.01 dB	1000.00 Hz	2.00 %
Level2:	NA	N	113.92 dB	1000.00 Hz	0.35 %
Uncertainty			±0.11 dB	±0.05%	±0.20 %
Uncertainty (at 95% c.l.) k=2					

CONDITION OF TEST:

Ambient Pressure	1013	hPa ±1 hPa	**Date of Receipt :**	17/10/2022
Temperature	22	°C ±1° C	**Date of Calibration :**	17/10/2022
Relative Humidity	56	% ±5%	**Date of Issue :**	17/10/2022

Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2017

CHECKED BY: .....

AUTHORISED SIGNATURE: .....

Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

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Appendix B

Monthly attended noise monitoring report – February 2023

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Ashton Coal

Monthly attended noise monitoring - February 2023

Prepared for Ashton Coal Operations Pty Ltd

March 2023

Ashton Coal

Monthly attended noise monitoring - February 2023

Ashton Coal Operations Pty Ltd

E221164 RP2

March 2023

Version	Date	Prepared by	Reviewed by	Comments
1	1 March 2023	Lucas Adamson	Tony Welbourne	Draft
2	6 March 2023	Lucas Adamson	Tony Welbourne	Final

Approved by

Tony Welbourne
Associate Director
1 March 2023

Level 3 175 Scott Street
Newcastle NSW 2300

TABLE OF CONTENTS

Appendices

Tables

Figures

1 Introduction

1.1 Background

EMM Consulting Pty Ltd (EMM) was engaged by Ashton Coal Operations Pty Ltd to conduct a monthly noise survey of operations at Ashton Coal Operations (Ashton Coal, the site) located at Glennies Creek Rd, Camberwell NSW. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified limits.

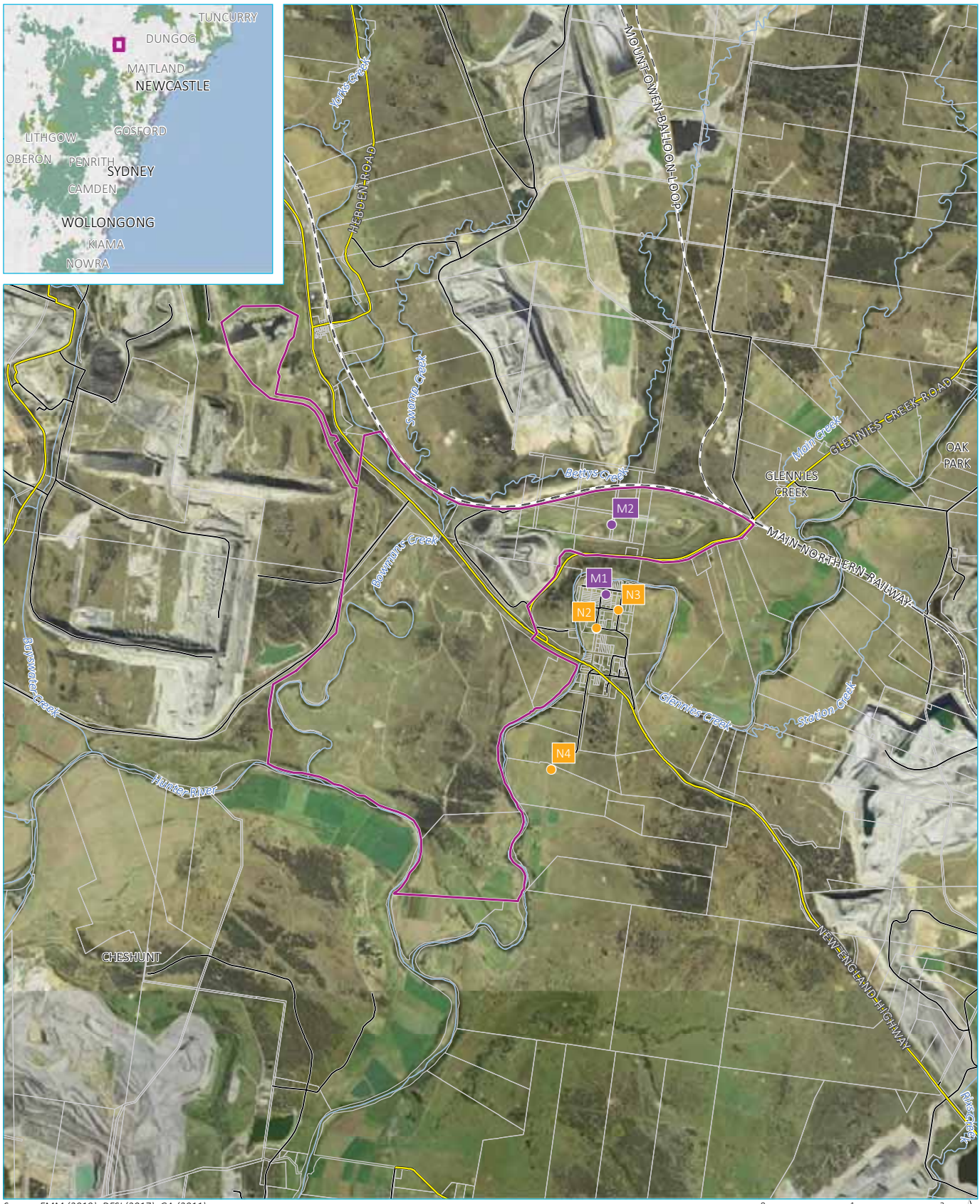
Attended environmental noise monitoring described in this report was conducted during the night period of Wednesday 15 February 2023 at three monitoring locations.

1.2 Attended monitoring locations

Site monitoring locations are detailed in Table 1.1 and shown on Figure 1.1. It should be noted that Figure 1.1 shows actual monitoring positions, not necessarily the location of residences.

Table 1.1 Attended noise monitoring locations

Location descriptor/ID	Description/address	Coordinates (MGA56)	
		Easting	Northing
N2	Camberwell Village (west)	320297	6405670
N3	Camberwell Village (north-east)	320554	6405839
N4	South of New England Highway	319776	6404101



Source: EMM (2019); DFSI (2017); GA (2011)

0 1 2 km

GDA 1994 MGA Zone 56

N

\\emmsvr1\EMM\Jobs\2019\H190081 - Ashton Coal Noise Monitoring\8 GIS\02_Maps\N001_NoiseMonitoring_20190312_02.mxd 12/03/2019

KEY

- Site boundary
- Noise monitoring location
- Meteorological station
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Cadastral boundary

Noise monitoring locations and Ashton colliery boundary

Ashton Coal
Monthly attended noise monitoring
Figure 1.1

EMM
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1.3 Terminology and abbreviations

Some definitions of terms and abbreviations which may be used in this report are provided in Table 1.2.

Table 1.2 Terminology and abbreviations

Term/descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to approximate how humans hear noise.
L_{Amax}	The maximum root mean squared A-weighted noise level over a time period.
L_{A1}	The A-weighted noise level which is exceeded for 1 per cent of the time.
$L_{A1,1minute}$	The A-weighted noise level which is exceeded for 1 per cent of the specified time period of 1 minute.
L_{A10}	The A-weighted noise level which is exceeded for 10 percent of the time.
L_{Aeq}	The energy average A-weighted noise level.
L_{A50}	The A-weighted noise level which is exceeded for 50 per cent of the time, also the median noise level during a measurement period.
L_{A90}	The A-weighted noise level exceeded for 90 percent of the time, also referred to as the "background" noise level and commonly used to derive noise limits.
L_{Amin}	The minimum A-weighted noise level over a time period.
L_{Ceq}	The energy average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	Monday – Saturday: 7 am to 6 pm, on Sundays and Public Holidays: 8 am to 6 pm.
Evening	Monday – Saturday: 6 pm to 10 pm, on Sundays and Public Holidays: 6 pm to 10 pm.
Night	Monday – Saturday: 10 pm to 7 am, on Sundays and Public Holidays: 10 pm to 8 am.
Temperature inversion	A meteorological condition where the atmospheric temperature increases with altitude.

Appendix A provides further information that gives an indication as to how an average person perceives changes in noise level, and examples of common noise levels.

2 Noise limits

2.1 Development consent

Ashton Coal noise limits are provided in Table 1, Condition 2 of Appendix 6 of development consent 309-11-2001-I (DC). Relevant sections of the DC are reproduced in Appendix B.1.

2.2 Environment protection licence

Ashton Coal noise limits are provided in Condition L4.1 of EPL 11879 (EPL). Relevant sections of the EPL are reproduced in Appendix B.2.

2.3 Noise management plan

The approved NMP adopts three attended noise monitoring locations that are representative of residences outlined in the DC and EPL. Relevant sections of the NMP are reproduced in Appendix B.3.

2.4 Noise limits

Noise impact limits based on the NMP are as shown in Table 2.1.

Table 2.1 Noise impact limits, dB

Location	Day $L_{Aeq,15minute}$	Evening $L_{Aeq,15minute}$	Night $L_{Aeq,15minute}$	Night $L_{A1,1minute}$
N2	38	38	36	46
N3	38	38	36	46
N4	38	38	36	46

2.5 Meteorological conditions

The DC and the EPL specify the following meteorological conditions under which noise limits do not apply:

- during periods of rain or hail
- average wind speed at microphone height exceeds 5 metres per second (m/s)
- wind speeds greater than 3 m/s at 10 metres above ground level
- temperature inversion conditions greater than 3°C/100 m.

2.6 Additional requirements

Monitoring and reporting have been done in accordance with the NSW EPA 'Noise Policy for Industry' (NPfI) issued in October 2017 and the 'Approved methods for the measurement and analysis of environmental noise in NSW' (Approved Methods) issued in January 2022.

3 Methodology

3.1 Overview

Attended environmental noise monitoring was done in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant EPA requirements. Meteorological data was obtained from the Ashton Coal on-site weather station which allowed correlation of atmospheric parameters with measured noise levels.

3.2 Attended noise monitoring

During this survey, attended noise monitoring was conducted during the night period at each location. The duration of each measurement was 15 minutes. Atmospheric conditions were measured at each monitoring location.

Measured sound levels from various sources were noted during each measurement, and particular attention was paid to the extent of site's contribution (if any) to measured levels. At each monitoring location, the site-only $L_{Aeq,15minute}$ and L_{Amax} were measured directly or determined by other methods detailed in Section 7.1 of the NPfI.

If the exact noise levels from site could not be established due to masking by other noise sources in a similar frequency range, but site noise was determined to be at least 5 dB lower than relevant limits, then a maximum estimate of site noise may be provided. This is expressed as a 'less than' quantity, such as <20 dB or <30 dB.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. When site noise is noted as NM, this means site noise was audible but could not be quantified. All results noted as NM in this report were due to one or more of the following:

- Site noise levels were extremely low and unlikely, in many cases, to be noticed.
- Site noise levels were masked by other more dominant noise sources that are characteristic of the environment, such as breeze in foliage or continuous road traffic noise, that cannot be eliminated by monitoring at an alternate or intermediate location.
- It was not feasible or reasonable to employ methods such as move closer and back calculate. Cases may include rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

For this assessment, the measured L_{Amax} has been used as a conservative estimate of $L_{A1,1minute}$. The EPA accepts sleep disturbance analysis based on either the $L_{A1,1minute}$ or L_{Amax} metrics, with the L_{Amax} representing a more conservative assessment of site noise emissions.

3.3 Meteorological data

As per Condition L4.4, this assessment determined the stability categories throughout the attended monitoring period using the direct measurement method as per Fact Sheet D of the Noise Policy for Industry (2017).

The temperature lapse rate between the two weather stations (M1 – Sentinex Unit 40 located in Camberwell Village and M2 – Ashton Coal 'repeater' meteorological station, the site AWS, located in the north-eastern open cut (NEOC) area) was calculated using the following formula:

$$\text{Temperature lapse rate} = (\Delta T) \times (100/(\Delta H))$$

Where:

- ΔT = temperature measured at M2 (at 10 metres above ground level) minus temperature measured at M1 (at 10 metres above ground level); and
- ΔH = the vertical height difference between M2 and M1 (equal to 73 metres).

3.4 Modifying factors

All measurements were evaluated for potential modifying factors in accordance with the NPfI. Assessment of modifying factors is undertaken at the time of measurement if the site was audible and directly quantifiable. If applicable, modifying factor penalties have been reported and added to measured site-only L_{Aeq} noise levels.

Low-frequency modifying factor penalties have only been applied to site-only L_{Aeq} levels if the site was the only contributing low-frequency noise source. Specific methodology for assessment of each modifying factor is outlined in Fact Sheet C of the NPfI.

3.5 Instrumentation

Equipment used to measure environmental noise levels is detailed in Table 3.1. Calibration certificates are provided in Appendix C.

Table 3.1 Attended noise monitoring equipment

Item	Serial number	Calibration due date	Relevant standard
Rion NA28 sound level meter	00370304	31/10/2024	IEC 61672-1:2002
Pulsar 105 calibrator	81334	29/11/2023	IEC 60942

4 Results

4.1 Total measured noise levels and atmospheric conditions

Overall noise levels measured at each location during attended measurements are provided in Table 4.1. Discussion as to the noise sources responsible for these measured levels is provided in Section 5 of this report.

Table 4.1 Total measured noise levels – February 2023[1]

Location	Start date	Time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB
N2	15/2/2023	22:45	58	54	52	49	48	45	41
N3	15/2/2023	22:23	56	48	45	43	43	40	36
N4	15/2/2023	22:00	50	47	46	44	43	41	38

Notes: 1. Levels in this table are not necessarily the result of activity at site.

Atmospheric condition data measured by the operator during each measurement using a hand-held weather meter is shown in Table 4.2. The wind speed, direction and temperature were measured at approximately 1.5 metres above ground. Attended noise monitoring is not done during rain, hail, or wind speeds above 5 m/s at microphone height.

Table 4.2 Measured atmospheric conditions – February 2023

Location	Start date	Time	Temperature °C	Wind speed m/s	Wind direction °Magnetic north[1]	Cloud cover 1/8s
N2	15/2/2023	22:45	20.2	0.7	165	0
N3	15/2/2023	22:23	20.6	1.1	150	0
N4	15/2/2023	22:00	21.2	2.4	130	0

Notes: 1. "-" indicates calm conditions at monitoring location.

4.2 Site only noise levels

4.2.1 Modifying factors

There were no modifying factors, as defined in the NPfI, applicable during the survey.

4.2.2 Monitoring results

Table 4.3 provides site noise levels in the absence of other sources, where possible, and includes weather data from the site AWS. Limits are applicable if weather conditions were within specified parameters during each measurement.

Table 4.3 Site noise levels and limits – February 2023

Location	Start Date	Time	Wind		Stability Class	Lapse rate	Limits apply? [1]	Limit, dB		Site level, dB [2]		Exceedance, dB	
			Speed m/s	Direction [4]				$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
N2	15/2/2023	22:45	2.5	149	E	1.2°C/100m VTG	Yes	36	46	IA	IA	Nil	Nil
N3	15/2/2023	22:23	2.4	143	E	1.1°C/100m VTG	Yes	36	46	IA	IA	Nil	Nil
N4	15/2/2023	22:00	2.8	128	E	-0.3°C/100m VTG	Yes	36	46	IA	IA	Nil	Nil

Notes:
1. Noise emission limits do not apply during periods of rainfall or winds greater than 3 metres per second (at a height of 10 metres).
2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties if applicable.
3. NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in project approval.
4. Degrees magnetic north, "-" indicates calm conditions.

5 Discussion

5.1 Noted noise sources

During attended monitoring, the time variations (temporal characteristics) of noise sources are considered in each measurement via statistical descriptors. From these observations, summaries have been derived for the location and provided in this chapter. Statistical 1/3 octave-band analysis of environmental noise was undertaken and the following figures display frequency ranges of various noise sources at each location for L_{A1}, L_{A10}, L_{Aeq}, L_{A50}, and L_{A90} descriptors. These figures also provide, graphically, statistical information for these noise levels.

An example is provided as Figure 5.1, where frogs and insects are seen to be generating noise at frequencies above 1000 Hz, while industrial noise is observed at frequencies less than 1000 Hz.

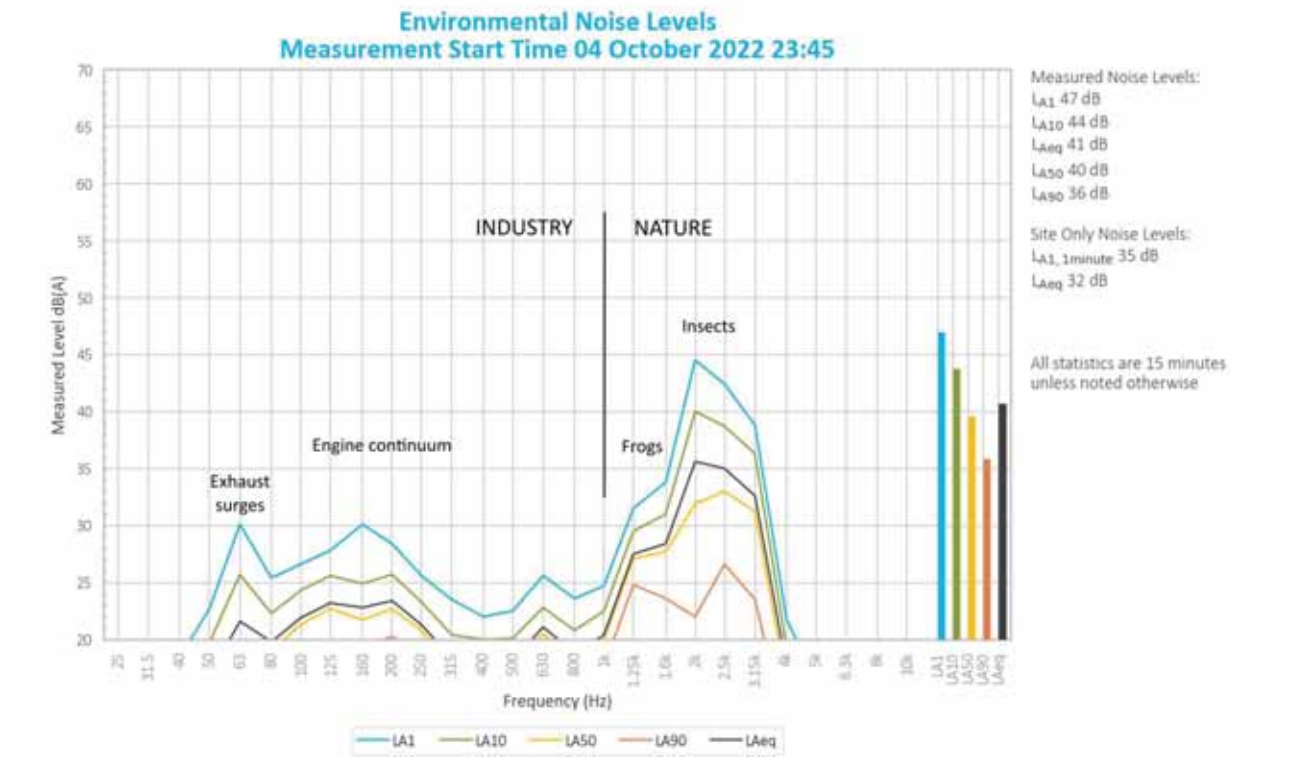

Figure 5.1 Example graph (refer to Section 5.1 for explanatory note)

5.2 N2

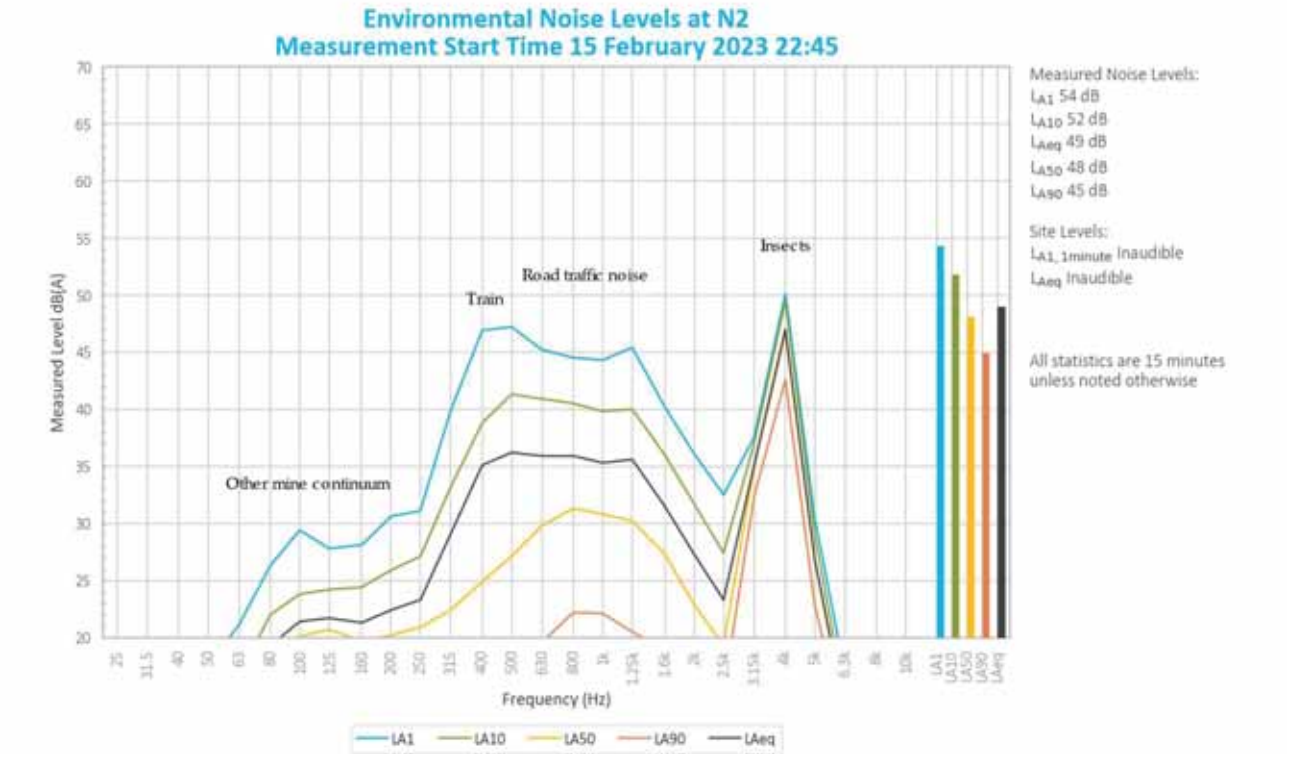

Figure 5.2 Environmental Noise Levels - NM2, Camberwell Village (West)

Ashton Coal operations were inaudible during the entire measurement.

Insects, road traffic noise, and a train generated the measured L_{A1} and L_{A10}. Insects were primarily responsible for the measured L_{A50}.and L_{Aeq} with a contribution from road traffic noise. Insects were primarily responsible for the measured L_{A90}.

Noise from wind in the trees, a train horn, and bats were also noted. Noise generated by other mines in the vicinity (unrelated to Ashton Coal) contributed < $L_{Aeq,15minute}$ 26 dB.

5.2.1 Cumulative mining noise at N2

Ashton Coal was inaudible and, therefore, did not contribute to any mining noise at this location.

5.3 N3

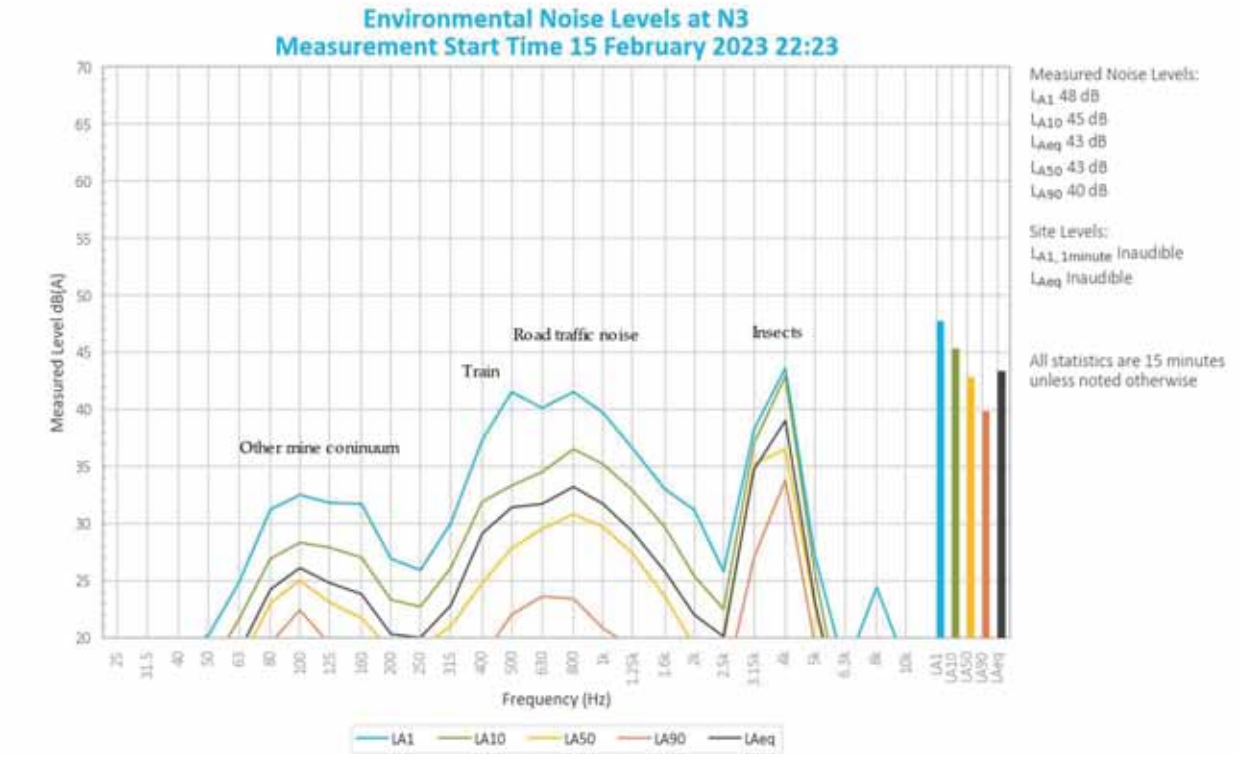

Figure 5.3 Environmental Noise Levels – N3, Camberwell Village (North-East)

Ashton Coal operations were inaudible during the entire measurement.

Insects, road traffic noise, and a train generated the measured L_{A1} and L_{A10}. Insects and road traffic noise were primarily responsible for the measured L_{A50}, and L_{Aeq} with a contribution from another mine continuum (unrelated to Ashton). Insects were primarily responsible for the measured L_{A90}.

Noise from a dog barking was also noted. Noise generated by other mines in the vicinity (unrelated to Ashton) contributed < $L_{Aeq,15minute}$ 34 dB.

5.3.1 Cumulative mining noise at N3

Ashton Coal was inaudible and, therefore, did not contribute to any mining noise at this location.

5.4 N4

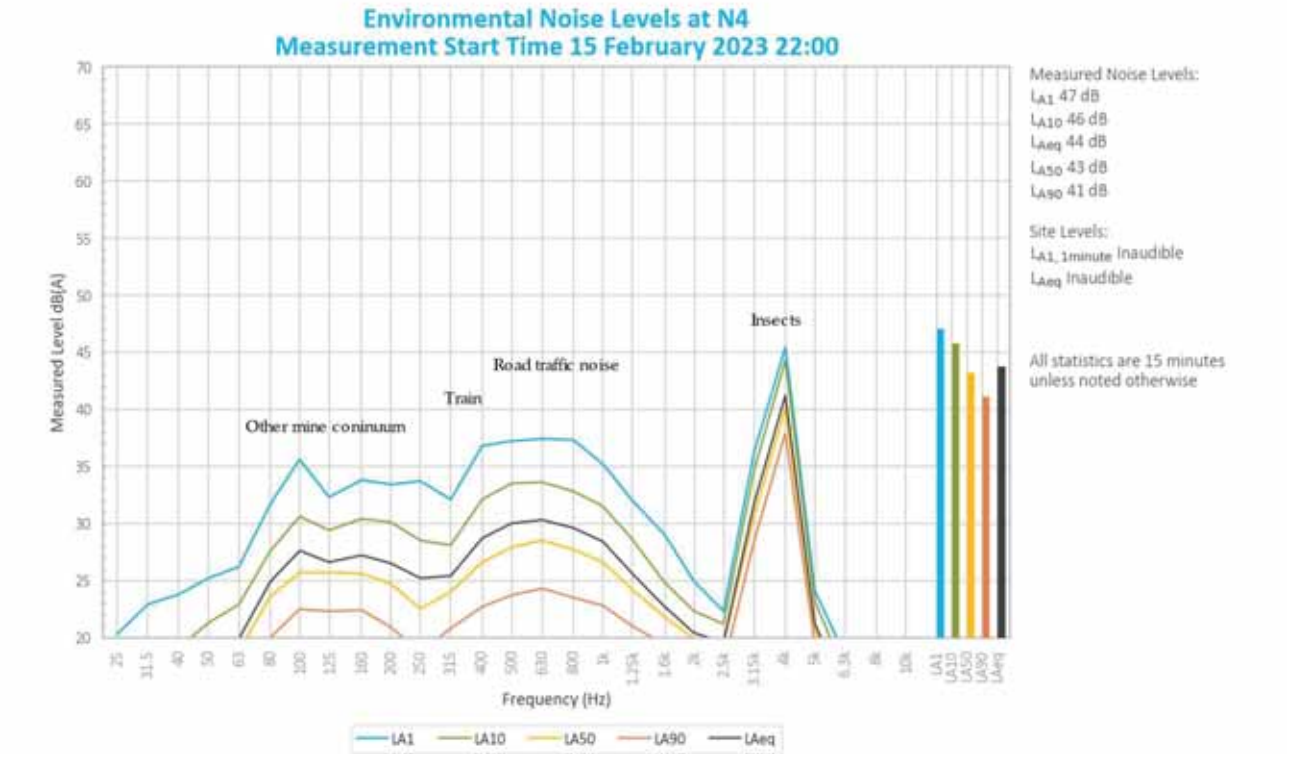

Figure 5.4 Environmental Noise Levels – N4, South of New England Highway

Ashton Coal operations were inaudible during the entire measurement.

Insects, road traffic noise, and a train generated the measured L_{A1} and L_{A10}. Insects were primarily responsible for the measured L_{A50}.and L_{Aeq} with a large contribution from road traffic noise, and a small contribution from trains and other mine continuum. Insects were primarily responsible for the measured L_{A90}.

Noise from wind in the trees, a train horn, and bats were also noted. Noise generated by other mines in the vicinity (not Ashton Coal) contributed < $L_{Aeq,15minute}$ 35 dB.

5.4.1 Cumulative mining noise at N4

Ashton Coal was inaudible and, therefore, did not contribute to any mining noise at this location.

6 Summary

EMM Consulting Pty Ltd (EMM) was engaged by Ashton Coal Operations Pty Ltd to conduct a monthly noise survey of operations at Ashton Coal. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified noise limits.

Attended environmental noise monitoring described in this report was done during the night period on Wednesday 15 February 2023 at three monitoring locations.

Noise levels from site complied with relevant limits at all monitoring locations during the February 2023 survey.

Appendix A

Noise perception and examples

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A.1 Noise levels

Table A.1 gives an indication as to how an average person perceives changes in noise level. Examples of common noise levels are provided in Figure A.1.

Table A.1 Perceived change in noise

Change in sound pressure level (dB)	Perceived change in noise
up to 2	Not perceptible
3	Just perceptible
5	Noticeable difference
10	Twice (or half) as loud
15	Large change
20	Four times (or quarter) as loud

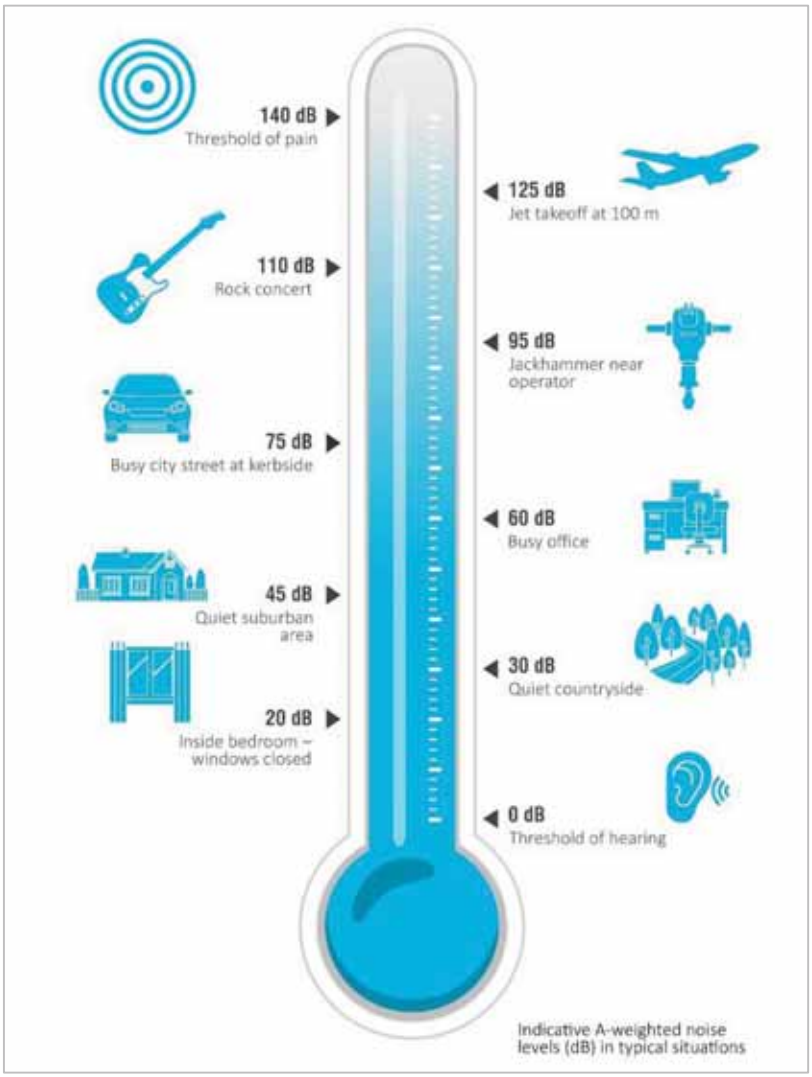

Figure A.1 Common noise levels

Appendix B
Regulator documents

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B.1 Project approval

APPENDIX 6

ALTERNATE NOISE CONDITIONS

NOISE

Application

1. Conditions 2 to 3 below have effect during times when open cut mining operations are not being undertaken at the Ashton Mine Complex, in the opinion of the Planning Secretary.

Noise Criteria

2. Except for the noise-affected land in Table 1 of Schedule 3, the Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 1 at any residence on privately-owned land or on more than 25 per cent of any privately-owned land.

Table 1: Noise Criteria dB(A)

Receiver No.	***Receiver***	***Day*** ($L_{Aeq\ (15min)}$)	***Evening*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{A1\ (1\ min)}$)
-	All privately-owned land	38	38	36	46

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy*. Appendix 8 sets out the requirements for evaluating compliance with these criteria.

However, these noise criteria do not apply if the Applicant has an agreement with the relevant owner/s of the residence/land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Additional Noise Mitigation Measures

3. Upon receiving a written request from the owner of any residence on any privately-owned land where subsequent operational noise monitoring shows the noise generated by the development exceeds the noise limits in Table 2, the Applicant must implement additional reasonable and feasible noise mitigation measures (such as double glazing, insulation, and/or air conditioning) at the residence in consultation with the owner.

If within 3 months of receiving this request from the landowner, the Applicant and the landowner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Planning Secretary for resolution.

Table 2: Additional Noise Mitigation Criteria dB(A) $L_{Aeq\ (15min)}$

Receiver No.	***Receiver***	***Day*** ($L_{Aeq\ (15min)}$)	***Evening*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{Aeq\ (15min)}$)
-	All privately-owned land	38	38	38

Notes:

- *Noise generated by the development is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 8 sets out the requirements for evaluating compliance with these criteria.*
- *For this condition to apply, the exceedance of the criteria must be systemic.*

APPENDIX 8

NOISE COMPLIANCE ASSESSMENT

Compliance Monitoring

1. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this approval.

2. Data collected for the purposes of determining compliance with the relevant conditions of this approval is to be excluded under the following meteorological conditions:
   a) during periods of rain or hail;
   b) average wind speed at microphone height exceeds 5 m/s;
   c) wind speeds greater than 3 m/s measures at 10 m above ground level; and
   d) temperature inversion conditions greater than 3°C/100m.

3. Unless otherwise agreed with the Planning Secretary, this monitoring is to be carried out in accordance with the relevant requirements relating for reviewing performance set out in the NSW Industrial Noise Policy (as amended from time to time), in particular the requirements relating to:
   a) monitoring locations for the collection of representative noise data;
   b) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
   c) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

4. To the extent that there is any inconsistency between the Industrial Noise Policy and the requirements set out in this Appendix, the Appendix prevails to the extent of the inconsistency.

Determination of Meteorological Conditions

5. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located in the vicinity of the site (as required by condition 18 of Schedule 3).

B.2 Environmental protection licence

14	Noise monitoring	Monitoring at coordinates 320297, 6405670 (Easting, Northing), identified as N2 on Figure 2 and representative of Noise Assessment Group 1.
15	Noise monitoring	Monitoring at coordinates 319776, 6404101 (Easting, Northing), identified as N4 on Figure 2 and representative of Noise Assessment Group 3.
32	Meteorological Station – to determine meteorological conditions for noise monitoring	Monitoring of temperature at 'M1' at coordinates 320259, 6405971 (Easting, Northing).

P1.5 For the purposes of Condition P1.1, P1.2 and P1.3, Figure 1 refers to the plan titled "Ashton Underground Mine Environment Protection licence 11879 Premises Boundary, Surface Infrastructure" dated 30/08/19 (EPA reference DOC19/761196).

P1.6 For the purpose of Condition P1.4, Figure 2 refers to the plan titled "Ashton Underground Mine Environment Protection licence 11879 Premises Boundary, Monitoring" dated 30/08/19 (EPA reference DOC19/761196).

P1.7 The datum for grid references in this Licence is the Geodetic Datum of Australia 1994 (GDA94), Zone 56.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

L2.1 Flares must be operated by the licensee such that there is no visible emission other than for a total period of no more than 5 minutes in any 2 hours, except for heat haze.

L3 Waste

L3.1 The licensee must not cause, permit or allow any waste to be received at the premises unless specified in this licence.

L3.2 The Licensee must not dispose of waste on the premises unless authorised by a condition of this Licence.

L4 Noise limits

L4.1 Noise from the premises must not exceed the noise limits specified in the table below.

Residences referenced in this table are from the consent DA 309-11-2001-i and summarised in the EPA

reference DOC19/761196.

Location	Day LAeq(15 minute)	Evening LAeq(15 minute)	Night LAeq(15 minute)	Night LAeq(1 minute)
EPA Point 13	38	38	36	46
EPA Point 14	38	38	36	46
EPA Point 15	38	38	36	46
All other privately owned residences	38	38	36	46

L4.2 For the purpose of Condition L4.1:
a) Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays,
b) Evening is defined as the period from 6pm to 10pm, and
c) Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays

L4.3 The noise emission limits identified in condition L4.1 apply under the following meteorological conditions:

a) wind speeds up to 3m/s at 10m above ground level; and
b) temperature inversion conditions up to 3 degrees C/100m.

L4.4 For the purposes of condition L4.1:

a) Data recorded by the closest and most representative meteorological station installed on the premises at EPA Identification Point 12 must be used to determine meteorological conditions; and
b) Temperature inversion conditions (stability category) are to be determined by the methods referred to in Fact Sheet D of the Noise Policy for Industry (2017) using EPA Identification Points 12 and 32.

4 Operating Conditions

O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.
This includes:
a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
a) must be maintained in a proper and efficient condition; and
b) must be operated in a proper and efficient manner.

B.3 Noise management plan

4.2 Applicable Criteria

Noise criteria for the ACP are divided into three categories:

- Impact assessment criteria;
- Additional noise mitigation criteria; and
- Cumulative noise acquisition criteria.

4.2.1 Impact Assessment Criteria

In accordance with Condition 2, Appendix 6 of the Development Consent and Condition L4.1 of EPL 11879, noise generated by the development must not exceed the limits specified in **Table 3**.

Table 3: Noise Impact Criteria dB(A)

Location	Day	Evening	Night	
	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{A1} (1 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	38	38	36	46

4.2.2 Additional Noise Mitigation Criteria

If noise emissions generated by the ACP exceed the criteria in **Table 4** at any residence on privately owned land, then, upon receiving a written request from the landowner, ACOL will implement additional reasonable and feasible noise mitigation measures (such as double glazing, insulation and/or air conditioning) at the residence in consultation with the owner.

Table 4: Additional Noise Mitigation Criteria dB(A)*

Location	Day	Evening	Night
	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	38	38	38

* Exceedance of the criteria must be systemic.

4.2.3 Cumulative Noise Acquisition Criteria

If noise emissions generated by the ACP and other mines exceed the criteria in **Table 5** at any residence on privately owned land or on more than 25 per cent of any privately-owned land (except for noise affected residential receivers in Condition 1, Schedule 3 of the Development Consent), then, upon receiving a written request for acquisition from the landowner, ACOL together with the relevant mines, will acquire the land in accordance with the Acquisition Process (as defined in Conditions 7 and 8, Schedule 4 of the Development Consent).

Table 5: Cumulative Noise Acquisition Criteria dB(A)

Location	Day	Evening	Night
	L_{Aeq} (period)	L_{Aeq} (period)	L_{Aeq} (period)
Camberwell Village	60	50	45
All other privately-owned land	55	50	45

4.3 Existing Environment

The ACP is located in the Hunter Valley region of New South Wales and is bound by the Main Northern Railway to the north, Hunter River to the south and Glennies Creek to the east with the New England Highway dividing the open cut from the underground mining areas.

Other mining operations in the area include the Ravensworth Complex, the Mount Owen Complex, Rix's Creek Open Cut, Integra Underground and Hunter Valley Operations. The approved Ashton SEOC project is located to the south east of the site (see Figure 1 for the Project location in relation to surrounding mining operations).

The closest sensitive receivers are located in Camberwell. There are currently 13 private landholdings in the local area, 11 of these have an occupied residence.

Ambient noise levels within the village of Camberwell are influenced by the New England Highway to the south, the railway line to the northeast and surrounding mining operations. Attended noise monitoring has confirmed that the major contributing noise source is usually the New England Highway. Noise from ACP has been noted at times in Camberwell Village, historical reports show this has been infrequent and at relatively low levels.

Based on the historical meteorological data collected by ACOL's M2 (repeater) weather station the most common winds in winter are from the west-northwest and the east-southeast in summer. Prevailing winds act to enhance noise from surrounding noise sources (road, rail and mining).

Appendix C
Calibration certificates

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Unit 36/14 Loyalty Rd
North Rocks NSW AUSTRALIA 2151
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Octave Band Filter
IEC 61260-3:2016
Calibration Certificate

Calibration Number C22699A

Client Details EMM Consulting
Level 3/175 Scott Street
Newcastle NSW 2300

Filter Model Number :	Rion NA-28
Filter Serial Number :	N/A
Instrument Serial Number :	00370304
Microphone Serial Number :	10421
Pre-amplifier Serial Number :	60313
Firmware Version :	2.0

Atmospheric Conditions

Ambient Temperature :	23.8°C
Relative Humidity :	47.8%
Barometric Pressure :	98.77kPa

Calibration Technician :	Lucky Jaiswal	**Secondary Check:**	Dhanush Bonu
Calibration Date :	31 Oct 2022	**Report Issue Date :**	31 Oct 2022

Approved Signatory : Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
Midband Relative Attenuation (Clause 10)	**Pass**	Operating Range Lower Limit (Clause 12)	**Pass**
Linearity, Range and Overload (Clause 11)	**Pass**	Relative Attenuation (Clause 13)	**Pass**

The filter submitted for testing successfully completed the periodic tests of IEC 61260-3, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the filter to the full specifications of IEC 61260-1:2014 because (a) evidence was not publicly available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of filter fully conformed to the class 1 specifications in IEC 61260-1:2014 and (b) because the periodic tests of IEC 61260-3 cover only a limited subset of the specifications in IEC 61260-1:2014.

Uncertainties of Measurement -

Electrical Tests		Environmental Conditions	
-5dB < ΔA(Ω) ≤ 40dB	*±0.12dB*	*Temperature*	*±0.1°C*
40dB < ΔA(Ω) ≤ 120dB	*±0.2dB*	*Relative Humidity*	*±1.9%*
		Barometric Pressure	*±0.014kPa*

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - Calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to SI units.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

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Sound Calibrator

IEC 60942:2017

Calibration Certificate

Calibration Number C21832

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : Pulsar Model 105
Instrument Serial Number : 81334

Atmospheric Conditions

Ambient Temperature : 25°C
Relative Humidity : 49.6%
Barometric Pressure : 100.8kPa

Calibration Technician : Lucky Jaiswal
Secondary Check: Harrison Kim
Calibration Date : 29 Nov 2021
Report Issue Date : 2 Dec 2021

Approved Signatory : Ken Williams

Characteristic Tested	Result
Generated Sound Pressure Level	*Pass*
Frequency Generated	*Pass*
Total Distortion	*Pass*

Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
94	1000	94.19	1000.30

The sound calibrator has been shown to conform to the class 2 requirements for periodic testing, described in Annex B of IEC 60942:2017 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	*±0.11dB*	*Temperature*	*±0.1°C*
Frequency	*±0.07%*	*Relative Humidity*	*±1.9%*
Distortion	*±0.50%*	*Barometric Pressure*	*±0.014kPa*

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - Calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to SI units.

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Appendix C

Monthly attended noise monitoring report – March 2023

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Ashton Coal

Monthly attended noise monitoring - March 2023

Prepared for Ashton Coal Operations Pty Ltd

March 2023

Ashton Coal

Monthly attended noise monitoring - March 2023

Ashton Coal Operations Pty Ltd

E221164 RP3

March 2023

Version	Date	Prepared by	Reviewed by	Comments
1	16 March 2023	Lucas Adamson	Najah Ishac	Draft
2	17 March 2023	Lucas Adamson	Najah Ishac	Final

Approved by

Najah Ishac
Director
17 March 2023

Level 3 175 Scott Street
Newcastle NSW 2300

TABLE OF CONTENTS

Appendices

Tables

Figures

1 Introduction

1.1 Background

EMM Consulting Pty Ltd (EMM) was engaged by Ashton Coal Operations Pty Ltd to conduct a monthly noise survey of operations at Ashton Coal Operations (Ashton Coal, the site) located at Glennies Creek Rd, Camberwell NSW. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified limits.

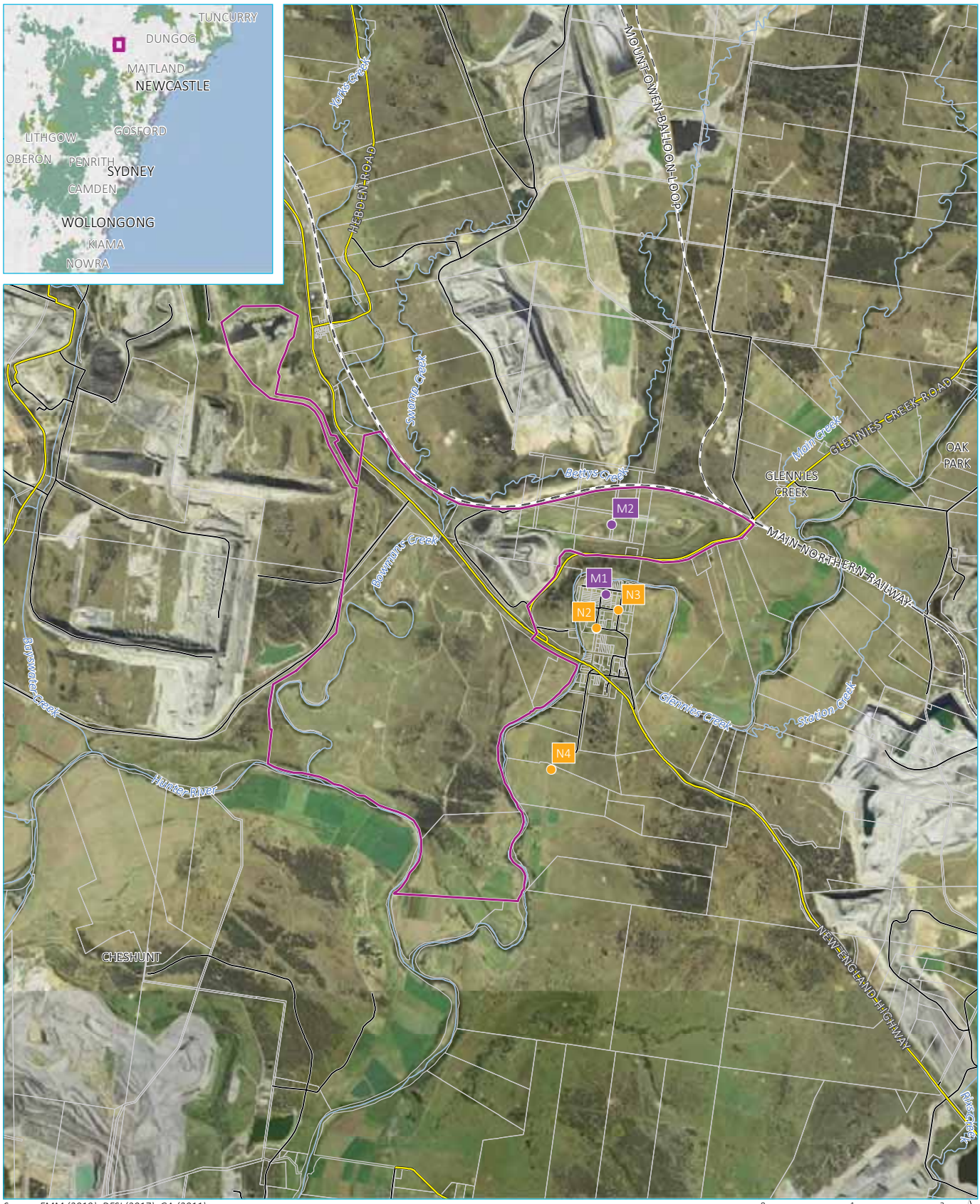
Attended environmental noise monitoring described in this report was conducted during the night period of Thursday 2 March 2023 at three monitoring locations.

1.2 Attended monitoring locations

Site monitoring locations are detailed in Table 1.1 and shown on Figure 1.1. It should be noted that Figure 1.1 shows actual monitoring positions, not necessarily the location of residences.

Table 1.1 Attended noise monitoring locations

Location descriptor/ID	Description/address	Coordinates (MGA56)	
		Easting	Northing
N2	Camberwell Village (west)	320297	6405670
N3	Camberwell Village (north-east)	320554	6405839
N4	South of New England Highway	319776	6404101



Source: EMM (2019); DFSI (2017); GA (2011)

0 1 2 km

GDA 1994 MGA Zone 56

N

\\emmsvr1\EMM\Jobs\2019\H190081 - Ashton Coal Noise Monitoring\8 GIS\02_Maps\N001_NoiseMonitoring_20190312_02.mxd 12/03/2019

KEY

- Site boundary
- Noise monitoring location
- Meteorological station
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Cadastral boundary

Noise monitoring locations and Ashton colliery boundary

Ashton Coal
Monthly attended noise monitoring
Figure 1.1

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1.3 Terminology and abbreviations

Some definitions of terms and abbreviations which may be used in this report are provided in Table 1.2.

Table 1.2 Terminology and abbreviations

Term/descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to approximate how humans hear noise.
L_{Amax}	The maximum root mean squared A-weighted noise level over a time period.
L_{A1}	The A-weighted noise level which is exceeded for 1 per cent of the time.
$L_{A1,1minute}$	The A-weighted noise level which is exceeded for 1 per cent of the specified time period of 1 minute.
L_{A10}	The A-weighted noise level which is exceeded for 10 percent of the time.
L_{Aeq}	The energy average A-weighted noise level.
L_{A50}	The A-weighted noise level which is exceeded for 50 per cent of the time, also the median noise level during a measurement period.
L_{A90}	The A-weighted noise level exceeded for 90 percent of the time, also referred to as the "background" noise level and commonly used to derive noise limits.
L_{Amin}	The minimum A-weighted noise level over a time period.
L_{Ceq}	The energy average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	Monday – Saturday: 7 am to 6 pm, on Sundays and Public Holidays: 8 am to 6 pm.
Evening	Monday – Saturday: 6 pm to 10 pm, on Sundays and Public Holidays: 6 pm to 10 pm.
Night	Monday – Saturday: 10 pm to 7 am, on Sundays and Public Holidays: 10 pm to 8 am.
Temperature inversion	A meteorological condition where the atmospheric temperature increases with altitude.

Appendix A provides further information that gives an indication as to how an average person perceives changes in noise level, and examples of common noise levels.

2 Noise limits

2.1 Development consent

Ashton Coal noise limits are provided in Table 1, Condition 2 of Appendix 6 of development consent 309-11-2001-I (DC). Relevant sections of the DC are reproduced in Appendix B.1.

2.2 Environment protection licence

Ashton Coal noise limits are provided in Condition L4.1 of EPL 11879 (EPL). Relevant sections of the EPL are reproduced in Appendix B.2.

2.3 Noise management plan

The approved NMP adopts three attended noise monitoring locations that are representative of residences outlined in the DC and EPL. Relevant sections of the NMP are reproduced in Appendix B.3.

2.4 Noise limits

Noise impact limits based on the NMP are as shown in Table 2.1.

Table 2.1 Noise impact limits, dB

Location	Day $L_{Aeq,15minute}$	Evening $L_{Aeq,15minute}$	Night $L_{Aeq,15minute}$	Night $L_{A1,1minute}$
N2	38	38	36	46
N3	38	38	36	46
N4	38	38	36	46

2.5 Meteorological conditions

The DC and the EPL specify the following meteorological conditions under which noise limits do not apply:

- during periods of rain or hail
- average wind speed at microphone height exceeds 5 metres per second (m/s)
- wind speeds greater than 3 m/s at 10 metres above ground level
- temperature inversion conditions greater than 3°C/100 m.

2.6 Additional requirements

Monitoring and reporting have been done in accordance with the NSW EPA 'Noise Policy for Industry' (NPfI) issued in October 2017 and the 'Approved methods for the measurement and analysis of environmental noise in NSW' (Approved Methods) issued in January 2022.

3 Methodology

3.1 Overview

Attended environmental noise monitoring was done in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant EPA requirements. Meteorological data was obtained from the Ashton Coal on-site weather station which allowed correlation of atmospheric parameters with measured noise levels.

3.2 Attended noise monitoring

During this survey, attended noise monitoring was conducted during the night period at each location. The duration of each measurement was 15 minutes. Atmospheric conditions were measured at each monitoring location.

Measured sound levels from various sources were noted during each measurement, and particular attention was paid to the extent of site's contribution (if any) to measured levels. At each monitoring location, the site-only $L_{Aeq,15minute}$ and L_{Amax} were measured directly or determined by other methods detailed in Section 7.1 of the NPfI.

If the exact noise levels from site could not be established due to masking by other noise sources in a similar frequency range, but site noise was determined to be at least 5 dB lower than relevant limits, then a maximum estimate of site noise may be provided. This is expressed as a 'less than' quantity, such as <20 dB or <30 dB.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. When site noise is noted as NM, this means site noise was audible but could not be quantified. All results noted as NM in this report were due to one or more of the following:

- Site noise levels were extremely low and unlikely, in many cases, to be noticed.
- Site noise levels were masked by other more dominant noise sources that are characteristic of the environment, such as breeze in foliage or continuous road traffic noise, that cannot be eliminated by monitoring at an alternate or intermediate location.
- It was not feasible or reasonable to employ methods such as move closer and back calculate. Cases may include rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

For this assessment, the measured L_{Amax} has been used as a conservative estimate of $L_{A1,1minute}$. The EPA accepts sleep disturbance analysis based on either the $L_{A1,1minute}$ or L_{Amax} metrics, with the L_{Amax} representing a more conservative assessment of site noise emissions.

3.3 Meteorological data

As per Condition L4.4, this assessment determined the stability categories throughout the attended monitoring period using the sigma-theta method as per Fact Sheet D of the Noise Policy for Industry (2017).

3.4 Modifying factors

All measurements were evaluated for potential modifying factors in accordance with the NPfI. Assessment of modifying factors is undertaken at the time of measurement if the site was audible and directly quantifiable. If applicable, modifying factor penalties have been reported and added to measured site-only L_{Aeq} noise levels.

Low-frequency modifying factor penalties have only been applied to site-only L_{Aeq} levels if the site was the only contributing low-frequency noise source. Specific methodology for assessment of each modifying factor is outlined in Fact Sheet C of the NPfI.

3.5 Instrumentation

Equipment used to measure environmental noise levels is detailed in Table 3.1. Calibration certificates are provided in Appendix C.

Table 3.1 Attended noise monitoring equipment

Item	Serial number	Calibration due date	Relevant standard
B&K 2250 sound level meter	3029363	3/11/2024	IEC 61672-1:2002
Svantek SV-36 calibrator	86311	17/10/2023	IEC 60942

4 Results

4.1 Total measured noise levels and atmospheric conditions

Overall noise levels measured at each location during attended measurements are provided in Table 4.1. Discussion as to the noise sources responsible for these measured levels is provided in Section 5 of this report.

Table 4.1 Total measured noise levels – March 2023[1]

Location	Start date	Time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB
N2	2/03/2023	22:19	57	53	49	46	44	41	38
N3	2/03/2023	22:39	55	49	45	43	42	40	37
N4	2/03/2023	23:01	54	51	49	48	48	44	39

Notes: 1. Levels in this table are not necessarily the result of activity at site.

Atmospheric condition data measured by the operator during each measurement using a hand-held weather meter is shown in Table 4.2. The wind speed, direction and temperature were measured at approximately 1.5 metres above ground. Attended noise monitoring is not done during rain, hail, or wind speeds above 5 m/s at microphone height.

Table 4.2 Measured at microphone atmospheric conditions – March 2023

Location	Date	Time	Temperature °C	Wind speed m/s	Wind direction °Magnetic north	Cloud cover 1/8s
N2	2/03/2023	22:19	20.5	0.3	110	0
N3	2/03/2023	22:39	20.4	0	0	0
N4	2/03/2023	23:01	19.8	0.2	190	0

4.2 Site only noise levels

4.2.1 Modifying factors

There were no modifying factors, as defined in the NPfI, applicable during the survey.

4.2.2 Monitoring results

Table 4.3 provides site noise levels in the absence of other sources, where possible, and includes weather data from the site AWS. Limits are applicable if weather conditions were within specified parameters during each measurement.

Table 4.3 Site noise levels and limits – March 2023

Location	Start Date	Time	Wind		Stability Class	Limits apply? [1]	Limit, dB		Site level, dB [2]		Exceedance, dB	
			Speed m/s	Direction [4]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
N2	2/03/2023	22:19	2.1	141^0	E	Yes	36	46	IA	IA	Nil	Nil
N3	2/03/2023	22:39	2.0	157^0	E	Yes	36	46	IA	IA	Nil	Nil
N4	2/03/2023	23:01	2.2	151^0	E	Yes	36	46	IA	IA	Nil	Nil

Notes:
1. Noise emission limits do not apply during periods of rainfall or winds greater than 3 metres per second (at a height of 10 metres).
2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties if applicable.
3. NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in project approval.
4. Degrees magnetic north, "-" indicates calm conditions.
5. IA in site level column means that the site was deemed inaudible at that location.

5 Discussion

5.1 Noted noise sources

During attended monitoring, the time variations (temporal characteristics) of noise sources are considered in each measurement via statistical descriptors. From these observations, summaries have been derived for the location and provided in this chapter. Statistical 1/3 octave-band analysis of environmental noise was undertaken and the following figures display frequency ranges of various noise sources at each location for L_{A1}, L_{A10}, L_{Aeq}, L_{A50}, and L_{A90} descriptors. These figures also provide, graphically, statistical information for these noise levels.

An example is provided as Figure 5.1, where frogs and insects are seen to be generating noise at frequencies above 1000 Hz, while industrial noise is observed at frequencies less than 1000 Hz.

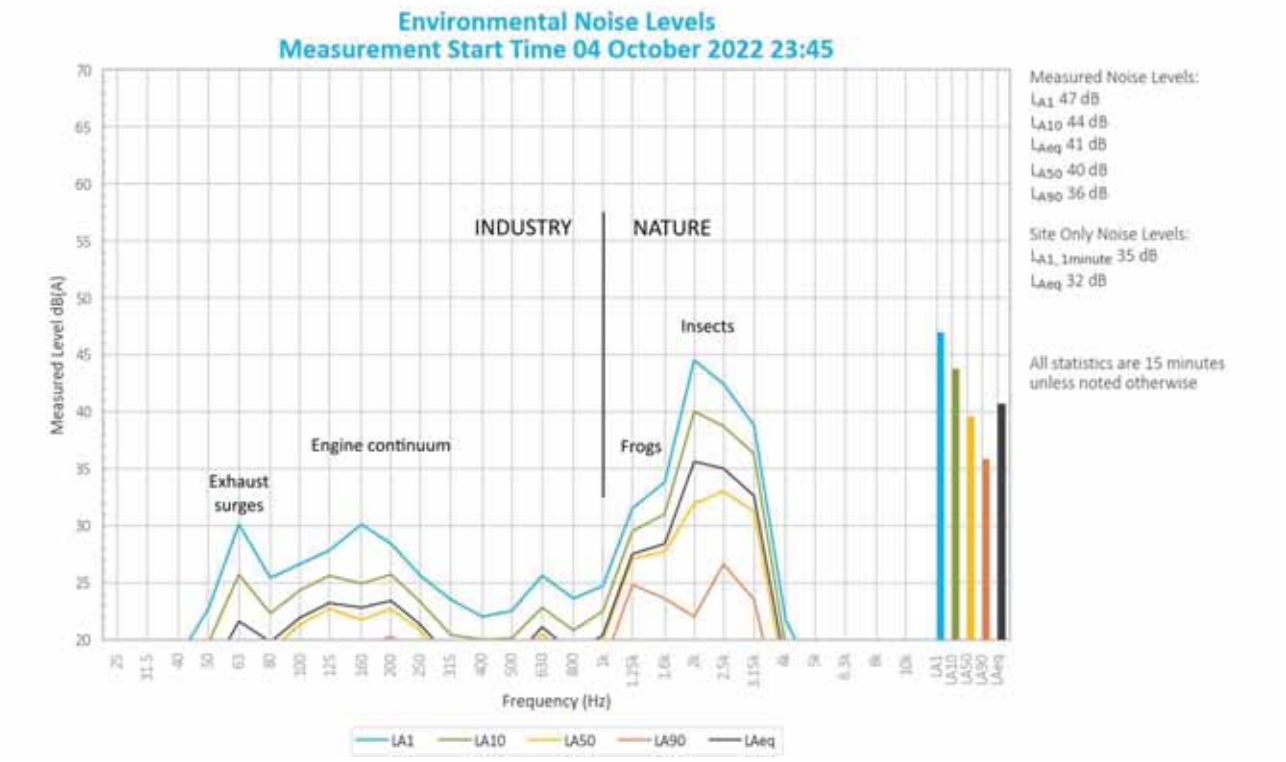

Figure 5.1 Example graph

5.2 N2

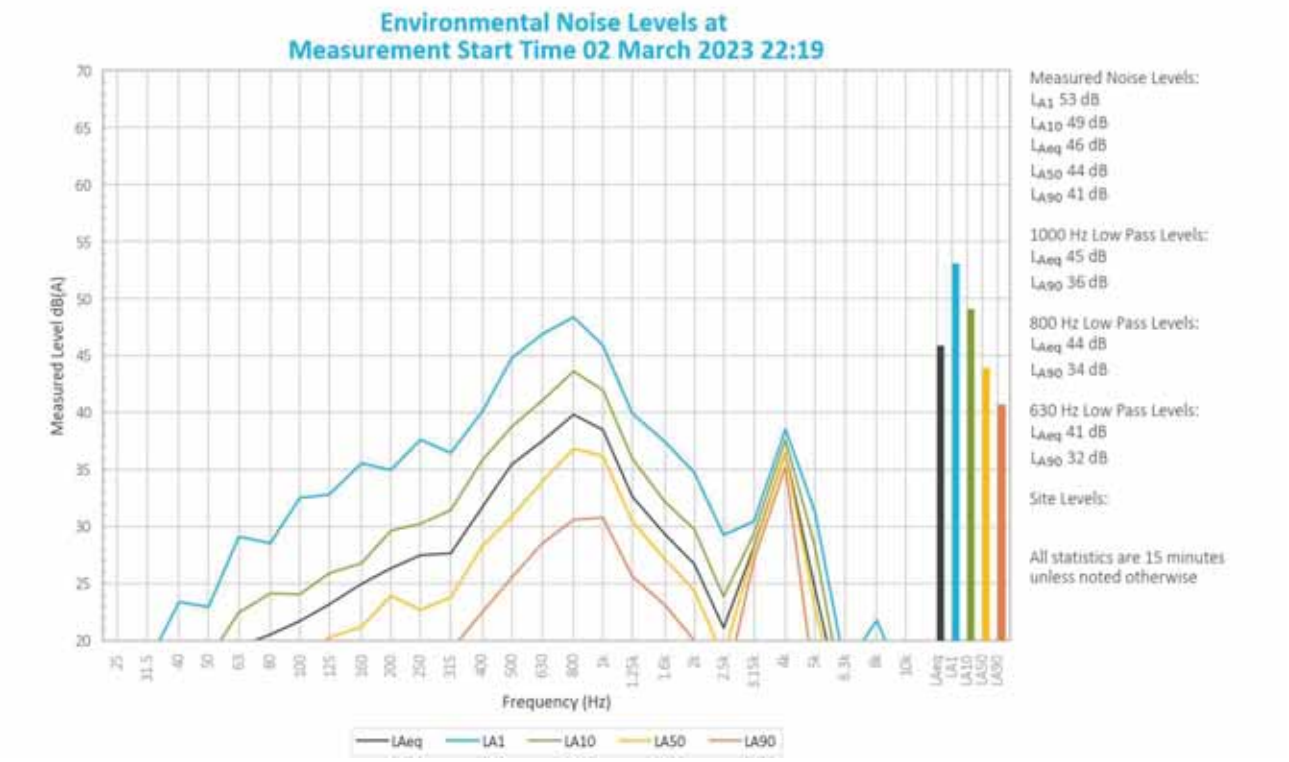

Figure 5.2 Environmental Noise Levels - NM2, Camberwell Village (West)

Ashton Coal operations were inaudible during the entire measurement. Typically, when this type of noise source is not audible above ambient (not withstanding insect noise and other sources of varied character), the likely level of that source is at least 10 dB below the measured background (L_{A90}) level. Given this, and the measured background noise level of 41 dB L_{A90}, the Ashton Coal $L_{Aeq,15\ minute}$ was estimated to be <31 dB $L_{Aeq,15\ minute}$ and therefore below the relevant noise limit. Ashton Coal noise contributions complied with the DC and EPL noise limits.

Road traffic noise and trains (unrelated to Ashton Coal) dominated the measured L_{A1} and L_{A10}. Insects and road traffic noise were primarily responsible for the measured L_{A50}.and L_{Aeq}. Insects were primarily responsible for the measured L_{A90}.

Noise from birds and dogs barking were also noted. No noise from other mines in the vicinity was noted.

5.2.1 Cumulative mining noise at N2

Ashton Coal was inaudible and, therefore, did not contribute to any mining noise at this location.

5.3 N3

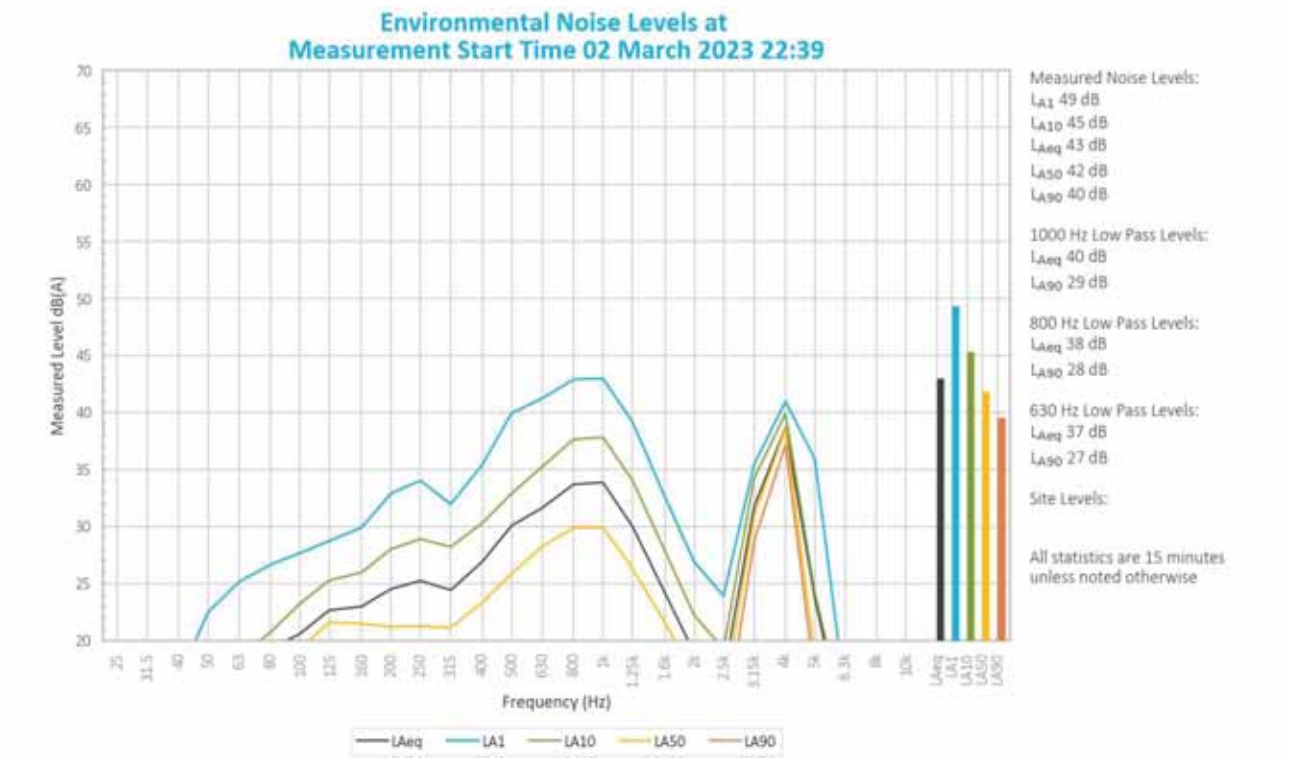

Figure 5.3 Environmental Noise Levels – N3, Camberwell Village (North-East)

Ashton Coal operations were inaudible during the entire measurement. Typically, when this type of noise source is not audible above ambient (not withstanding insect noise and other sources of varied character), the likely level of that source is at least 10 dB below the measured background (L_{A90}) level. Given this, and the measured background noise level of 40 dB L_{A90}, the Ashton Coal $L_{Aeq,15\ minute}$ was estimated to be <30 dB $L_{Aeq,15\ minute}$ and therefore below the relevant noise limit. Ashton Coal noise contributions complied with the DC and EPL noise limits.

Road traffic noise, and trains (unrelated to Ashton Coal) dominated the measured L_{A1} and L_{A10}. Insects and road traffic noise were primarily responsible for the measured L_{A50}, and L_{Aeq} with a contribution generated by other mines in the vicinity. Insects were primarily responsible for the measured L_{A90}.

Noise from possums, birds and a dog barking were also noted. Noise generated by other mines in the vicinity (unrelated to Ashton) contributed less than $L_{Aeq,15minute}$ 28 dB.

5.3.1 Cumulative mining noise at N3

Ashton Coal was inaudible and, therefore, did not contribute to any mining noise at this location.

5.4 N4

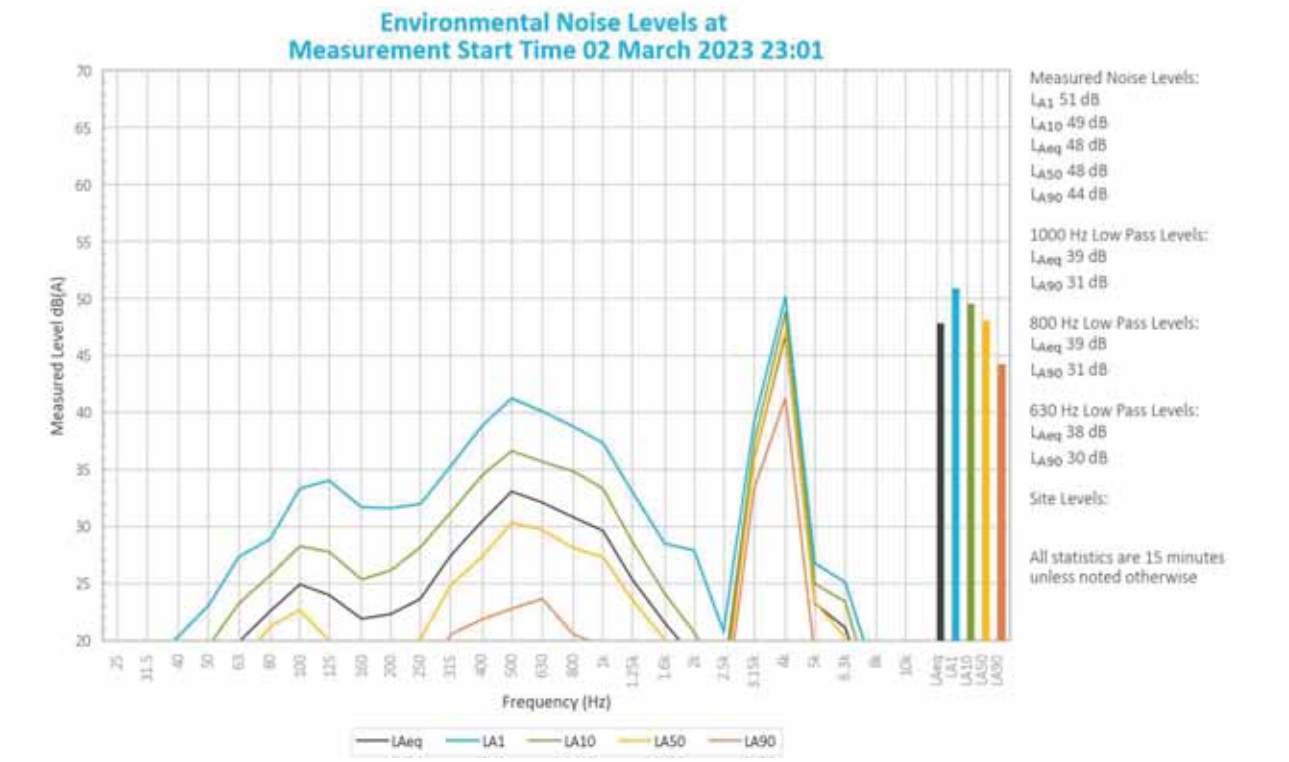

Figure 5.4 Environmental Noise Levels – N4, South of New England Highway

Ashton Coal operations were inaudible during the entire measurement. Typically, when this type of noise source is not audible above ambient (not withstanding insect noise and other sources of varied character), the likely level of that source is at least 10 dB below the measured background (L_{A90}) level. Given this, and the measured background noise level of 44 dB L_{A90}, the Ashton Coal $L_{Aeq,15\ minute}$ was estimated to be <34 dB $L_{Aeq,15\ minute}$ and therefore below the relevant noise limit. Ashton Coal noise contributions complied with the DC and EPL noise limits.

Insects, road traffic noise, and a train dominated the measured L_{A1} and L_{A10}. Insects were primarily responsible for the measured L_{A50}.and L_{Aeq} with contributions from road traffic and train noise. Insects were primarily responsible for the measured L_{A90}.

Noise from frogs and livestock were also noted. Noise generated by other mines in the vicinity () was only briefly audible and was not considered measurable.

5.4.1 Cumulative mining noise at N4

Ashton Coal was inaudible and, therefore, did not contribute to any mining noise at this location.

6 Summary

EMM Consulting Pty Ltd (EMM) was engaged by Ashton Coal Operations Pty Ltd to conduct a monthly noise survey of operations at Ashton Coal. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified noise limits.

Attended environmental noise monitoring described in this report was done during the night period on Thursday 2 March 2023 at three monitoring locations.

Noise levels from site complied with relevant limits at all monitoring locations during the March 2023 survey.

Appendix A

Noise perception and examples

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A.1 Noise levels

Table A.1 gives an indication as to how an average person perceives changes in noise level. Examples of common noise levels are provided in Figure A.1.

Table A.1 Perceived change in noise

Change in sound pressure level (dB)	Perceived change in noise
up to 2	Not perceptible
3	Just perceptible
5	Noticeable difference
10	Twice (or half) as loud
15	Large change
20	Four times (or quarter) as loud

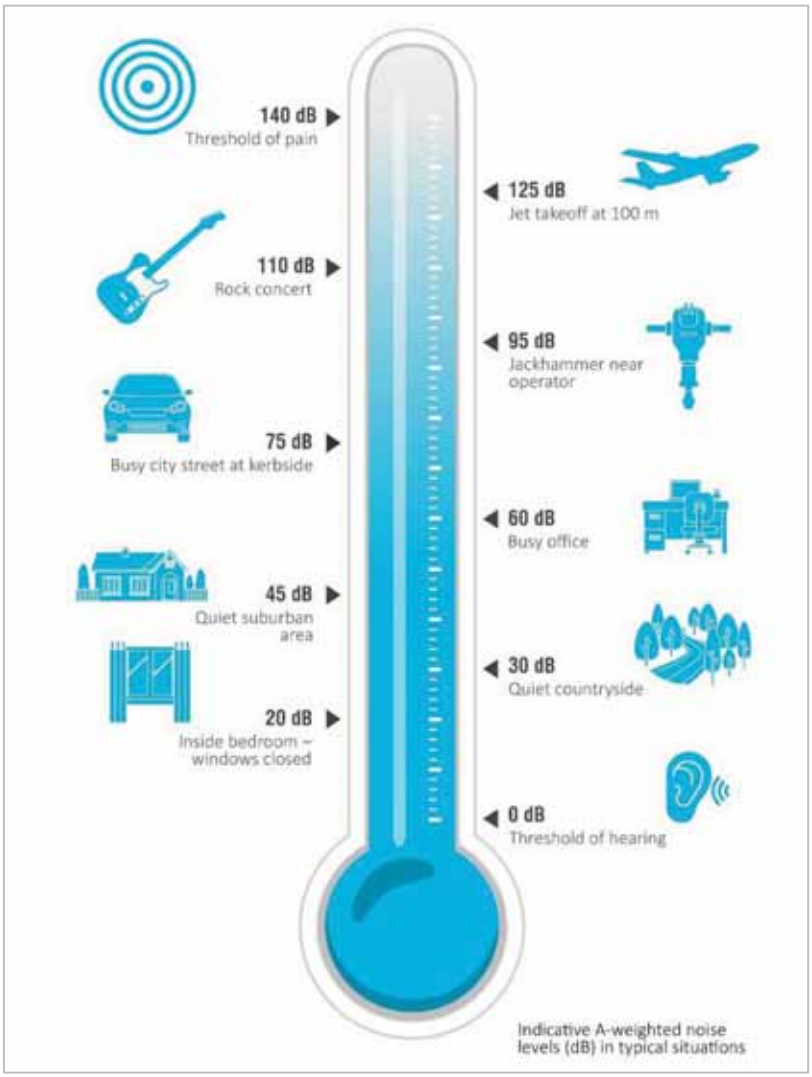

Figure A.1 Common noise levels

Appendix B
Regulator documents

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B.1 Project approval

APPENDIX 6

ALTERNATE NOISE CONDITIONS

NOISE

Application

1. Conditions 2 to 3 below have effect during times when open cut mining operations are not being undertaken at the Ashton Mine Complex, in the opinion of the Planning Secretary.

Noise Criteria

2. Except for the noise-affected land in Table 1 of Schedule 3, the Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 1 at any residence on privately-owned land or on more than 25 per cent of any privately-owned land.

Table 1: Noise Criteria dB(A)

Receiver No.	***Receiver***	***Day*** ($L_{Aeq\ (15min)}$)	***Evening*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{A1\ (1\ min)}$)
-	All privately-owned land	38	38	36	46

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy*. Appendix 8 sets out the requirements for evaluating compliance with these criteria.

However, these noise criteria do not apply if the Applicant has an agreement with the relevant owner/s of the residence/land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Additional Noise Mitigation Measures

3. Upon receiving a written request from the owner of any residence on any privately-owned land where subsequent operational noise monitoring shows the noise generated by the development exceeds the noise limits in Table 2, the Applicant must implement additional reasonable and feasible noise mitigation measures (such as double glazing, insulation, and/or air conditioning) at the residence in consultation with the owner.

If within 3 months of receiving this request from the landowner, the Applicant and the landowner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Planning Secretary for resolution.

Table 2: Additional Noise Mitigation Criteria dB(A) $L_{Aeq\ (15min)}$

Receiver No.	***Receiver***	***Day*** ($L_{Aeq\ (15min)}$)	***Evening*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{Aeq\ (15min)}$)
-	All privately-owned land	38	38	38

Notes:

- *Noise generated by the development is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 8 sets out the requirements for evaluating compliance with these criteria.*
- *For this condition to apply, the exceedance of the criteria must be systemic.*

APPENDIX 8

NOISE COMPLIANCE ASSESSMENT

Compliance Monitoring

1. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this approval.

2. Data collected for the purposes of determining compliance with the relevant conditions of this approval is to be excluded under the following meteorological conditions:
   a) during periods of rain or hail;
   b) average wind speed at microphone height exceeds 5 m/s;
   c) wind speeds greater than 3 m/s measures at 10 m above ground level; and
   d) temperature inversion conditions greater than 3°C/100m.

3. Unless otherwise agreed with the Planning Secretary, this monitoring is to be carried out in accordance with the relevant requirements relating for reviewing performance set out in the NSW Industrial Noise Policy (as amended from time to time), in particular the requirements relating to:
   a) monitoring locations for the collection of representative noise data;
   b) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
   c) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

4. To the extent that there is any inconsistency between the Industrial Noise Policy and the requirements set out in this Appendix, the Appendix prevails to the extent of the inconsistency.

Determination of Meteorological Conditions

5. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located in the vicinity of the site (as required by condition 18 of Schedule 3).

B.2 Environmental protection licence

14	Noise monitoring	Monitoring at coordinates 320297, 6405670 (Easting, Northing), identified as N2 on Figure 2 and representative of Noise Assessment Group 1.
15	Noise monitoring	Monitoring at coordinates 319776, 6404101 (Easting, Northing), identified as N4 on Figure 2 and representative of Noise Assessment Group 3.
32	Meteorological Station – to determine meteorological conditions for noise monitoring	Monitoring of temperature at 'M1' at coordinates 320259, 6405971 (Easting, Northing).

P1.5 For the purposes of Condition P1.1, P1.2 and P1.3, Figure 1 refers to the plan titled "Ashton Underground Mine Environment Protection licence 11879 Premises Boundary, Surface Infrastructure" dated 30/08/19 (EPA reference DOC19/761196).

P1.6 For the purpose of Condition P1.4, Figure 2 refers to the plan titled "Ashton Underground Mine Environment Protection licence 11879 Premises Boundary, Monitoring" dated 30/08/19 (EPA reference DOC19/761196).

P1.7 The datum for grid references in this Licence is the Geodetic Datum of Australia 1994 (GDA94), Zone 56.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

L2.1 Flares must be operated by the licensee such that there is no visible emission other than for a total period of no more than 5 minutes in any 2 hours, except for heat haze.

L3 Waste

L3.1 The licensee must not cause, permit or allow any waste to be received at the premises unless specified in this licence.

L3.2 The Licensee must not dispose of waste on the premises unless authorised by a condition of this Licence.

L4 Noise limits

L4.1 Noise from the premises must not exceed the noise limits specified in the table below.

Residences referenced in this table are from the consent DA 309-11-2001-i and summarised in the EPA

reference DOC19/761196.

Location	Day LAeq(15 minute)	Evening LAeq(15 minute)	Night LAeq(15 minute)	Night LAeq(1 minute)
EPA Point 13	38	38	36	46
EPA Point 14	38	38	36	46
EPA Point 15	38	38	36	46
All other privately owned residences	38	38	36	46

L4.2 For the purpose of Condition L4.1:
a) Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays,
b) Evening is defined as the period from 6pm to 10pm, and
c) Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays

L4.3 The noise emission limits identified in condition L4.1 apply under the following meteorological conditions:

a) wind speeds up to 3m/s at 10m above ground level; and
b) temperature inversion conditions up to 3 degrees C/100m.

L4.4 For the purposes of condition L4.1:

a) Data recorded by the closest and most representative meteorological station installed on the premises at EPA Identification Point 12 must be used to determine meteorological conditions; and
b) Temperature inversion conditions (stability category) are to be determined by the methods referred to in Fact Sheet D of the Noise Policy for Industry (2017) using EPA Identification Points 12 and 32.

4 Operating Conditions

O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.
This includes:
a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
a) must be maintained in a proper and efficient condition; and
b) must be operated in a proper and efficient manner.

B.3 Noise management plan

4.2 Applicable Criteria

Noise criteria for the ACP are divided into three categories:

- Impact assessment criteria;
- Additional noise mitigation criteria; and
- Cumulative noise acquisition criteria.

4.2.1 Impact Assessment Criteria

In accordance with Condition 2, Appendix 6 of the Development Consent and Condition L4.1 of EPL 11879, noise generated by the development must not exceed the limits specified in **Table 3**.

Table 3: Noise Impact Criteria dB(A)

Location	Day	Evening	Night	
	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{A1} (1 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	38	38	36	46

4.2.2 Additional Noise Mitigation Criteria

If noise emissions generated by the ACP exceed the criteria in **Table 4** at any residence on privately owned land, then, upon receiving a written request from the landowner, ACOL will implement additional reasonable and feasible noise mitigation measures (such as double glazing, insulation and/or air conditioning) at the residence in consultation with the owner.

Table 4: Additional Noise Mitigation Criteria dB(A)*

Location	Day	Evening	Night
	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	38	38	38

* Exceedance of the criteria must be systemic.

4.2.3 Cumulative Noise Acquisition Criteria

If noise emissions generated by the ACP and other mines exceed the criteria in **Table 5** at any residence on privately owned land or on more than 25 per cent of any privately-owned land (except for noise affected residential receivers in Condition 1, Schedule 3 of the Development Consent), then, upon receiving a written request for acquisition from the landowner, ACOL together with the relevant mines, will acquire the land in accordance with the Acquisition Process (as defined in Conditions 7 and 8, Schedule 4 of the Development Consent).

Table 5: Cumulative Noise Acquisition Criteria dB(A)

Location	Day	Evening	Night
	L_{Aeq} (period)	L_{Aeq} (period)	L_{Aeq} (period)
Camberwell Village	60	50	45
All other privately-owned land	55	50	45

4.3 Existing Environment

The ACP is located in the Hunter Valley region of New South Wales and is bound by the Main Northern Railway to the north, Hunter River to the south and Glennies Creek to the east with the New England Highway dividing the open cut from the underground mining areas.

Other mining operations in the area include the Ravensworth Complex, the Mount Owen Complex, Rix's Creek Open Cut, Integra Underground and Hunter Valley Operations. The approved Ashton SEOC project is located to the south east of the site (see Figure 1 for the Project location in relation to surrounding mining operations).

The closest sensitive receivers are located in Camberwell. There are currently 13 private landholdings in the local area, 11 of these have an occupied residence.

Ambient noise levels within the village of Camberwell are influenced by the New England Highway to the south, the railway line to the northeast and surrounding mining operations. Attended noise monitoring has confirmed that the major contributing noise source is usually the New England Highway. Noise from ACP has been noted at times in Camberwell Village, historical reports show this has been infrequent and at relatively low levels.

Based on the historical meteorological data collected by ACOL's M2 (repeater) weather station the most common winds in winter are from the west-northwest and the east-southeast in summer. Prevailing winds act to enhance noise from surrounding noise sources (road, rail and mining).

Appendix C
Calibration certificates

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM34169

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	B & K		
Type No:	2250	**Serial No:**	3029363
Mic. Type:	4189	**Serial No:**	3260501
Pre-Amp. Type:	ZC0032	**Serial No:**	30109
Filter Type:	1/3 Octave	**Test No:**	F034175

Owner: EMM Consulting
Suite 01, 20 Chandos St
St Leonards NSW 2065

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	1002	hPa ±1 hPa	**Date of Receipt :**	02/11/2022
Temperature	24	°C ±1° C	**Date of Calibration :**	03/11/2022
Relative Humidity	35	% ±5%	**Date of Issue :**	04/11/2022

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

Jack Kielt

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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Head Office & Calibration Laboratory
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
(02) 9680 8133
www.acu-vib.com.au

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C34022

EQUIPMENT TESTED : Sound Level Calibrator

Manufacturer: Svantek
Type No: SV-36 **Serial No:** 86311
Owner: EMM Consulting
Suite 01, 20 Chandos St
St Leonards NSW 2065
Tests Performed: Measured Output Pressure level, Frequency & Distortion
Comments: See Details overleaf. All Test Passed.

Parameter	Pre-Adj	Adj Y/N	Output: (dB re 20 µPa)	Frequency (Hz)	THD&N (%)
Level1:	NA	N	94.01 dB	1000.00 Hz	2.00 %
Level2:	NA	N	113.92 dB	1000.00 Hz	0.35 %
Uncertainty			±0.11 dB	±0.05%	±0.20 %
Uncertainty (at 95% c.l.) k=2					

CONDITION OF TEST:

Ambient Pressure	1013	hPa ±1 hPa	**Date of Receipt :**	17/10/2022
Temperature	22	°C ±1° C	**Date of Calibration :**	17/10/2022
Relative Humidity	56	% ±5%	**Date of Issue :**	17/10/2022

Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2017

CHECKED BY: .....

AUTHORISED SIGNATURE: .....

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Appendix D

Monthly attended noise monitoring report – April 2023

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Ashton Coal

Monthly attended noise monitoring - April 2023

Prepared for Ashton Coal Operations Pty Ltd

May 2023

Ashton Coal

Monthly attended noise monitoring - April 2023

Ashton Coal Operations Pty Ltd

E221164 RP4

April 2023

Version	Date	Prepared by	Reviewed by	Comments
1	27 April 2023	Lucas Adamson	Tony Welbourne	Draft
2	3 May 2023	Lucas Adamson	Tony Welbourne	Revised draft
3	3 May 2023	Lucas Adamson	Tony Welbourne	Final

Approved by

Tony Welbourne
Associate Director
3 May 2023

Level 3 175 Scott Street
Newcastle NSW 2300

TABLE OF CONTENTS

Appendices

Tables

Figures

1 Introduction

1.1 Background

EMM Consulting Pty Ltd (EMM) was engaged by Ashton Coal Operations Pty Ltd to conduct a monthly noise survey of operations at Ashton Coal Operations (Ashton Coal, the site) located at Glennies Creek Rd, Camberwell NSW. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified limits.

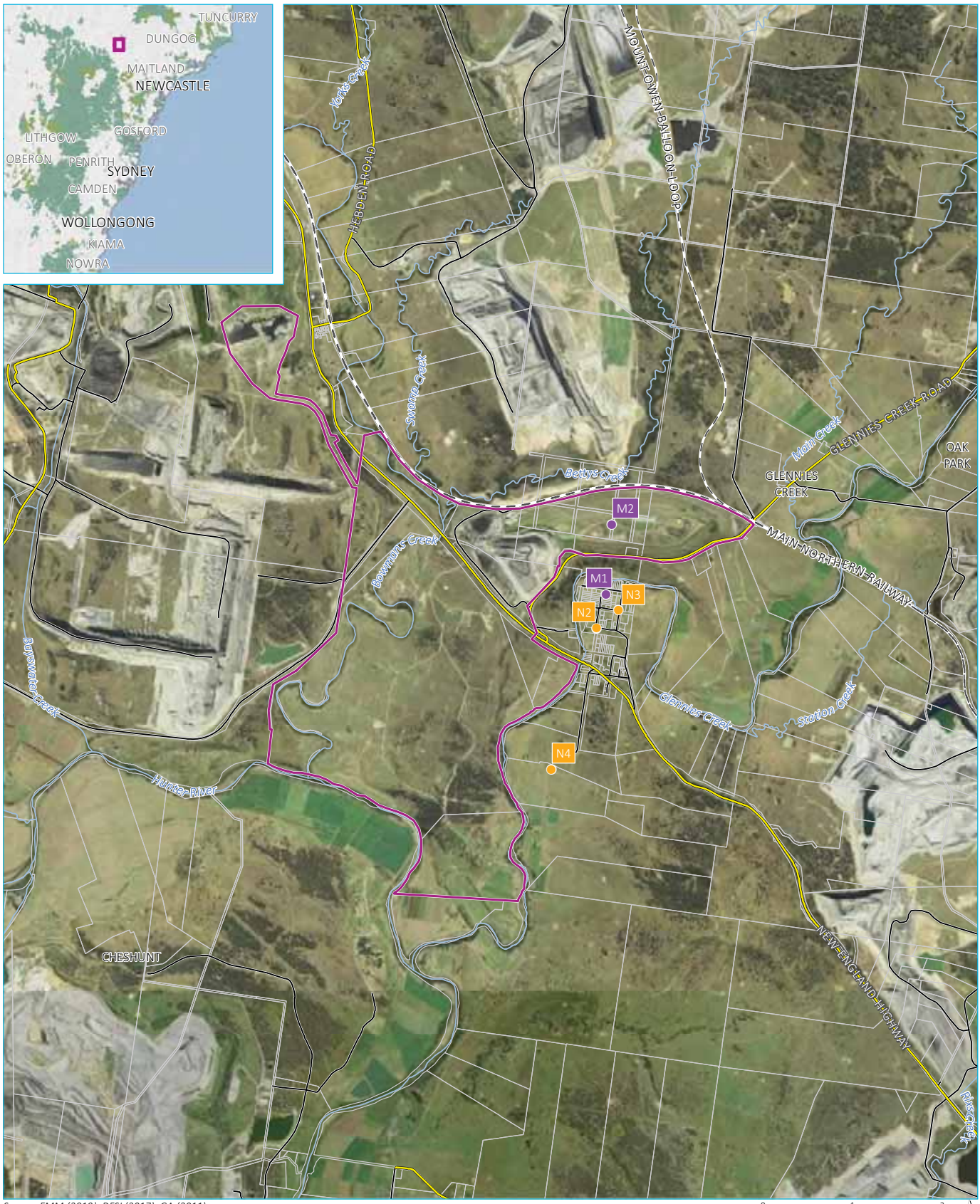
Attended environmental noise monitoring described in this report was conducted during the night period of Tuesday 11 April 2023 at three monitoring locations.

1.2 Attended monitoring locations

Site monitoring locations are detailed in Table 1.1 and shown on Figure 1.1. It should be noted that Figure 1.1 shows actual monitoring positions, not necessarily the location of residences.

Table 1.1 Attended noise monitoring locations

Location descriptor/ID	Description/address	Coordinates (MGA56)	
		Easting	Northing
N2	Camberwell Village (west)	320297	6405670
N3	Camberwell Village (north-east)	320554	6405839
N4	South of New England Highway	319776	6404101



Source: EMM (2019); DFSI (2017); GA (2011)

0 1 2 km

GDA 1994 MGA Zone 56

N

\\emmsvr1\EMM\Jobs\2019\H190081 - Ashton Coal Noise Monitoring\8 GIS\02_Maps\N001_NoiseMonitoring_20190312_02.mxd 12/03/2019

KEY

- Site boundary
- Noise monitoring location
- Meteorological station
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Cadastral boundary

Noise monitoring locations and Ashton colliery boundary

Ashton Coal
Monthly attended noise monitoring
Figure 1.1

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1.3 Terminology and abbreviations

Some definitions of terms and abbreviations which may be used in this report are provided in Table 1.2.

Table 1.2 Terminology and abbreviations

Term/descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to approximate how humans hear noise.
L_{Amax}	The maximum root mean squared A-weighted noise level over a time period.
L_{A1}	The A-weighted noise level which is exceeded for 1 per cent of the time.
$L_{A1,1minute}$	The A-weighted noise level which is exceeded for 1 per cent of the specified time period of 1 minute.
L_{A10}	The A-weighted noise level which is exceeded for 10 percent of the time.
L_{Aeq}	The energy average A-weighted noise level.
L_{A50}	The A-weighted noise level which is exceeded for 50 per cent of the time, also the median noise level during a measurement period.
L_{A90}	The A-weighted noise level exceeded for 90 percent of the time, also referred to as the "background" noise level and commonly used to derive noise limits.
L_{Amin}	The minimum A-weighted noise level over a time period.
L_{Ceq}	The energy average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	Monday – Saturday: 7 am to 6 pm, on Sundays and Public Holidays: 8 am to 6 pm.
Evening	Monday – Saturday: 6 pm to 10 pm, on Sundays and Public Holidays: 6 pm to 10 pm.
Night	Monday – Saturday: 10 pm to 7 am, on Sundays and Public Holidays: 10 pm to 8 am.
Temperature inversion	A meteorological condition where the atmospheric temperature increases with altitude.

Appendix A provides further information that gives an indication as to how an average person perceives changes in noise level, and examples of common noise levels.

2 Noise limits

2.1 Development consent

Ashton Coal noise limits are provided in Table 1, Condition 2 of Appendix 6 of development consent 309-11-2001-I (DC). Relevant sections of the DC are reproduced in Appendix B.1.

2.2 Environment protection licence

Ashton Coal noise limits are provided in Condition L4.1 of EPL 11879 (EPL). Relevant sections of the EPL are reproduced in Appendix B.2.

2.3 Noise management plan

The approved NMP adopts three attended noise monitoring locations that are representative of residences outlined in the DC and EPL. Relevant sections of the NMP are reproduced in Appendix B.3.

2.4 Noise limits

Noise impact limits based on the NMP are as shown in Table 2.1.

Table 2.1 Noise impact limits, dB

Location	Day $L_{Aeq,15minute}$	Evening $L_{Aeq,15minute}$	Night $L_{Aeq,15minute}$	Night $L_{A1,1minute}$
N2	38	38	36	46
N3	38	38	36	46
N4	38	38	36	46

2.5 Meteorological conditions

The DC and EPL specify the following meteorological conditions under which noise limits do not apply:

- during periods of rain or hail
- average wind speed at microphone height exceeds 5 metres per second (m/s)
- wind speeds greater than 3 m/s at 10 metres above ground level
- temperature inversion conditions greater than 3°C/100 m.

2.6 Additional requirements

Monitoring and reporting have been done in accordance with the NSW EPA 'Noise Policy for Industry' (NPfI) issued in October 2017 and the 'Approved methods for the measurement and analysis of environmental noise in NSW' (Approved Methods) issued in January 2022.

3 Methodology

3.1 Overview

Attended environmental noise monitoring was done in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant EPA requirements. Meteorological data was obtained from the Ashton Coal on-site weather station (AWS) which allowed correlation of atmospheric parameters with measured noise levels.

3.2 Attended noise monitoring

During this survey, attended noise monitoring was conducted during the night period at each location. The duration of each measurement was 15 minutes. Atmospheric conditions were measured at each monitoring location.

Measured sound levels from various sources were noted during each measurement, and particular attention was paid to the extent of site's contribution (if any) to measured levels. At each monitoring location, the site only $L_{Aeq,15minute}$ and L_{Amax} were measured directly or determined by other methods detailed in Section 7.1 of the NPfI.

If the exact noise levels from site could not be established due to masking by other noise sources in a similar frequency range, but was determined to be at least 5 dB lower than relevant limits, then a maximum estimate of it may be provided. This is expressed as a 'less than' quantity, such as <20 dB or <30 dB.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. When site noise is noted as NM, this means site noise was audible but could not be quantified. All results noted as NM in this report were due to one or more of the following:

- Site noise levels were extremely low and unlikely, in many cases, to be noticed.
- Site noise levels were masked by other more dominant noise sources that are characteristic of the environment, such as breeze in foliage or continuous road traffic noise, that cannot be eliminated by monitoring at an alternate or intermediate location.
- It was not feasible or reasonable to employ methods such as move closer and back calculate. Cases may include rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

For this assessment, the measured L_{Amax} has been used as a conservative estimate of $L_{A1,1minute}$. The EPA accepts sleep disturbance analysis based on either the $L_{A1,1minute}$ or L_{Amax} metrics, with the L_{Amax} representing a more conservative assessment of site noise emissions.

3.3 Meteorological data

As per Condition L4.4, this assessment determined stability categories for the attended monitoring period using the direct measurement method as per Fact Sheet D of the Noise Policy for Industry (2017).

The temperature lapse rate between the two weather stations (M1 – Sentinex Unit 40 located in Camberwell Village and M2 – Ashton Coal 'repeater' meteorological station, the site AWS, located in the north-eastern open cut (NEOC) area) was calculated using the following formula:

$$\text{Temperature lapse rate} = (\Delta T) \times (100/(\Delta H))$$

Where:

- ΔT = temperature measured at M2 (at 10 metres above ground level) minus temperature measured at M1 (at 10 metres above ground level); and
- ΔH = the vertical height difference between M2 and M1 (equal to 73 metres).

3.4 Modifying factors

All measurements were evaluated for potential modifying factors in accordance with the NPfI. Assessment of modifying factors is done at the time of measurement if the site was audible and directly quantifiable. If applicable, modifying factor penalties have been reported and added to measured site only L_{Aeq} noise levels.

Low-frequency modifying factor penalties have only been applied to site-only L_{Aeq} levels if the site was the only contributing low-frequency noise source. Specific methodology for assessment of each modifying factor is outlined in Fact Sheet C of the NPfI.

3.5 Instrumentation

Equipment used to measure environmental noise levels is detailed in Table 3.1. Calibration certificates are provided in Appendix C.

Table 3.1 Attended noise monitoring equipment

Item	Serial number	Calibration due date	Relevant standard
Rion NA28 sound level meter	30131882	23/1/2025	IEC 61672-1:2002
Pulsar 105 calibrator	78226	24/1/2025	IEC 60942

4 Results

4.1 Total measured noise levels and atmospheric conditions

Overall noise levels measured at each location during attended measurements are provided in Table 4.1. Discussion as to the noise sources responsible for these measured levels is provided in Section 5 of this report.

Table 4.1 Total measured noise levels – April 2023[1]

Location	Start date	Time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB
N2	11/04/2023	23:21	63	57	51	47	44	38	35
N3	11/04/2023	23:40	56	51	42	40	37	35	32
N4	11/04/2023	22:01	58	54	42	41	37	34	31

Notes: 1. Levels in this table are not necessarily the result of activity at site.

Atmospheric condition data measured by the operator during each measurement using a hand-held weather meter is shown in Table 4.2. The wind speed, direction and temperature were measured at approximately 1.5 metres above ground. Attended noise monitoring is not done during rain, hail, or wind speeds above 5 m/s at microphone height.

Table 4.2 Atmospheric conditions measured at microphone height – April 2023

Location	Date	Time	Temperature °C	Wind speed m/s	Wind direction °Magnetic north	Cloud cover 1/8s
N2	11/04/2023	23:21	11.1	Calm	-	4
N3	11/04/2023	23:40	12.3	0.8	110	4
N4	11/04/2023	22:01	12.6	Calm	-	3

4.2 Site only noise levels

4.2.1 Modifying factors

There were no modifying factors, as defined in the NPfI, applicable during the survey.

4.2.2 Monitoring results

Table 4.3 provides site noise levels in the absence of other sources, where possible, and includes weather data from the site AWS. Limits are applicable if weather conditions were within specified parameters during each measurement.

Table 4.3 Site noise levels and limits – April 2023

Location	Start Date	Time	Wind		Stability Class	Lapse rate (VTG) °C/100m	Limits apply? [1]	Limit, dB		Site level, dB [2]		Exceedance, dB	
			Speed m/s	Direction [4]				$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
N2	11/04/2023	23:21	0.5	311^0	G	6.4	No	36	46	IA	IA	Nil	Nil
N3	11/04/2023	23:40	0.9	19^0	G	6.6	No	36	46	IA	IA	Nil	Nil
N4	11/04/2023	22:01	0.8	280^0	G	6.8	No	36	46	IA	IA	Nil	Nil

Notes:
1. Noise emission limits do not apply during periods of rainfall or winds greater than 3 metres per second (at a height of 10 metres).
2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties if applicable.
3. NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in project approval.
4. Degrees magnetic north, "-" indicates calm conditions.
5. IA in site level column means that the site was deemed inaudible at that location.

5 Discussion

5.1 Noted noise sources

During attended monitoring, the time variations (temporal characteristics) of noise sources are considered in each measurement via statistical descriptors. From these observations, summaries have been derived for the location and provided in this chapter. Statistical 1/3 octave-band analysis of environmental noise was undertaken, and the following figures display frequency ranges of various noise sources at each location for L_{A1}, L_{A10}, L_{Aeq}, L_{A50}, and L_{A90} descriptors. These figures also provide, graphically, statistical information for these noise levels.

An example is provided as Figure 5.1, where frogs and insects are seen to be generating noise at frequencies above 1000 Hz, while industrial noise is observed at frequencies less than 1000 Hz.

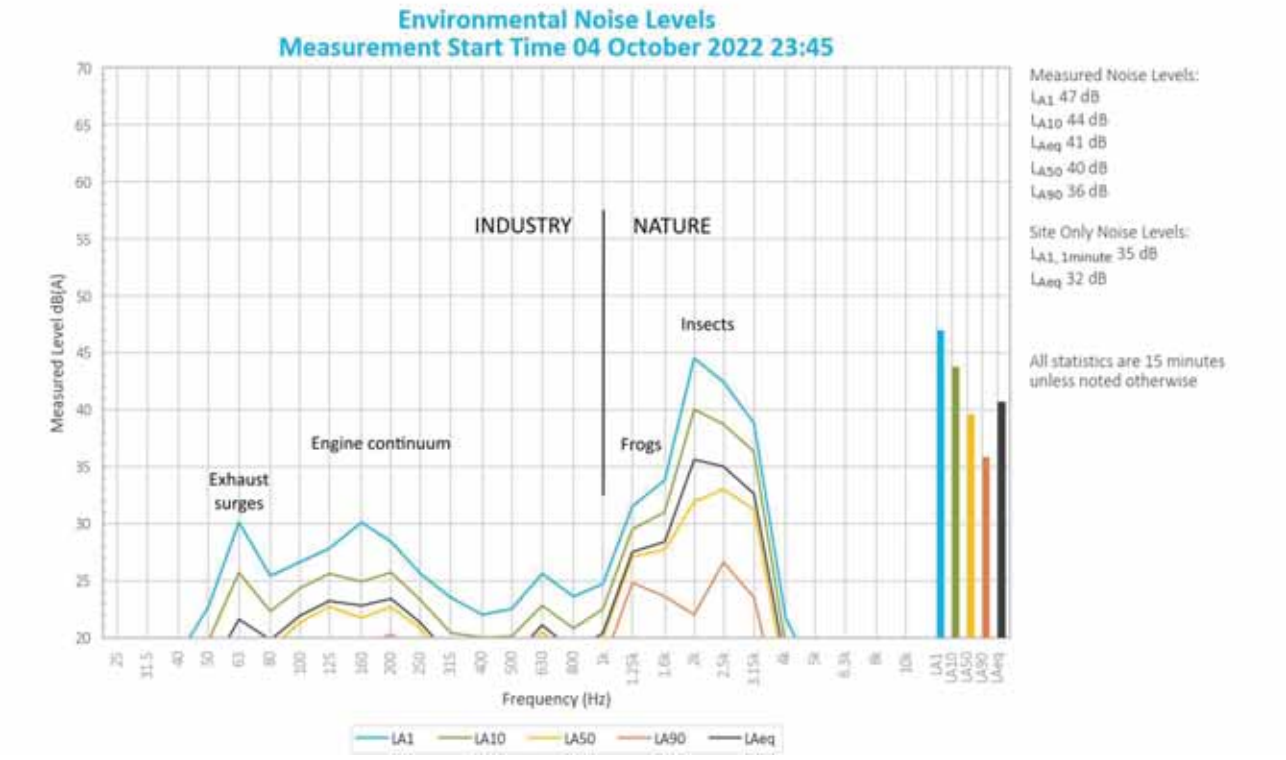

Figure 5.1 Example graph

5.2 N2

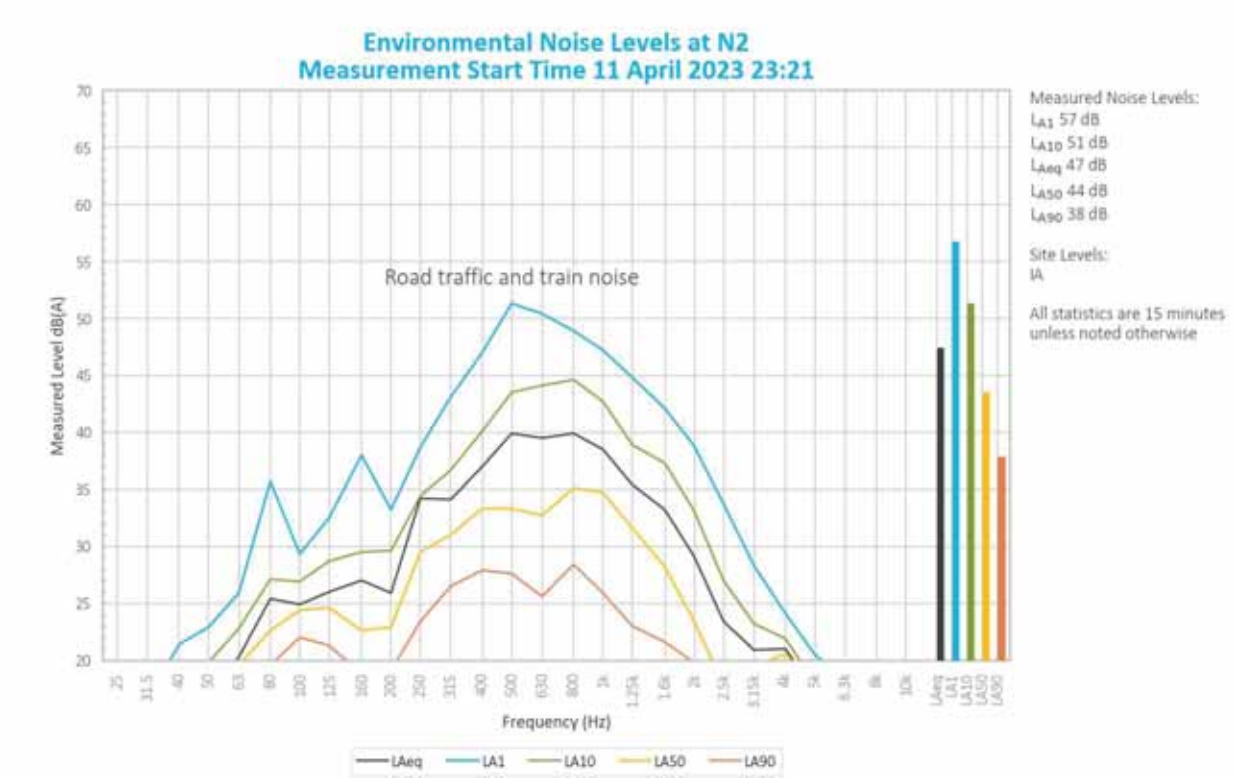

Figure 5.2 Environmental Noise Levels - NM2, Camberwell Village (West)

Ashton Coal operations were inaudible during the entire measurement.

Road traffic noise and trains (unrelated to Ashton Coal) were primarily responsible for all measured levels.

Noise from frogs and other mines in the vicinity (unrelated to Ashton Coal) were also noted.

5.2.1 Cumulative mining noise at N2

Ashton Coal was inaudible and, therefore, did not contribute to any mining noise at this location.

5.3 N3

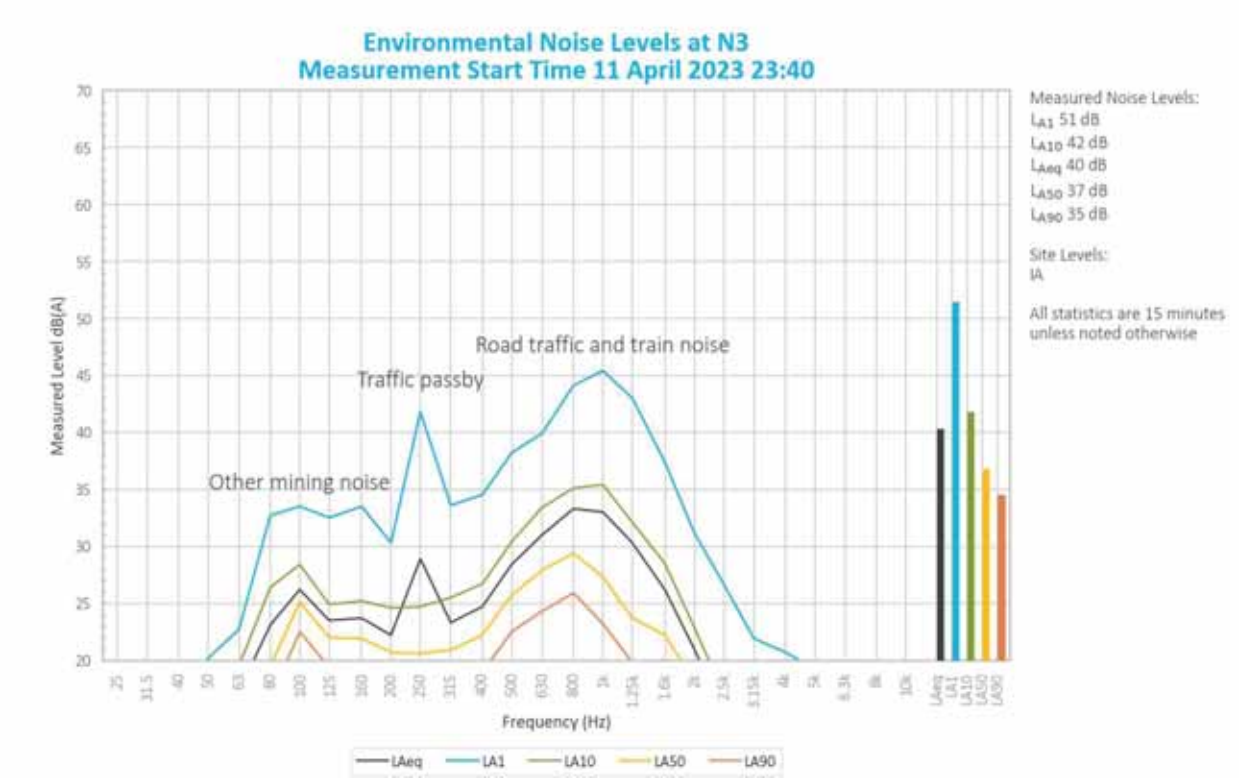

Figure 5.3 Environmental Noise Levels – N3, Camberwell Village (North-East)

Ashton Coal operations were inaudible during the entire measurement.

Road traffic and trains (unrelated to Ashton Coal) were primarily responsible for all measured noise levels.

Noise from other mines in the vicinity (unrelated to Ashton Coal) was noted.

5.3.1 Cumulative mining noise at N3

Ashton Coal was inaudible and, therefore, did not contribute to any mining noise at this location.

5.4 N4

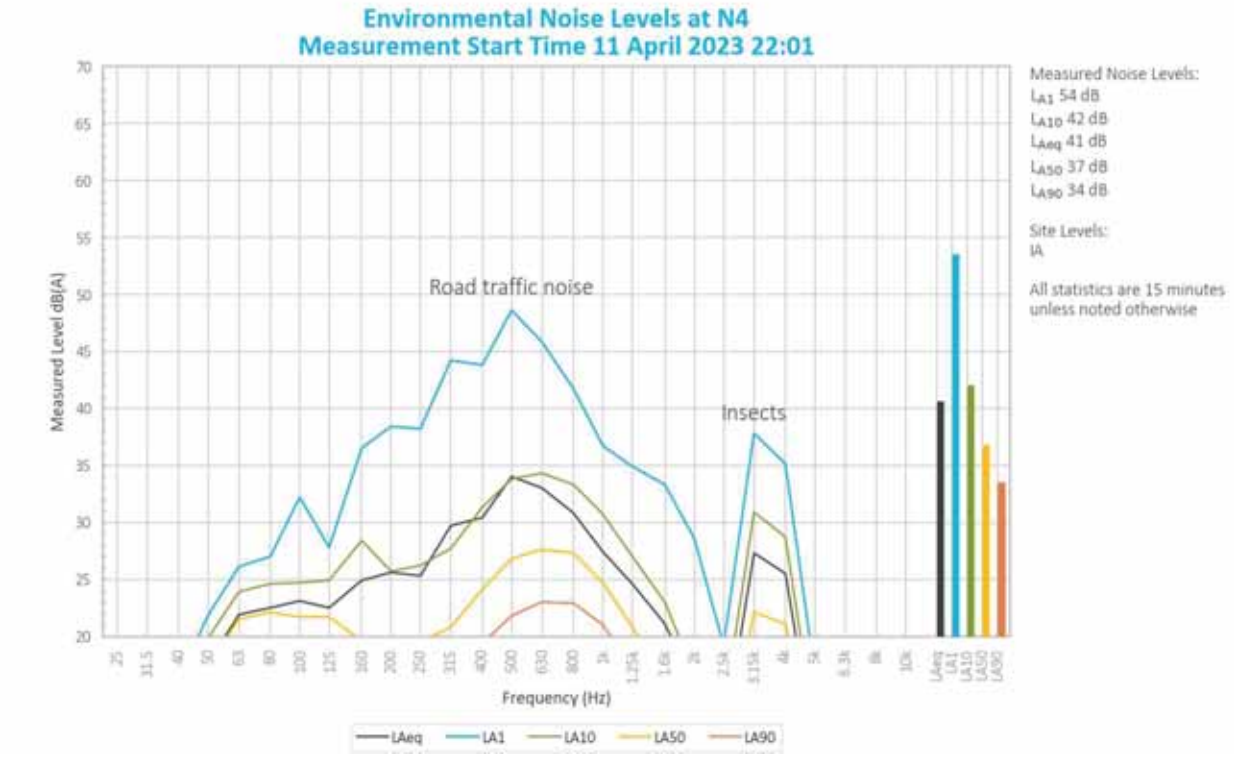

Figure 5.4 Environmental Noise Levels – N4, South of New England Highway

Ashton Coal operations were inaudible during the entire measurement.

Road traffic noise dominated the measured L_{A1} and L_{A10}. Road traffic noise was primarily responsible for the measured L_{A50}.and L_{Aeq} with contributions from livestock. Road traffic noise and insects were primarily responsible for the measured L_{A90}.

Noise from trains and other mines in the vicinity (unrelated to Ashton Coal) were also noted.

5.4.1 Cumulative mining noise at N4

Ashton Coal was inaudible and, therefore, did not contribute to any mining noise at this location.

6 Summary

EMM Consulting Pty Ltd (EMM) was engaged by Ashton Coal Operations Pty Ltd to conduct a monthly noise survey of operations at Ashton Coal. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified noise limits.

Attended environmental noise monitoring described in this report was done during the night period on Tuesday 11 April 2023 at three monitoring locations.

Noise levels from site complied with relevant limits at all monitoring locations during the April 2023 survey.

Appendix A
Noise perception and examples

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A.1 Noise levels

Table A.1 gives an indication as to how an average person perceives changes in noise level. Examples of common noise levels are provided in Figure A.1.

Table A.1 Perceived change in noise

Change in sound pressure level (dB)	Perceived change in noise
up to 2	Not perceptible
3	Just perceptible
5	Noticeable difference
10	Twice (or half) as loud
15	Large change
20	Four times (or quarter) as loud

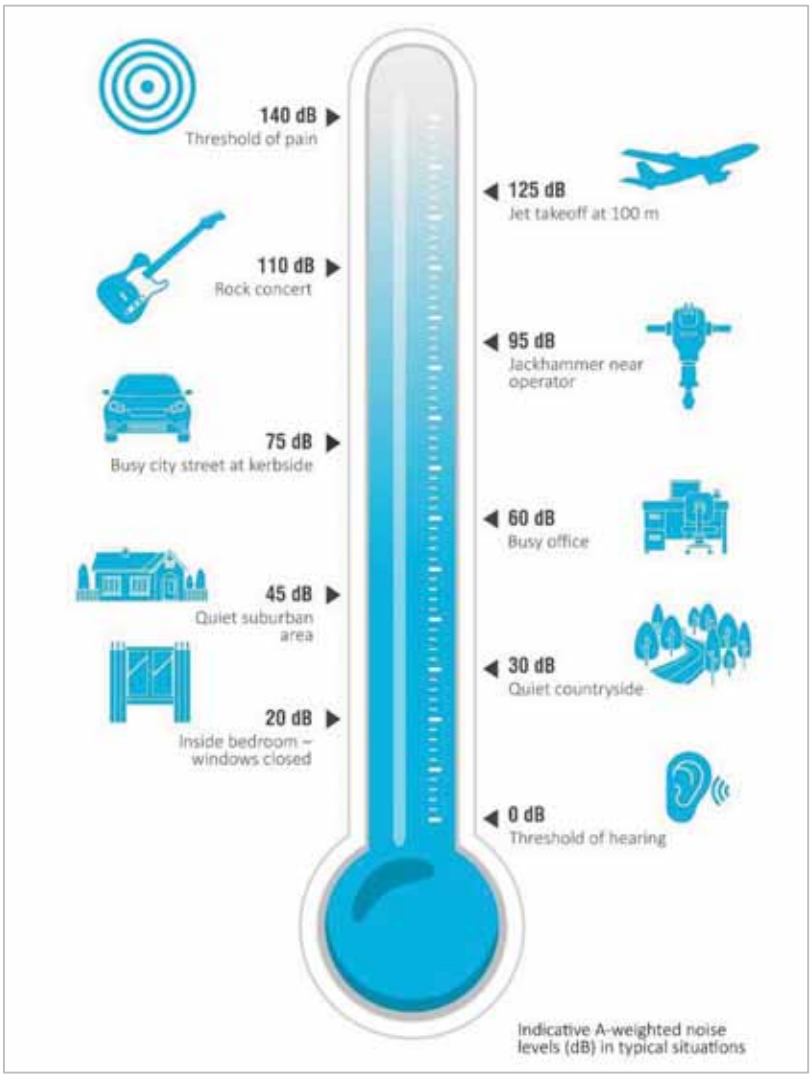

Figure A.1 Common noise levels

Appendix B
Regulator documents

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B.1 Project approval

APPENDIX 6

ALTERNATE NOISE CONDITIONS

NOISE

Application

1. Conditions 2 to 3 below have effect during times when open cut mining operations are not being undertaken at the Ashton Mine Complex, in the opinion of the Planning Secretary.

Noise Criteria

2. Except for the noise-affected land in Table 1 of Schedule 3, the Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 1 at any residence on privately-owned land or on more than 25 per cent of any privately-owned land.

Table 1: Noise Criteria dB(A)

Receiver No.	***Receiver***	***Day*** ($L_{Aeq\ (15min)}$)	***Evening*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{A1\ (1\ min)}$)
-	All privately-owned land	38	38	36	46

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy*. Appendix 8 sets out the requirements for evaluating compliance with these criteria.

However, these noise criteria do not apply if the Applicant has an agreement with the relevant owner/s of the residence/land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Additional Noise Mitigation Measures

3. Upon receiving a written request from the owner of any residence on any privately-owned land where subsequent operational noise monitoring shows the noise generated by the development exceeds the noise limits in Table 2, the Applicant must implement additional reasonable and feasible noise mitigation measures (such as double glazing, insulation, and/or air conditioning) at the residence in consultation with the owner.

If within 3 months of receiving this request from the landowner, the Applicant and the landowner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Planning Secretary for resolution.

Table 2: Additional Noise Mitigation Criteria dB(A) $L_{Aeq\ (15min)}$

Receiver No.	***Receiver***	***Day*** ($L_{Aeq\ (15min)}$)	***Evening*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{Aeq\ (15min)}$)
-	All privately-owned land	38	38	38

Notes:

- *Noise generated by the development is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 8 sets out the requirements for evaluating compliance with these criteria.*
- *For this condition to apply, the exceedance of the criteria must be systemic.*

APPENDIX 8

NOISE COMPLIANCE ASSESSMENT

Compliance Monitoring

1. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this approval.

2. Data collected for the purposes of determining compliance with the relevant conditions of this approval is to be excluded under the following meteorological conditions:
   a) during periods of rain or hail;
   b) average wind speed at microphone height exceeds 5 m/s;
   c) wind speeds greater than 3 m/s measures at 10 m above ground level; and
   d) temperature inversion conditions greater than 3°C/100m.

3. Unless otherwise agreed with the Planning Secretary, this monitoring is to be carried out in accordance with the relevant requirements relating for reviewing performance set out in the NSW Industrial Noise Policy (as amended from time to time), in particular the requirements relating to:
   a) monitoring locations for the collection of representative noise data;
   b) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
   c) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

4. To the extent that there is any inconsistency between the Industrial Noise Policy and the requirements set out in this Appendix, the Appendix prevails to the extent of the inconsistency.

Determination of Meteorological Conditions

5. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located in the vicinity of the site (as required by condition 18 of Schedule 3).

B.2 Environmental protection licence

Environment Protection Licence

24	Groundwater monitoring	Monitoring up-gradient of Glennies Creek alluvium at coordinates 319294, 6404588 (Easting, Northing), identified as WML120B in Figure 1.
25	Groundwater monitoring	Monitoring mid-gradient of Glennies Creek alluvium at coordinates 319468, 6403528 (Easting, Northing), identified as WML129 in Figure 1.
26	Groundwater monitoring	Monitoring down-gradient of Glennies Creek alluvium at coordinates 318965, 6402842 (Easting, Northing), identified as WMLP336 in Figure 1.
27	Groundwater monitoring	Monitoring up-gradient of Barrett coal seam at coordinates 318431, 6407214 (Easting, Northing), identified as GM1 in Figure 1.
28	Groundwater monitoring	Monitoring up-gradient of Pikes Gully coal seam at coordinates 319292, 6404580 (Easting, Northing), identified as WML120A in Figure 1.
29	Groundwater monitoring	Monitoring mid-gradient of Pikes Gully coal seam at coordinates 319220, 6403928 (Easting, Northing), identified as WML262 in Figure 1.
30	Groundwater monitoring	Monitoring up-gradient of Upper Liddell coal seam at coordinates 319215, 6403958 (Easting, Northing), identified as WML181 in Figure 1.
31	Groundwater monitoring	Monitoring mid-gradient of Upper Liddell coal seam at coordinates 319188, 6404325 (Easting, Northing), identified as WML183 in Figure 1.

P1.4 The following points referred to in the table below are identified in this licence for the purposes of weather and/or noise monitoring and/or setting limits for the emission of noise from the premises.

Noise/Weather

EPA identification no.	Type of monitoring point	Location description
12	Meteorological Station – to determine meteorological conditions for noise monitoring	Meteorological monitoring at coordinates 320522, 6406815 (Easting, Northing), identified as Repeater on Figure 2.
13	Noise monitoring	Monitoring at coordinates 320554, 6405839 (Easting, Northing), identified as N3 on Figure 2 and representative of Noise Assessment Group 2.

14	Noise monitoring	Monitoring at coordinates 320297, 6405670 (Easting, Northing), identified as N2 on Figure 2 and representative of Noise Assessment Group 1.
15	Noise monitoring	Monitoring at coordinates 319776, 6404101 (Easting, Northing), identified as N4 on Figure 2 and representative of Noise Assessment Group 3.
32	Meteorological Station – to determine meteorological conditions for noise monitoring	Monitoring of temperature at 'M1' at coordinates 320259, 6405971 (Easting, Northing).

P1.5 For the purposes of Condition P1.1, P1.2 and P1.3, Figure 1 refers to the plan titled "Ashton Underground Mine Environment Protection licence 11879 Premises Boundary, Surface Infrastructure" dated 30/08/19 (EPA reference DOC19/761196).

P1.6 For the purpose of Condition P1.4, Figure 2 refers to the plan titled "Ashton Underground Mine Environment Protection licence 11879 Premises Boundary, Monitoring" dated 30/08/19 (EPA reference DOC19/761196).

P1.7 The datum for grid references in this Licence is the Geodetic Datum of Australia 1994 (GDA94), Zone 56.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

L2.1 Flares must be operated by the licensee such that there is no visible emission other than for a total period of no more than 5 minutes in any 2 hours, except for heat haze.

L3 Waste

L3.1 The licensee must not cause, permit or allow any waste to be received at the premises unless specified in this licence.

L3.2 The Licensee must not dispose of waste on the premises unless authorised by a condition of this Licence.

L4 Noise limits

L4.1 Noise from the premises must not exceed the noise limits specified in the table below.

Residences referenced in this table are from the consent DA 309-11-2001-i and summarised in the EPA

reference DOC19/761196.

Location	Day LAeq(15 minute)	Evening LAeq(15 minute)	Night LAeq(15 minute)	Night LAeq(1 minute)
EPA Point 13	38	38	36	46
EPA Point 14	38	38	36	46
EPA Point 15	38	38	36	46
All other privately owned residences	38	38	36	46

L4.2 For the purpose of Condition L4.1:
a) Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays,
b) Evening is defined as the period from 6pm to 10pm, and
c) Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays

L4.3 The noise emission limits identified in condition L4.1 apply under the following meteorological conditions:

a) wind speeds up to 3m/s at 10m above ground level; and
b) temperature inversion conditions up to 3 degrees C/100m.

L4.4 For the purposes of condition L4.1:

a) Data recorded by the closest and most representative meteorological station installed on the premises at EPA Identification Point 12 must be used to determine meteorological conditions; and
b) Temperature inversion conditions (stability category) are to be determined by the methods referred to in Fact Sheet D of the Noise Policy for Industry (2017) using EPA Identification Points 12 and 32.

4 Operating Conditions

O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.
This includes:
a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
a) must be maintained in a proper and efficient condition; and
b) must be operated in a proper and efficient manner.

B.3 Noise management plan

Relevant parts of the DA have been reproduced in Appendix A along with reference to where they have been addressed in this document.

4.2 Applicable Criteria

Noise criteria for the ACP are divided into three categories:

- Impact assessment criteria;
- Additional noise mitigation criteria; and
- Cumulative noise acquisition criteria.

The RUM must adhere to a single set of noise criteria relating to noise generated by the RUM development.

4.2.1 Impact Assessment Criteria

In accordance with Condition 2, Appendix 6 of the Ashton DA and Condition L4.1 of EPL 11879, noise generated by the development within the ACP must not exceed the limits specified in **Table 3** at any privately-owned land or on more than 25 per cent of any privately-owned land. The noise limits are provided in decibels (dB).

Table 3: Ashton Noise Impact Criteria dB(A)

Location	Day	Evening	Night	
	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{A1} (1 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	38	38	36	46

In accordance with Condition 12, Schedule 3 of the RUM DA, noise generated by development in the ACOL-operated RUM must not exceed the limits specified in **Table 4** at any residence on privately-owned land or on more than 25 per cent of any privately-owned land.

Table 4 RUM Noise Impact Criteria dB(A)

Location	Day	Evening	Night	
	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{A1} (1 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	35	35	35	45

4.2.2 Additional Noise Mitigation Criteria

If noise emissions generated by the ACP exceed the criteria displayed in **Table 5** at any residence on privately-owned land, then, upon receiving a written request from the landowner, ACOL will implement additional reasonable and feasible noise mitigation measures (such as double glazing, insulation and/or air conditioning) at the residence in consultation with the owner.

Table 5 Additional Noise Mitigation Criteria dB(A)#

Location	Day	Evening	Night
	LAeq (15 minute)	LAeq (15 minute)	LAeq (15 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	38	38	38

* Exceedance of the criteria must be systemic.

4.2.3 Cumulative Noise Acquisition Criteria

If noise emissions generated by the ACP, and other mines exceed the criteria in **Table 6** at any residence on privately-owned land or on more than 25 per cent of any privately-owned land (except for noise affected residential receivers in Condition 1, Schedule 3 of the Ashton DA) then, upon receiving a written request for acquisition from the landowner, ACOL together with the relevant mines, will acquire the land in accordance with the Acquisition Process (as defined in Conditions 7 and 8, Schedule 4 of the Ashton DA).

Table 6 Cumulative Noise Acquisition Criteria dB(A)

Location	Day	Evening	Night
	LAeq (period)	LAeq (period)	LAeq (period)
Camberwell Village	60	50	45
All other privately-owned land	55	50	45

4.3 Existing Environment

The ACP is located in the Hunter Valley region of New South Wales and is bound by the Main Northern Railway to the north, Hunter River to the south and Glennies Creek to the east with the New England Highway dividing the open cut from the underground mining areas.

Other mining operations in the area include the Ravensworth Complex, the Mount Owen Complex, Rix's Creek Open Cut, Integra Underground and Hunter Valley Operations.

The closest sensitive receivers are located in Camberwell. There are currently 13 private landholdings in the local area, 11 of these have an occupied residence.

Ambient noise levels within the village of Camberwell are influenced by the New England Highway to the south, the railway line to the northeast and surrounding mining operations. Attended noise monitoring has confirmed that the major contributing noise source is usually the New England Highway. Noise from ACP has been noted at times in Camberwell Village, historical reports show this has been infrequent and at relatively low levels.

Based on the historical meteorological data collected by ACOL's M2 (repeater) weather station the most common winds in winter are from the west-northwest and the east-southeast in summer. Prevailing winds act to enhance noise from surrounding noise sources (road, rail and mining).

Appendix C
Calibration certificates

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Acoustic Research Labs Pty Ltd
Unit 36/14 Loyalty Rd
North Rocks NSW AUSTRALIA 2151
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

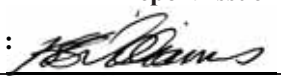
Sound Level Meter
IEC 61672-3:2013
Calibration Certificate

Calibration Number C23032

Client Details	EMM Consulting Level 3/175 Scott Street Newcastle NSW 2300
Equipment Tested/ Model Number :	Rion NA-28
Instrument Serial Number :	30131882
Microphone Serial Number :	04739
Pre-amplifier Serial Number :	11942
Firmware Version :	2.0

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	24°C	**Ambient Temperature :**	23.5°C
Relative Humidity :	47.3%	**Relative Humidity :**	46.1%
Barometric Pressure :	100.14kPa	**Barometric Pressure :**	100.16kPa

Calibration Technician :	Shaheen Boaz	**Secondary Check:**	Dylan Selge
Calibration Date :	23 Jan 2023	**Report Issue Date :**	25 Jan 2023

Approved Signatory :  Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*Pass*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*Pass*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2013 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013 and because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
125Hz	*±0.13dB*	*Temperature*	*±0.1°C*
1kHz	*±0.13dB*	*Relative Humidity*	*±1.9%*
8kHz	*±0.14dB*	*Barometric Pressure*	*±0.014kPa*
Electrical Tests	*±0.13dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - Calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to SI units.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

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Sound Calibrator

IEC 60942:2017

Calibration Certificate

Calibration Number C23033

Client Details EMM Consulting
Level 3/175 Scott Street
Newcastle NSW 2300

Equipment Tested/ Model Number : Pulsar Model 105
Instrument Serial Number : 78226

Atmospheric Conditions
Ambient Temperature : 24.4°C
Relative Humidity : 50.2%
Barometric Pressure : 100.2kPa

Calibration Technician : Shaheen Boaz
Secondary Check: Dylan Selge
Calibration Date : 24 Jan 2023
Report Issue Date : 25 Jan 2023

Approved Signatory :  Ken Williams

Characteristic Tested	Result
Generated Sound Pressure Level	*Pass*
Frequency Generated	*Pass*
Total Distortion	*Pass*

Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
94	1000	94.17	1000.40

The sound calibrator has been shown to conform to the class 1 requirements for periodic testing, described in Annex B of IEC 60942:2017 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed..

Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	*±0.10dB*	*Temperature*	*±0.1°C*
Frequency	*±0.13%*	*Relative Humidity*	*±1.9%*
Distortion	*±0.20%*	*Barometric Pressure*	*±0.014kPa*

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - Calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to SI units.

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Appendix E

Monthly attended noise monitoring report – May 2023

EMM
creating opportunities

Ashton Coal

Monthly attended noise monitoring - May 2023

Prepared for Ashton Coal Operations Pty Ltd

May 2023

Ashton Coal

Monthly attended noise monitoring - May 2023

Ashton Coal Operations Pty Ltd

E221164 RP5

May 2023

Version	Date	Prepared by	Reviewed by	Comments
1	17 May 2023	Lucas Adamson	Najah Ishac	Draft
2	23 May 2023	Lucas Adamson	Najah Ishac	Final

Approved by

Najah Ishac
Director
23 May 2023

Level 3 175 Scott Street
Newcastle NSW 2300

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Appendices

Tables

Figures

1 Introduction

1.1 Background

EMM Consulting Pty Ltd (EMM) was engaged by Ashton Coal Operations Pty Ltd to conduct a monthly noise survey of operations at Ashton Coal Operations (Ashton Coal, the site) located at Glennies Creek Rd, Camberwell NSW. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified limits.

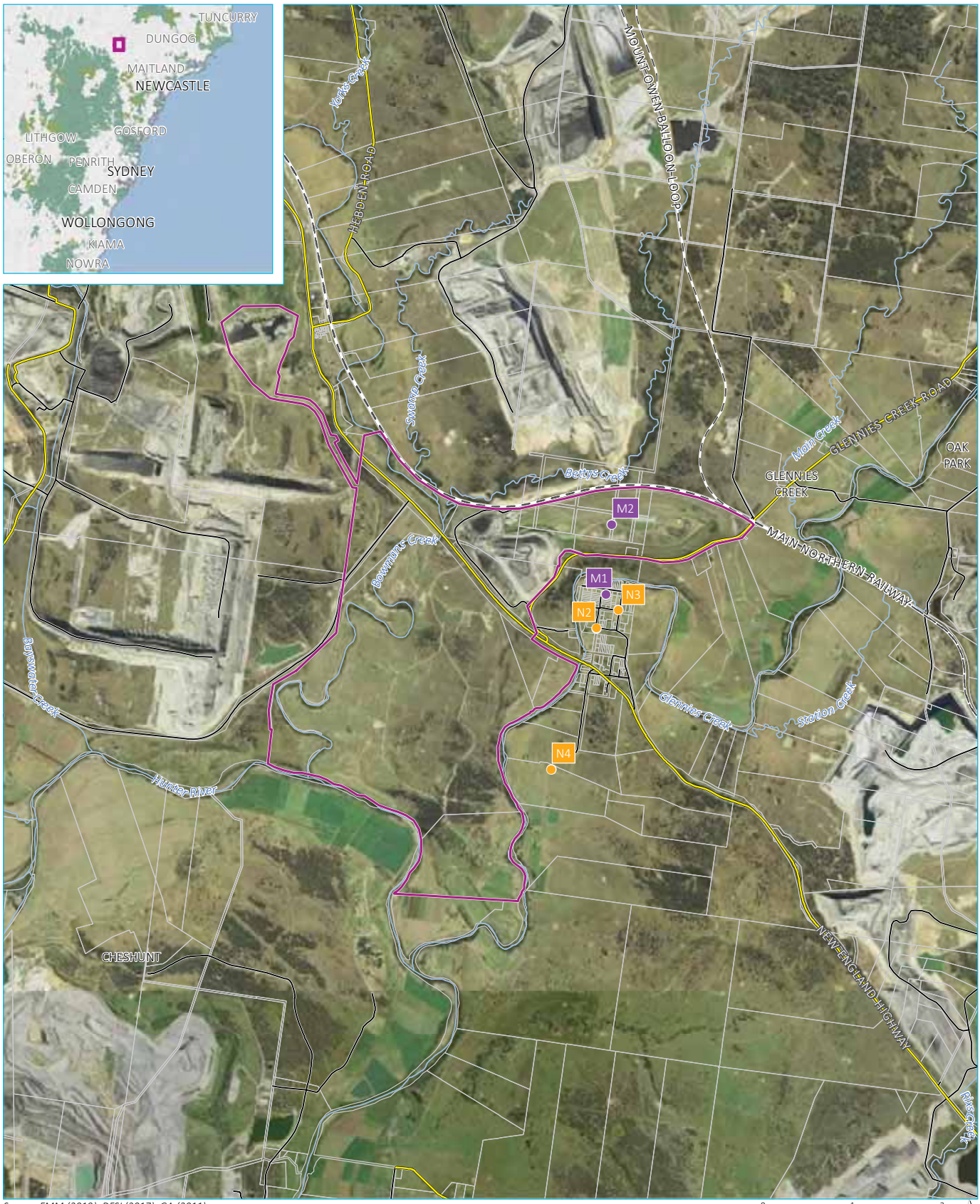
Attended environmental noise monitoring described in this report was conducted during the night period of Tuesday 9 May 2023 at three monitoring locations.

1.2 Attended monitoring locations

Site monitoring locations are detailed in Table 1.1 and shown on Figure 1.1. It should be noted that Figure 1.1 shows actual monitoring positions, not necessarily the location of residences.

Table 1.1 Attended noise monitoring locations

Location descriptor/ID	Description/address	Coordinates (MGA56)	
		Easting	Northing
N2	Camberwell Village (west)	320297	6405670
N3	Camberwell Village (north-east)	320554	6405839
N4	South of New England Highway	319776	6404101



Source: EMM (2019); DFSI (2017); GA (2011)

0 1 2 km

GDA 1994 MGA Zone 56

N

\\emmsvr1\EMM\Jobs\2019\H190081 - Ashton Coal Noise Monitoring\8 GIS\02_Maps\N001_NoiseMonitoring_20190312_02.mxd 12/03/2019

KEY

- Site boundary
- Noise monitoring location
- Meteorological station
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Cadastral boundary

Noise monitoring locations and Ashton colliery boundary

Ashton Coal
Monthly attended noise monitoring
Figure 1.1

EMM
creating opportunities

1.3 Terminology and abbreviations

Some definitions of terms and abbreviations which may be used in this report are provided in Table 1.2.

Table 1.2 Terminology and abbreviations

Term/descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to approximate how humans hear noise.
L_{Amax}	The maximum root mean squared A-weighted noise level over a time period.
L_{A1}	The A-weighted noise level which is exceeded for 1 per cent of the time.
$L_{A1,1minute}$	The A-weighted noise level which is exceeded for 1 per cent of the specified time period of 1 minute.
L_{A10}	The A-weighted noise level which is exceeded for 10 percent of the time.
L_{Aeq}	The energy average A-weighted noise level.
L_{A50}	The A-weighted noise level which is exceeded for 50 per cent of the time, also the median noise level during a measurement period.
L_{A90}	The A-weighted noise level exceeded for 90 percent of the time, also referred to as the "background" noise level and commonly used to derive noise limits.
L_{Amin}	The minimum A-weighted noise level over a time period.
L_{Ceq}	The energy average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	Monday – Saturday: 7 am to 6 pm, on Sundays and Public Holidays: 8 am to 6 pm.
Evening	Monday – Saturday: 6 pm to 10 pm, on Sundays and Public Holidays: 6 pm to 10 pm.
Night	Monday – Saturday: 10 pm to 7 am, on Sundays and Public Holidays: 10 pm to 8 am.
Temperature inversion	A meteorological condition where the atmospheric temperature increases with altitude.

Appendix A provides further information that gives an indication as to how an average person perceives changes in noise level, and examples of common noise levels.

2 Noise limits

2.1 Development consent

Ashton Coal noise limits are provided in Table 1, Condition 2 of Appendix 6 of development consent 309-11-2001-I (DC). Relevant sections of the DC are reproduced in Appendix B.1.

2.2 Environment protection licence

Ashton Coal noise limits are provided in Condition L4.1 of EPL 11879 (EPL). Relevant sections of the EPL are reproduced in Appendix B.2.

2.3 Noise management plan

The approved NMP adopts three attended noise monitoring locations that are representative of residences outlined in the DC and EPL. Relevant sections of the NMP are reproduced in Appendix B.3.

2.4 Noise limits

Noise impact limits based on the NMP are as shown in Table 2.1.

Table 2.1 Noise impact limits, dB

Location	Day $L_{Aeq,15minute}$	Evening $L_{Aeq,15minute}$	Night $L_{Aeq,15minute}$	Night $L_{A1,1minute}$
N2	38	38	36	46
N3	38	38	36	46
N4	38	38	36	46

2.5 Meteorological conditions

The DC and EPL specify the following meteorological conditions under which noise limits do not apply:

- during periods of rain or hail
- average wind speed at microphone height exceeds 5 metres per second (m/s)
- wind speeds greater than 3 m/s at 10 metres above ground level
- temperature inversion conditions greater than 3°C/100 m.

2.6 Additional requirements

Monitoring and reporting have been done in accordance with the NSW EPA 'Noise Policy for Industry' (NPfI) issued in October 2017 and the 'Approved methods for the measurement and analysis of environmental noise in NSW' (Approved Methods) issued in January 2022.

3 Methodology

3.1 Overview

Attended environmental noise monitoring was done in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant EPA requirements. Meteorological data was obtained from the Ashton Coal on-site weather station (AWS) which allowed correlation of atmospheric parameters with measured noise levels.

3.2 Attended noise monitoring

During this survey, attended noise monitoring was conducted during the night period at each location. The duration of each measurement was 15 minutes. Atmospheric conditions were measured at each monitoring location.

Measured sound levels from various sources were noted during each measurement, and particular attention was paid to the extent of site's contribution (if any) to measured levels. At each monitoring location, the site only $L_{Aeq,15minute}$ and L_{Amax} were measured directly or determined by other methods detailed in Section 7.1 of the NPfI.

If the exact noise levels from site could not be established due to masking by other noise sources in a similar frequency range, but was determined to be at least 5 dB lower than relevant limits, then a maximum estimate of it may be provided. This is expressed as a 'less than' quantity, such as <20 dB or <30 dB.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. When site noise is noted as NM, this means site noise was audible but could not be quantified. All results noted as NM in this report were due to one or more of the following:

- Site noise levels were extremely low and unlikely, in many cases, to be noticed.
- Site noise levels were masked by other more dominant noise sources that are characteristic of the environment, such as breeze in foliage or continuous road traffic noise, that cannot be eliminated by monitoring at an alternate or intermediate location.
- It was not feasible or reasonable to employ methods such as move closer and back calculate. Cases may include rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

For this assessment, the measured L_{Amax} has been used as a conservative estimate of $L_{A1,1minute}$. The EPA accepts sleep disturbance analysis based on either the $L_{A1,1minute}$ or L_{Amax} metrics, with the L_{Amax} representing a more conservative assessment of site noise emissions.

3.3 Meteorological data

As per Condition L4.4, this assessment determined the stability categories throughout the attended monitoring period using the sigma-theta method as per Fact Sheet D of the Noise Policy for Industry (2017).

3.4 Modifying factors

All measurements were evaluated for potential modifying factors in accordance with the NPfI. Assessment of modifying factors is done at the time of measurement if the site was audible and directly quantifiable. If applicable, modifying factor penalties have been reported and added to measured site only L_{Aeq} noise levels.

Low-frequency modifying factor penalties have only been applied to site-only L_{Aeq} levels if the site was the only contributing low-frequency noise source. Specific methodology for assessment of each modifying factor is outlined in Fact Sheet C of the NPfI.

3.5 Instrumentation

Equipment used to measure environmental noise levels is detailed in Table 3.1. Calibration certificates are provided in Appendix C.

Table 3.1 Attended noise monitoring equipment

Item	Serial number	Calibration due date	Relevant standard
Brüel & Kjær 2250 sound level meter	2759405	2/2/2024	IEC 61672-1:2002
Svantek SV-36 calibrator	79952	26/9/2024	IEC 60942

4 Results

4.1 Total measured noise levels and atmospheric conditions

Overall noise levels measured at each location during attended measurements are provided in Table 4.1. Discussion as to the noise sources responsible for measured levels is provided in Section 5 of this report.

Table 4.1 Total measured noise levels – May 2023[1]

Location	Start date	Time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB
N2	9/05/2023	22:00	68	64	51	50	43	34	30
N3	9/05/2023	22:17	65	50	42	40	36	32	30
N4	9/05/2023	22:39	60	46	43	40	38	31	28

Notes: 1. Levels in this table are not necessarily the result of activity at site.

Atmospheric condition data measured by the operator during each measurement using a hand-held weather meter is shown in Table 4.2. The wind speed, direction and temperature were measured at approximately 1.5 metres above ground. Attended noise monitoring is not done during rain, hail, or wind speeds above 5 m/s at microphone height.

Table 4.2 Atmospheric conditions measured at microphone height – May 2023

Location	Date	Time	Temperature °C	Wind speed m/s	Wind direction °Magnetic north	Cloud cover 1/8s
N2	9/05/2023	22:00	9.3	<0.5	-	0
N3	9/05/2023	22:17	8.4	<0.5	-	0
N4	9/05/2023	22:39	7.6	<0.5	-	0

4.2 Site only noise levels

4.2.1 Modifying factors

There were no modifying factors, as defined in the NPfI, applicable during the survey.

4.2.2 Monitoring results

Table 4.3 provides site noise levels in the absence of other sources, where possible, and includes weather data from the site AWS. Limits are applicable if weather conditions were within specified parameters during each measurement.

Table 4.3 Site noise levels and limits – May 2023

Location	Start Date	Time	Wind		Stability Class	Limits apply? [1]	Limit, dB		Site level, dB [2]		Exceedance, dB	
			Speed m/s	Direction [4]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
N2	9/05/2023	22:00	0.9	7^0	D	Yes	36	46	IA	IA	Nil	Nil
N3	9/05/2023	22:17	0.8	341^0	F	Yes	36	46	<30	<30	Nil	Nil
N4	9/05/2023	22:39	1.1	293^0	E	Yes	36	46	IA	IA	Nil	Nil

Notes:
1. Noise emission limits do not apply during periods of rainfall or winds greater than 3 metres per second (at a height of 10 metres).
2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties if applicable.
3. NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in project approval.
4. Degrees magnetic north, "-" indicates calm conditions.
5. IA in site level column means that the site was deemed inaudible at that location.

5 Discussion

5.1 Noted noise sources

During attended monitoring, the time variations (temporal characteristics) of noise sources are considered in each measurement via statistical descriptors. From these observations, summaries have been derived for the location and provided in this chapter. Statistical 1/3 octave-band analysis of environmental noise was undertaken, and the following figures display frequency ranges of various noise sources at each location for L_{A1}, L_{A10}, L_{Aeq}, L_{A50}, and L_{A90} descriptors. These figures also provide, graphically, statistical information for these noise levels.

An example is provided as Figure 5.1, where frogs and insects are seen to be generating noise at frequencies above 1000 Hz, while industrial noise is observed at frequencies less than 1000 Hz.

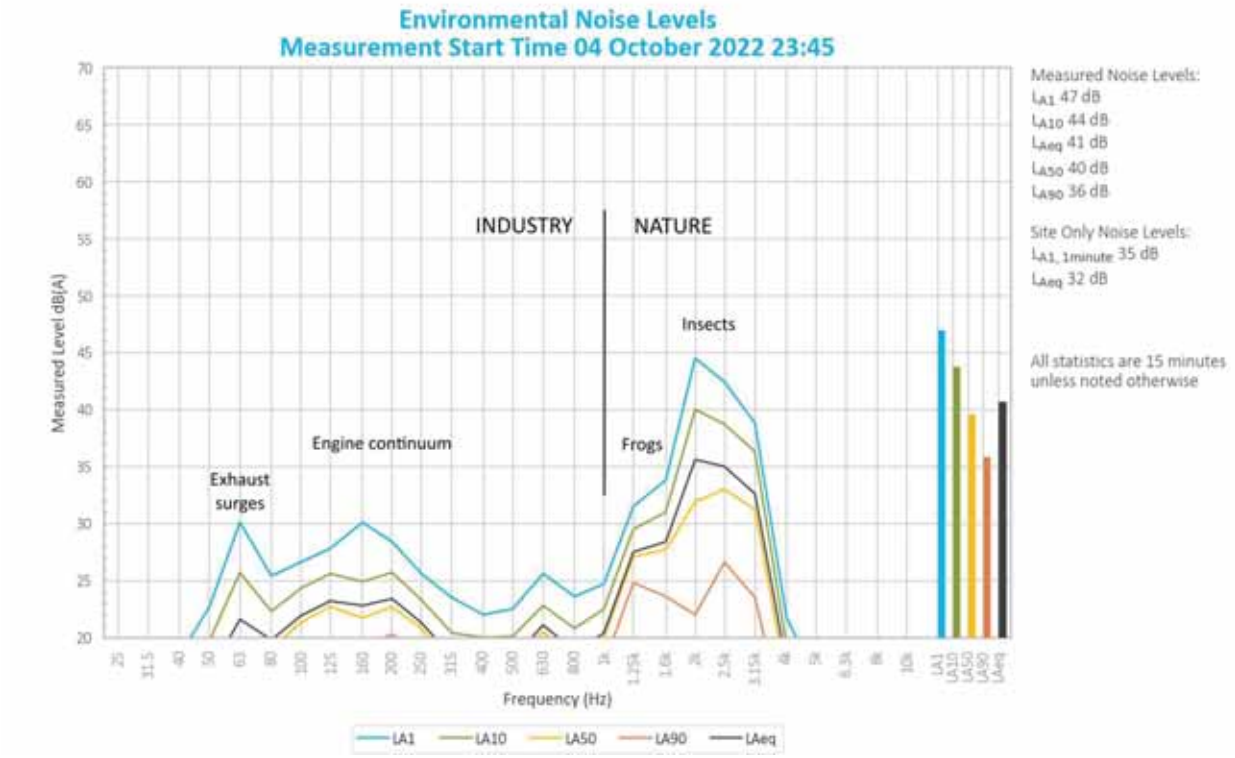


Figure 5.1 Example graph

5.2 N2

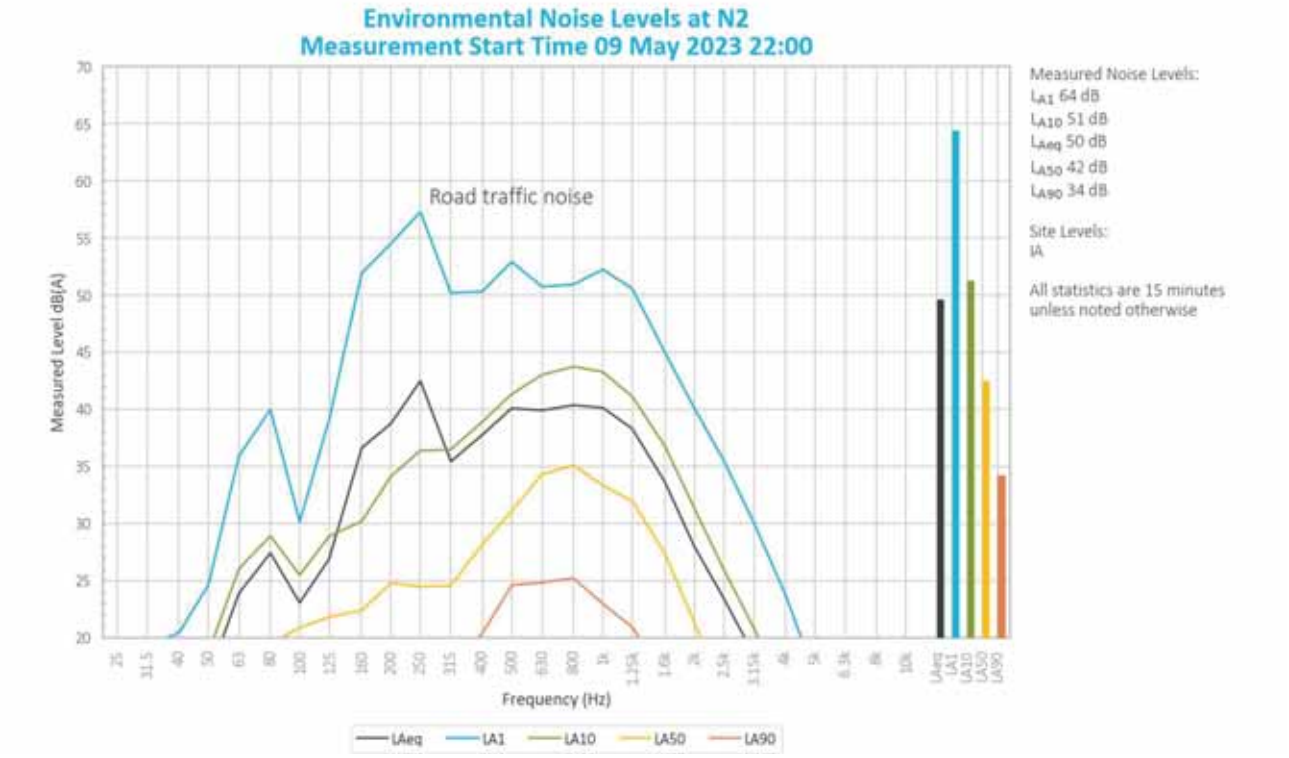


Figure 5.2 Environmental Noise Levels - NM2, Camberwell Village (West)

Ashton Coal operations were inaudible during the entire measurement. Typically, when this type of noise source is not audible above ambient (not withstanding insect noise and other sources of varied character), the likely level of that source is at least 10 dB below the measured background (L_{A90}) level. Given this and the measured background noise level, Ashton Coal was estimated to be below the relevant noise limits.

Road traffic noise was primarily responsible for all measured levels.

Noise from insects and nearby residents was also noted. No noise from other mines in the vicinity was noted.

5.2.1 Cumulative mining noise at N2

Ashton Coal was inaudible and, therefore, did not contribute to any mining noise at this location.

5.3 N3

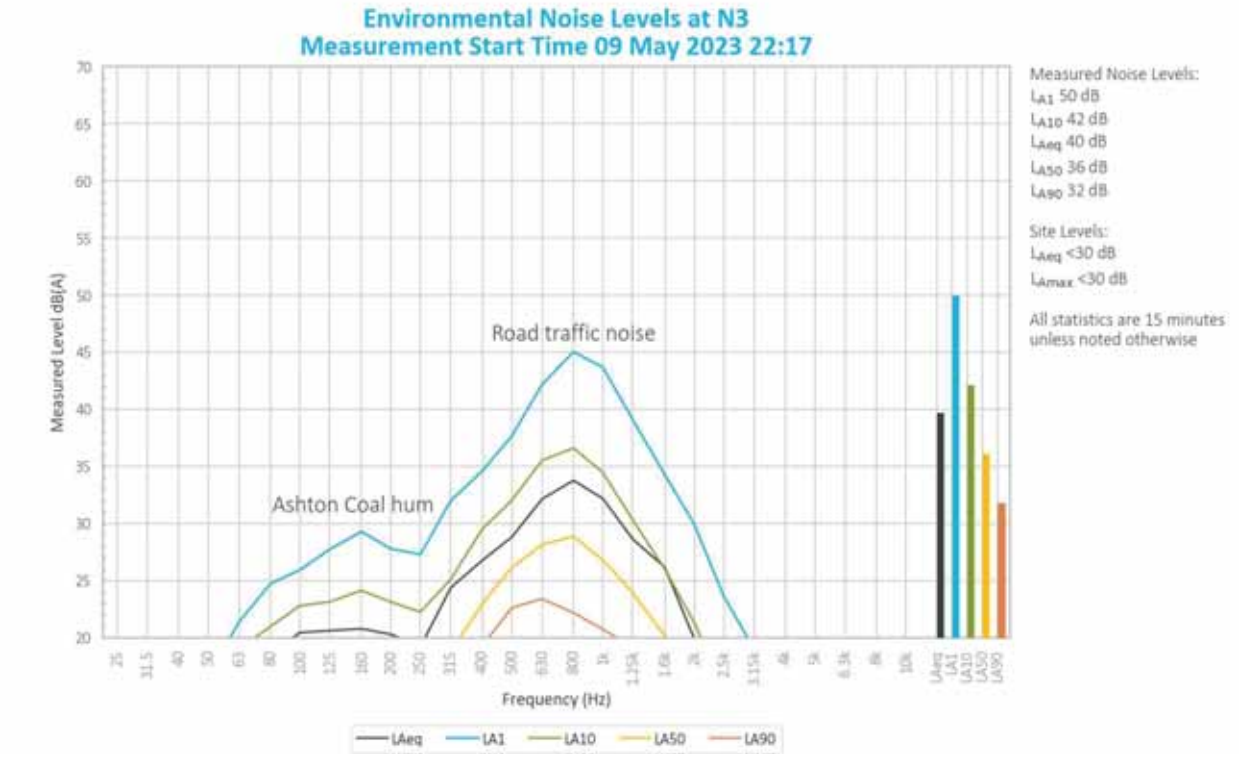


Figure 5.3 Environmental Noise Levels – N3, Camberwell Village (North-East)

Ashton Coal conveyor hum was consistently audible throughout the entire measurement, generating an Ashton Coal $L_{Aeq,15minute}$ of <30 dB $L_{Aeq,15minute}$. Conveyor hum was also responsible for the Ashton Coal $L_{A1,1minute}$ of <30 dB $L_{A1,1minute}$.

Road traffic was the primary source of noise observed.

Noise from insects, birds, nearby animals, dogs barking and a train on the main line (unrelated to Ashton Coal) was also noted. No noise from other mines in the vicinity was noted.

5.3.1 Cumulative mining noise at N3

Other mining operations were inaudible and, therefore, did not contribute to any mining noise at this location.

5.4 N4

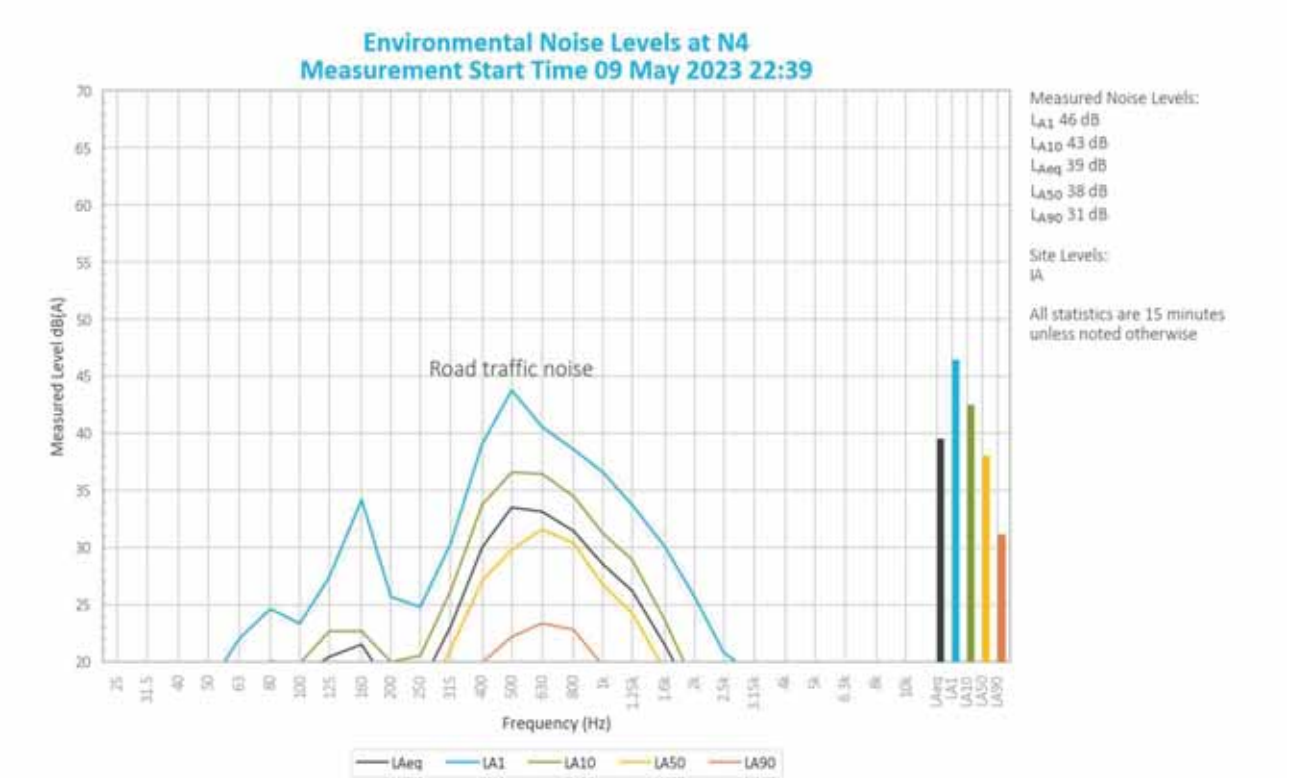


Figure 5.4 Environmental Noise Levels – N4, South of New England Highway

Ashton Coal operations were inaudible during the entire measurement. Given this and the measured background noise level, Ashton Coal was estimated to be below the relevant noise limits.

Road traffic was primarily responsible for all measured noise levels.

Noise from insects and livestock was also noted. No noise from other mines in the vicinity was noted.

5.4.1 Cumulative mining noise at N4

Ashton Coal was inaudible and, therefore, did not contribute to any mining noise at this location.

6 Summary

EMM Consulting Pty Ltd (EMM) was engaged by Ashton Coal Operations Pty Ltd to conduct a monthly noise survey of operations at Ashton Coal. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified noise limits.

Attended environmental noise monitoring described in this report was done during the night period on Tuesday 9 May 2023 at three monitoring locations.

Noise levels from site complied with relevant limits at all monitoring locations during the May 2023 survey.

Appendix A

Noise perception and examples

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A.1 Noise levels

Table A.1 gives an indication as to how an average person perceives changes in noise level. Examples of common noise levels are provided in Figure A.1.

Table A.1 Perceived change in noise

Change in sound pressure level (dB)	Perceived change in noise
up to 2	Not perceptible
3	Just perceptible
5	Noticeable difference
10	Twice (or half) as loud
15	Large change
20	Four times (or quarter) as loud

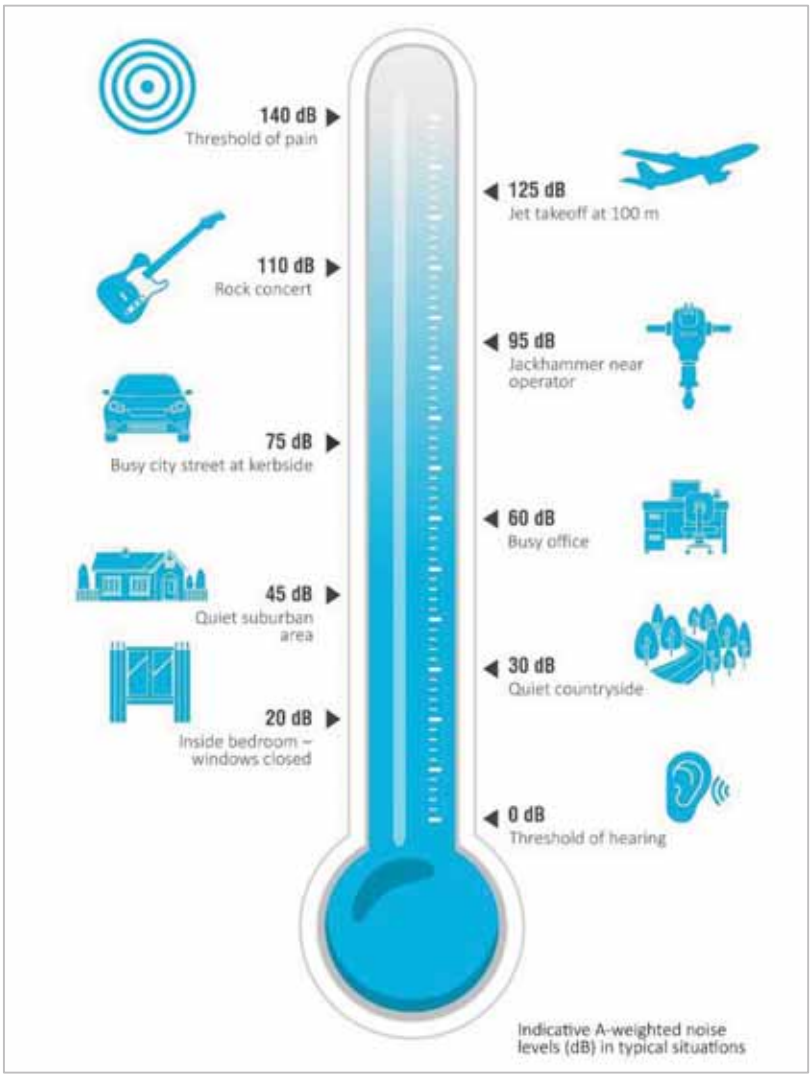

Figure A.1 Common noise levels

Appendix B
Regulator documents

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B.1 Project approval

APPENDIX 6

ALTERNATE NOISE CONDITIONS

NOISE

Application

1. Conditions 2 to 3 below have effect during times when open cut mining operations are not being undertaken at the Ashton Mine Complex, in the opinion of the Planning Secretary.

Noise Criteria

2. Except for the noise-affected land in Table 1 of Schedule 3, the Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 1 at any residence on privately-owned land or on more than 25 per cent of any privately-owned land.

Table 1: Noise Criteria dB(A)

Receiver No.	***Receiver***	***Day*** ($L_{Aeq\ (15min)}$)	***Evening*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{A1\ (1\ min)}$)
-	All privately-owned land	38	38	36	46

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy*. Appendix 8 sets out the requirements for evaluating compliance with these criteria.

However, these noise criteria do not apply if the Applicant has an agreement with the relevant owner/s of the residence/land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Additional Noise Mitigation Measures

3. Upon receiving a written request from the owner of any residence on any privately-owned land where subsequent operational noise monitoring shows the noise generated by the development exceeds the noise limits in Table 2, the Applicant must implement additional reasonable and feasible noise mitigation measures (such as double glazing, insulation, and/or air conditioning) at the residence in consultation with the owner.

If within 3 months of receiving this request from the landowner, the Applicant and the landowner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Planning Secretary for resolution.

Table 2: Additional Noise Mitigation Criteria dB(A) $L_{Aeq\ (15min)}$

Receiver No.	***Receiver***	***Day*** ($L_{Aeq\ (15min)}$)	***Evening*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{Aeq\ (15min)}$)
-	All privately-owned land	38	38	38

Notes:

- *Noise generated by the development is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 8 sets out the requirements for evaluating compliance with these criteria.*
- *For this condition to apply, the exceedance of the criteria must be systemic.*

APPENDIX 8

NOISE COMPLIANCE ASSESSMENT

Compliance Monitoring

1. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this approval.

2. Data collected for the purposes of determining compliance with the relevant conditions of this approval is to be excluded under the following meteorological conditions:
   a) during periods of rain or hail;
   b) average wind speed at microphone height exceeds 5 m/s;
   c) wind speeds greater than 3 m/s measures at 10 m above ground level; and
   d) temperature inversion conditions greater than 3°C/100m.

3. Unless otherwise agreed with the Planning Secretary, this monitoring is to be carried out in accordance with the relevant requirements relating for reviewing performance set out in the NSW Industrial Noise Policy (as amended from time to time), in particular the requirements relating to:
   a) monitoring locations for the collection of representative noise data;
   b) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
   c) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

4. To the extent that there is any inconsistency between the Industrial Noise Policy and the requirements set out in this Appendix, the Appendix prevails to the extent of the inconsistency.

Determination of Meteorological Conditions

5. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located in the vicinity of the site (as required by condition 18 of Schedule 3).

B.2 Environmental protection licence

Environment Protection Licence

24	Groundwater monitoring	Monitoring up-gradient of Glennies Creek alluvium at coordinates 319294, 6404588 (Easting, Northing), identified as WML120B in Figure 1.
25	Groundwater monitoring	Monitoring mid-gradient of Glennies Creek alluvium at coordinates 319468, 6403528 (Easting, Northing), identified as WML129 in Figure 1.
26	Groundwater monitoring	Monitoring down-gradient of Glennies Creek alluvium at coordinates 318965, 6402842 (Easting, Northing), identified as WMLP336 in Figure 1.
27	Groundwater monitoring	Monitoring up-gradient of Barrett coal seam at coordinates 318431, 6407214 (Easting, Northing), identified as GM1 in Figure 1.
28	Groundwater monitoring	Monitoring up-gradient of Pikes Gully coal seam at coordinates 319292, 6404580 (Easting, Northing), identified as WML120A in Figure 1.
29	Groundwater monitoring	Monitoring mid-gradient of Pikes Gully coal seam at coordinates 319220, 6403928 (Easting, Northing), identified as WML262 in Figure 1.
30	Groundwater monitoring	Monitoring up-gradient of Upper Liddell coal seam at coordinates 319215, 6403958 (Easting, Northing), identified as WML181 in Figure 1.
31	Groundwater monitoring	Monitoring mid-gradient of Upper Liddell coal seam at coordinates 319188, 6404325 (Easting, Northing), identified as WML183 in Figure 1.

P1.4 The following points referred to in the table below are identified in this licence for the purposes of weather and/or noise monitoring and/or setting limits for the emission of noise from the premises.

Noise/Weather

EPA identification no.	Type of monitoring point	Location description
12	Meteorological Station – to determine meteorological conditions for noise monitoring	Meteorological monitoring at coordinates 320522, 6406815 (Easting, Northing), identified as Repeater on Figure 2.
13	Noise monitoring	Monitoring at coordinates 320554, 6405839 (Easting, Northing), identified as N3 on Figure 2 and representative of Noise Assessment Group 2.

14	Noise monitoring	Monitoring at coordinates 320297, 6405670 (Easting, Northing), identified as N2 on Figure 2 and representative of Noise Assessment Group 1.
15	Noise monitoring	Monitoring at coordinates 319776, 6404101 (Easting, Northing), identified as N4 on Figure 2 and representative of Noise Assessment Group 3.
32	Meteorological Station – to determine meteorological conditions for noise monitoring	Monitoring of temperature at 'M1' at coordinates 320259, 6405971 (Easting, Northing).

P1.5 For the purposes of Condition P1.1, P1.2 and P1.3, Figure 1 refers to the plan titled "Ashton Underground Mine Environment Protection licence 11879 Premises Boundary, Surface Infrastructure" dated 30/08/19 (EPA reference DOC19/761196).

P1.6 For the purpose of Condition P1.4, Figure 2 refers to the plan titled "Ashton Underground Mine Environment Protection licence 11879 Premises Boundary, Monitoring" dated 30/08/19 (EPA reference DOC19/761196).

P1.7 The datum for grid references in this Licence is the Geodetic Datum of Australia 1994 (GDA94), Zone 56.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

L2.1 Flares must be operated by the licensee such that there is no visible emission other than for a total period of no more than 5 minutes in any 2 hours, except for heat haze.

L3 Waste

L3.1 The licensee must not cause, permit or allow any waste to be received at the premises unless specified in this licence.

L3.2 The Licensee must not dispose of waste on the premises unless authorised by a condition of this Licence.

L4 Noise limits

L4.1 Noise from the premises must not exceed the noise limits specified in the table below.

Residences referenced in this table are from the consent DA 309-11-2001-i and summarised in the EPA

reference DOC19/761196.

Location	Day LAeq(15 minute)	Evening LAeq(15 minute)	Night LAeq(15 minute)	Night LAeq(1 minute)
EPA Point 13	38	38	36	46
EPA Point 14	38	38	36	46
EPA Point 15	38	38	36	46
All other privately owned residences	38	38	36	46

L4.2 For the purpose of Condition L4.1:
a) Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays,
b) Evening is defined as the period from 6pm to 10pm, and
c) Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays

L4.3 The noise emission limits identified in condition L4.1 apply under the following meteorological conditions:

a) wind speeds up to 3m/s at 10m above ground level; and
b) temperature inversion conditions up to 3 degrees C/100m.

L4.4 For the purposes of condition L4.1:

a) Data recorded by the closest and most representative meteorological station installed on the premises at EPA Identification Point 12 must be used to determine meteorological conditions; and
b) Temperature inversion conditions (stability category) are to be determined by the methods referred to in Fact Sheet D of the Noise Policy for Industry (2017) using EPA Identification Points 12 and 32.

4 Operating Conditions

O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.
This includes:
a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
a) must be maintained in a proper and efficient condition; and
b) must be operated in a proper and efficient manner.

B.3 Noise management plan

Relevant parts of the DA have been reproduced in Appendix A along with reference to where they have been addressed in this document.

4.2 Applicable Criteria

Noise criteria for the ACP are divided into three categories:

- Impact assessment criteria;
- Additional noise mitigation criteria; and
- Cumulative noise acquisition criteria.

The RUM must adhere to a single set of noise criteria relating to noise generated by the RUM development.

4.2.1 Impact Assessment Criteria

In accordance with Condition 2, Appendix 6 of the Ashton DA and Condition L4.1 of EPL 11879, noise generated by the development within the ACP must not exceed the limits specified in **Table 3** at any privately-owned land or on more than 25 per cent of any privately-owned land. The noise limits are provided in decibels (dB).

Table 3: Ashton Noise Impact Criteria dB(A)

Location	Day	Evening	Night	
	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{A1} (1 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	38	38	36	46

In accordance with Condition 12, Schedule 3 of the RUM DA, noise generated by development in the ACOL-operated RUM must not exceed the limits specified in **Table 4** at any residence on privately-owned land or on more than 25 per cent of any privately-owned land.

Table 4 RUM Noise Impact Criteria dB(A)

Location	Day	Evening	Night	
	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{A1} (1 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	35	35	35	45

4.2.2 Additional Noise Mitigation Criteria

If noise emissions generated by the ACP exceed the criteria displayed in **Table 5** at any residence on privately-owned land, then, upon receiving a written request from the landowner, ACOL will implement additional reasonable and feasible noise mitigation measures (such as double glazing, insulation and/or air conditioning) at the residence in consultation with the owner.

Table 5 Additional Noise Mitigation Criteria dB(A)#

Location	Day	Evening	Night
	LAeq (15 minute)	LAeq (15 minute)	LAeq (15 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	38	38	38

* Exceedance of the criteria must be systemic.

4.2.3 Cumulative Noise Acquisition Criteria

If noise emissions generated by the ACP, and other mines exceed the criteria in **Table 6** at any residence on privately-owned land or on more than 25 per cent of any privately-owned land (except for noise affected residential receivers in Condition 1, Schedule 3 of the Ashton DA) then, upon receiving a written request for acquisition from the landowner, ACOL together with the relevant mines, will acquire the land in accordance with the Acquisition Process (as defined in Conditions 7 and 8, Schedule 4 of the Ashton DA).

Table 6 Cumulative Noise Acquisition Criteria dB(A)

Location	Day	Evening	Night
	LAeq (period)	LAeq (period)	LAeq (period)
Camberwell Village	60	50	45
All other privately-owned land	55	50	45

4.3 Existing Environment

The ACP is located in the Hunter Valley region of New South Wales and is bound by the Main Northern Railway to the north, Hunter River to the south and Glennies Creek to the east with the New England Highway dividing the open cut from the underground mining areas.

Other mining operations in the area include the Ravensworth Complex, the Mount Owen Complex, Rix's Creek Open Cut, Integra Underground and Hunter Valley Operations.

The closest sensitive receivers are located in Camberwell. There are currently 13 private landholdings in the local area, 11 of these have an occupied residence.

Ambient noise levels within the village of Camberwell are influenced by the New England Highway to the south, the railway line to the northeast and surrounding mining operations. Attended noise monitoring has confirmed that the major contributing noise source is usually the New England Highway. Noise from ACP has been noted at times in Camberwell Village, historical reports show this has been infrequent and at relatively low levels.

Based on the historical meteorological data collected by ACOL's M2 (repeater) weather station the most common winds in winter are from the west-northwest and the east-southeast in summer. Prevailing winds act to enhance noise from surrounding noise sources (road, rail and mining).

Appendix C
Calibration certificates

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C33872

EQUIPMENT TESTED : Sound Level Calibrator

Manufacturer: Svantek
Type No: SV-36 **Serial No:** 79952
Owner: EMM Consulting Pty Ltd
L3, 175 Scott Street
Newcastle, NSW 2300
Tests Performed: Measured Output Pressure level, Frequency & Distortion
Comments: See Details overleaf. All Test Passed.

Parameter	Pre-Adj	Adj Y/N	Output: (dB re 20 µPa)	Frequency (Hz)	THD&N (%)
Level1:	NA	N	94.09 dB	1000.00 Hz	1.12 %
Level2:	NA	N	114.06 dB	1000.00 Hz	0.71 %
Uncertainty			±0.11 dB	±0.05%	±0.20 %
Uncertainty (at 95% c.l.) k=2					

CONDITION OF TEST:

Ambient Pressure 1004 hPa ±1 hPa
Temperature 23 °C ±1° C
Relative Humidity 55 % ±5%

Date of Receipt : 26/09/2022
Date of Calibration : 29/09/2022
Date of Issue : 29/09/2022

Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2017

CHECKED BY: .....

AUTHORISED SIGNATURE: .....
Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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Acu-Vib Electronics
CALIBRATIONS SALES RENTALS REPAIRS

Head Office & Calibration Laboratory
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
(02) 9680 8133
www.acu-vib.com.au

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM31670

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	B & K		
Type No:	2250	**Serial No:**	2759405
Mic. Type:	4189	**Serial No:**	2983733
Pre-Amp. Type:	ZC0032	**Serial No:**	22666
Filter Type:	1/3 Octave	**Test No:**	F031671

Owner: EMM Consulting
Level 3, 175 Scott Street
Newcastle, NSW 2300

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	992	hPa ±1 hPa	**Date of Receipt :**	02/02/2022
Temperature	26	°C ±1° C	**Date of Calibration :**	02/02/2022
Relative Humidity	48	% ±5%	**Date of Issue :**	03/02/2022

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

Jack Kidt

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

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Appendix F

Monthly attended noise monitoring report – June 2023

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Ashton Coal

Monthly attended noise monitoring - June 2023

Prepared for Ashton Coal Operations Pty Ltd

June 2023

Ashton Coal

Monthly attended noise monitoring - June 2023

Ashton Coal Operations Pty Ltd

E221164 RP6

June 2023

Version	Date	Prepared by	Reviewed by	Comments
1	5 June 2023	Lucas Adamson	Najah Ishac	Draft
2	27 June 2023	Lucas Adamson	Najah Ishac	Final

Approved by

Najah Ishac
Director
5 June 2023

Level 3 175 Scott Street
Newcastle NSW 2300

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Appendices

Tables

Figures

1 Introduction

1.1 Background

EMM Consulting Pty Ltd (EMM) was engaged by Ashton Coal Operations Pty Ltd to conduct a monthly noise survey of operations at Ashton Coal Operations (Ashton Coal, the site) located at Glennies Creek Rd, Camberwell NSW. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified limits.

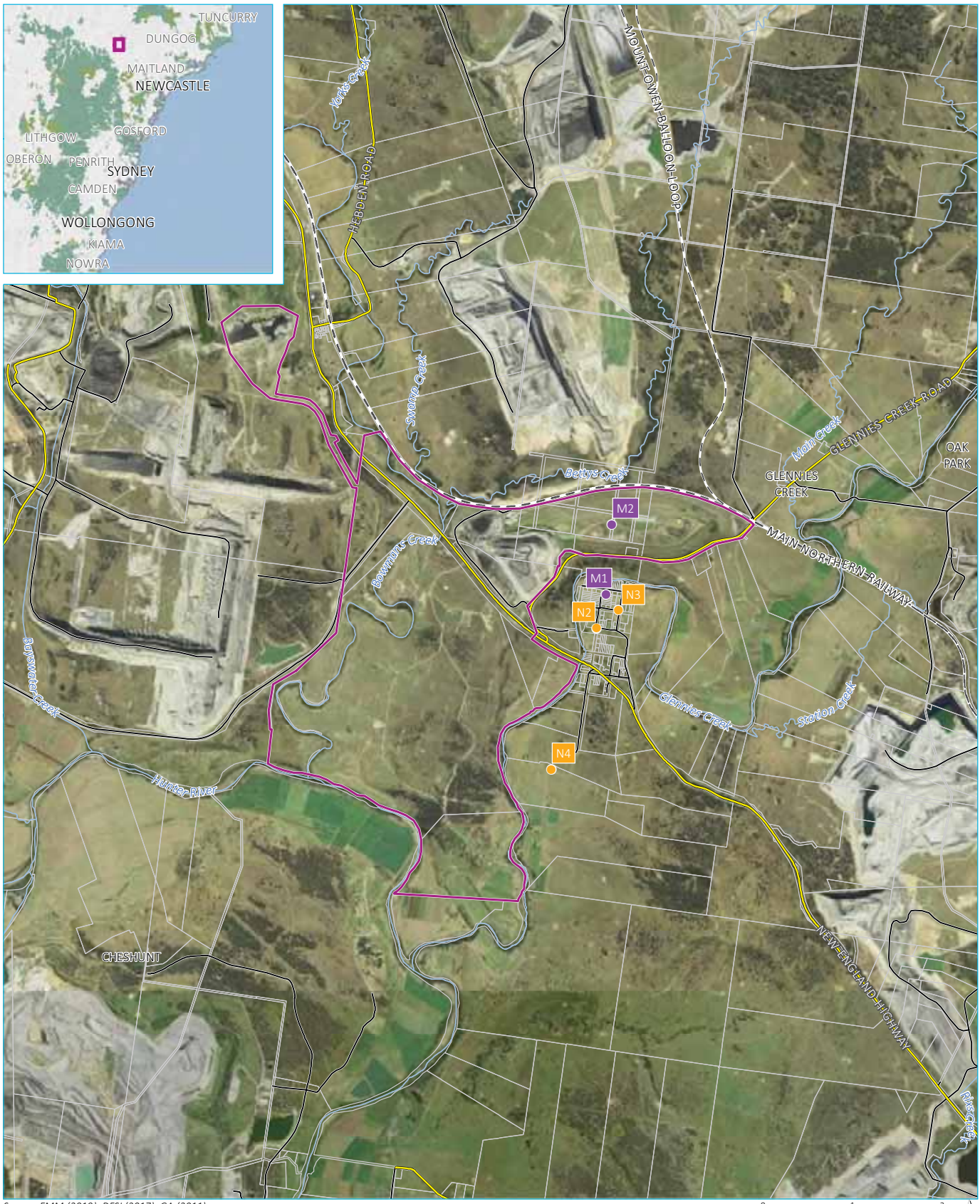
Attended environmental noise monitoring described in this report was conducted during the night period of Thursday 1 June 2023 at three monitoring locations.

1.2 Attended monitoring locations

Site monitoring locations are detailed in Table 1.1 and shown on Figure 1.1. It should be noted that Figure 1.1 shows actual monitoring positions, not necessarily the location of residences.

Table 1.1 Attended noise monitoring locations

Location descriptor/ID	Description/address	Coordinates (MGA56)	
		Easting	Northing
N2	Camberwell Village (west)	320297	6405670
N3	Camberwell Village (north-east)	320554	6405839
N4	South of New England Highway	319776	6404101



Source: EMM (2019); DFSI (2017); GA (2011)

0 1 2 km

GDA 1994 MGA Zone 56

N

\\emmsvr1\EMM\Jobs\2019\H190081 - Ashton Coal Noise Monitoring\8 GIS\02_Maps\N001_NoiseMonitoring_20190312_02.mxd 12/03/2019

KEY

- Site boundary
- Noise monitoring location
- Meteorological station
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Cadastral boundary

Noise monitoring locations and Ashton colliery boundary

Ashton Coal
Monthly attended noise monitoring
Figure 1.1

EMM
creating opportunities

1.3 Terminology and abbreviations

Some definitions of terms and abbreviations which may be used in this report are provided in Table 1.2.

Table 1.2 Terminology and abbreviations

Term/descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to approximate how humans hear noise.
L_{Amax}	The maximum root mean squared A-weighted noise level over a time period.
L_{A1}	The A-weighted noise level which is exceeded for 1 per cent of the time.
$L_{A1,1minute}$	The A-weighted noise level which is exceeded for 1 per cent of the specified time period of 1 minute.
L_{A10}	The A-weighted noise level which is exceeded for 10 percent of the time.
L_{Aeq}	The energy average A-weighted noise level.
L_{A50}	The A-weighted noise level which is exceeded for 50 per cent of the time, also the median noise level during a measurement period.
L_{A90}	The A-weighted noise level exceeded for 90 percent of the time, also referred to as the "background" noise level and commonly used to derive noise limits.
L_{Amin}	The minimum A-weighted noise level over a time period.
L_{Ceq}	The energy average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	Monday – Saturday: 7 am to 6 pm, on Sundays and Public Holidays: 8 am to 6 pm.
Evening	Monday – Saturday: 6 pm to 10 pm, on Sundays and Public Holidays: 6 pm to 10 pm.
Night	Monday – Saturday: 10 pm to 7 am, on Sundays and Public Holidays: 10 pm to 8 am.
Temperature inversion	A meteorological condition where the atmospheric temperature increases with altitude.

Appendix A provides further information that gives an indication as to how an average person perceives changes in noise level, and examples of common noise levels.

2 Noise limits

2.1 Development consent

Ashton Coal noise limits are provided in Table 1, Condition 2 of Appendix 6 of development consent 309-11-2001-I (DC). Relevant sections of the DC are reproduced in Appendix B.1.

2.2 Environment protection licence

Ashton Coal noise limits are provided in Condition L4.1 of EPL 11879 (EPL). Relevant sections of the EPL are reproduced in Appendix B.2.

2.3 Noise management plan

The approved NMP adopts three attended noise monitoring locations that are representative of residences outlined in the DC and EPL. Relevant sections of the NMP are reproduced in Appendix B.3.

2.4 Noise limits

Noise limits based on the NMP are as shown in Table 2.1.

Table 2.1 Noise impact limits, dB

Location	Day $L_{Aeq,15minute}$	Evening $L_{Aeq,15minute}$	Night $L_{Aeq,15minute}$	Night $L_{A1,1minute}$
N2	38	38	36	46
N3	38	38	36	46
N4	38	38	36	46

2.5 Meteorological conditions

The DC and EPL specify the following meteorological conditions under which noise limits do not apply:

- during periods of rain or hail
- average wind speed at microphone height exceeds 5 metres per second (m/s)
- wind speeds greater than 3 m/s at 10 metres above ground level
- temperature inversion conditions greater than 3°C/100 m.

2.6 Additional requirements

Monitoring and reporting have been done in accordance with the NSW EPA 'Noise Policy for Industry' (NPfI) issued in October 2017 and the 'Approved methods for the measurement and analysis of environmental noise in NSW' (Approved Methods) issued in January 2022.

3 Methodology

3.1 Overview

Attended environmental noise monitoring was done in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant EPA requirements. Meteorological data was obtained from the Ashton Coal on-site weather station (AWS) which allowed correlation of atmospheric parameters with measured noise levels.

3.2 Attended noise monitoring

During this survey, attended noise monitoring was conducted during the night period at each location. The duration of each measurement was 15 minutes. Atmospheric conditions were measured at each monitoring location.

Measured sound levels from various sources were noted during each measurement, and particular attention was paid to the extent of site's contribution (if any) to measured levels. At each monitoring location, the site only $L_{Aeq,15minute}$ and L_{Amax} were measured directly or determined by other methods detailed in Section 7.1 of the NPfI.

If the exact noise levels from site could not be established due to masking by other noise sources in a similar frequency range, but was determined to be at least 5 dB lower than relevant limits, then a maximum estimate of it may be provided. This is expressed as a 'less than' quantity, such as <20 dB or <30 dB.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. When site noise is noted as NM, this means site noise was audible but could not be quantified. All results noted as NM in this report were due to one or more of the following:

- Site noise levels were extremely low and unlikely, in many cases, to be noticed.
- Site noise levels were masked by other more dominant noise sources that are characteristic of the environment, such as breeze in foliage or continuous road traffic noise, that cannot be eliminated by monitoring at an alternate or intermediate location.
- It was not feasible or reasonable to employ methods such as move closer and back calculate. Cases may include rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

For this assessment, the measured L_{Amax} has been used as a conservative estimate of $L_{A1,1minute}$. The EPA accepts sleep disturbance analysis based on either the $L_{A1,1minute}$ or L_{Amax} metrics, with the L_{Amax} representing a more conservative assessment of site noise emissions.

3.3 Meteorological data

As per Condition L4.4, this assessment determined stability categories for the attended monitoring period using the direct measurement method as per Fact Sheet D of the Noise Policy for Industry (2017).

The temperature lapse rate between the two weather stations (M1 – Sentinex Unit 41 located in Camberwell Village and M2 – Ashton Coal 'repeater' meteorological station, the site AWS, located in the north-eastern open cut (NEOC) area) was calculated using the following formula:

$$\text{Temperature lapse rate} = (\Delta T) \times (100/(\Delta H))$$

Where:

- ΔT = temperature measured at M2 (at 10 metres above ground level) minus temperature measured at M1 (at 10 metres above ground level); and
- ΔH = the vertical height difference between M2 and M1 (equal to 73 metres).

3.4 Modifying factors

All measurements were evaluated for potential modifying factors in accordance with the NPfI. Assessment of modifying factors is done at the time of measurement if the site was audible and directly quantifiable. If applicable, modifying factor penalties have been reported and added to measured site only L_{Aeq} noise levels.

Low-frequency modifying factor penalties have only been applied to site-only L_{Aeq} levels if the site was the only contributing low-frequency noise source. Specific methodology for assessment of each modifying factor is outlined in Fact Sheet C of the NPfI.

3.5 Instrumentation

Equipment used to measure environmental noise levels is detailed in Table 3.1. Calibration certificates are provided in Appendix C.

Table 3.1 Attended noise monitoring equipment

Item	Serial number	Calibration due date	Relevant standard
Brüel & Kjær 2250 sound level meter	2759405	2/2/2024	IEC 61672-1:2002
Svantek SV-36 calibrator	79952	26/9/2024	IEC 60942

4 Results

4.1 Total measured noise levels and atmospheric conditions

Overall noise levels measured at each location during attended measurements are provided in Table 4.1. Discussion as to the noise sources responsible for measured levels is provided in Section 5 of this report.

Table 4.1 Total measured noise levels – June 2023[1]

Location	Start date	Time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB
N2	1/06/2023	22:00	63	58	51	48	42	37	33
N3	1/06/2023	22:17	64	47	43	40	37	34	31
N4	1/06/2023	22:39	65	50	45	41	37	33	29

Notes: 1. Levels in this table are not necessarily the result of activity at site.

Atmospheric condition data measured by the operator during each measurement using a hand-held weather meter is shown in Table 4.2. The wind speed, direction and temperature were measured at approximately 1.5 metres above ground. Attended noise monitoring is not done during rain, hail, or wind speeds above 5 m/s at microphone height.

Table 4.2 Atmospheric conditions measured at microphone height – June 2023

Location	Date	Time	Temperature °C	Wind speed m/s	Wind direction °Magnetic north	Cloud cover 1/8s
N2	1/06/2023	22:00	15.3	<0.5	-	0
N3	1/06/2023	22:17	15.1	<0.5	-	0
N4	1/06/2023	22:39	14.8	<0.5	-	0

4.2 Site only noise levels

4.2.1 Modifying factors

There were no modifying factors, as defined in the NPfI, applicable during the survey.

4.2.2 Monitoring results

Table 4.3 provides site noise levels in the absence of other sources, where possible, and includes weather data from the site AWS. Limits are applicable if weather conditions were within specified parameters during each measurement.

Table 4.3 Site noise levels and limits – June 2023

Location	Start Date	Time	Wind		Stability Class	Lapse rate (VTG) °C/100m	Limits apply?[1]	Limit, dB		Site level, dB [2]		Exceedance, dB	
			Speed m/s	Direction[4]				$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
N2	1/06/2023	22:00	1.5	302[0]	G	6.6	No	36	46	<30	33	N/A	N/A
N3	1/06/2023	22:17	1.6	291[0]	G	7.7	No	36	46	<29	33	N/A	N/A
N4	1/06/2023	22:39	1.7	294[0]	G	8.2	No	36	46	<27	<27	N/A	N/A

Notes:
1. Noise emission limits do not apply during periods of rainfall or winds greater than 3 metres per second (at a height of 10 metres).
2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties if applicable.
3. NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in project approval.
4. Degrees magnetic north, "-" indicates calm conditions.
5. IA in site level column means that the site was deemed inaudible at that location.

5 Discussion

5.1 Noted noise sources

During attended monitoring, the time variations (temporal characteristics) of noise sources are considered in each measurement via statistical descriptors. From these observations, summaries have been derived for the location and provided in this chapter. Statistical 1/3 octave-band analysis of environmental noise was undertaken, and the following figures display frequency ranges of various noise sources at each location for L_{A1}, L_{A10}, L_{Aeq}, L_{A50}, and L_{A90} descriptors. These figures also provide, graphically, statistical information for these noise levels.

An example is provided as Figure 5.1, where frogs and insects are seen to be generating noise at frequencies above 1000 Hz, while industrial noise is observed at frequencies less than 1000 Hz.

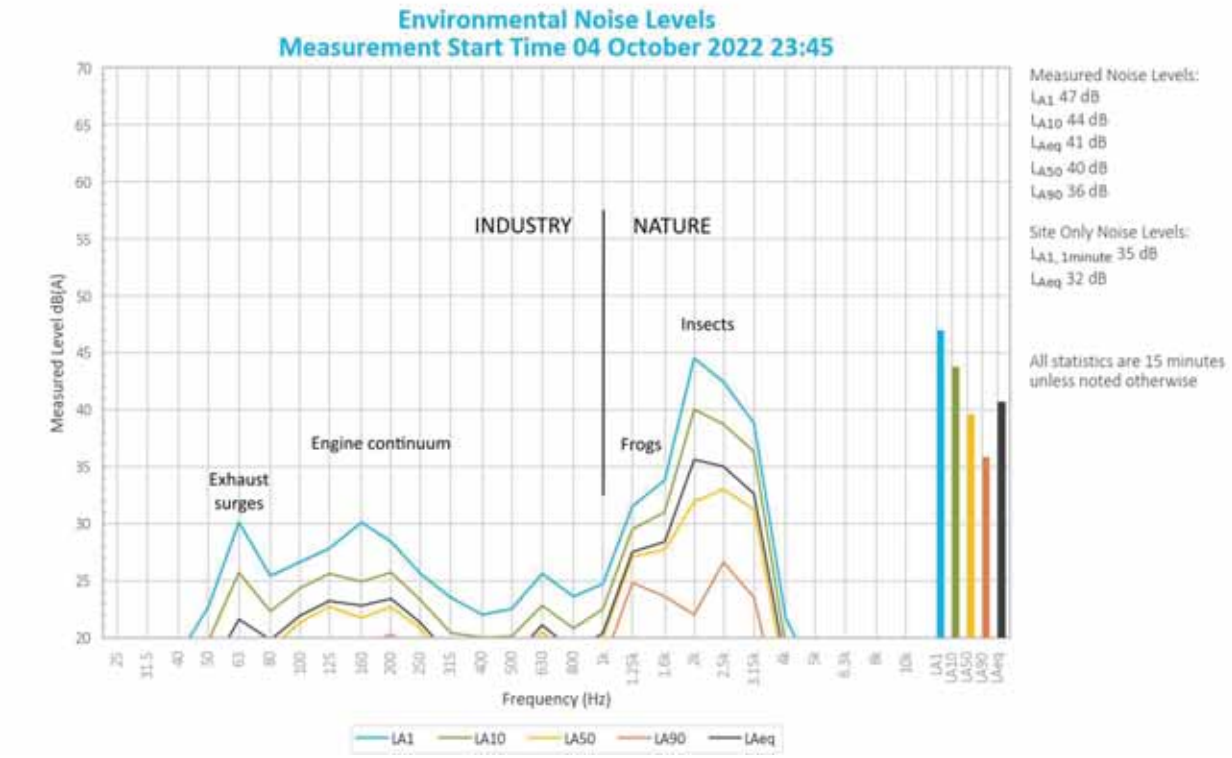


Figure 5.1 Example graph

5.2 N2

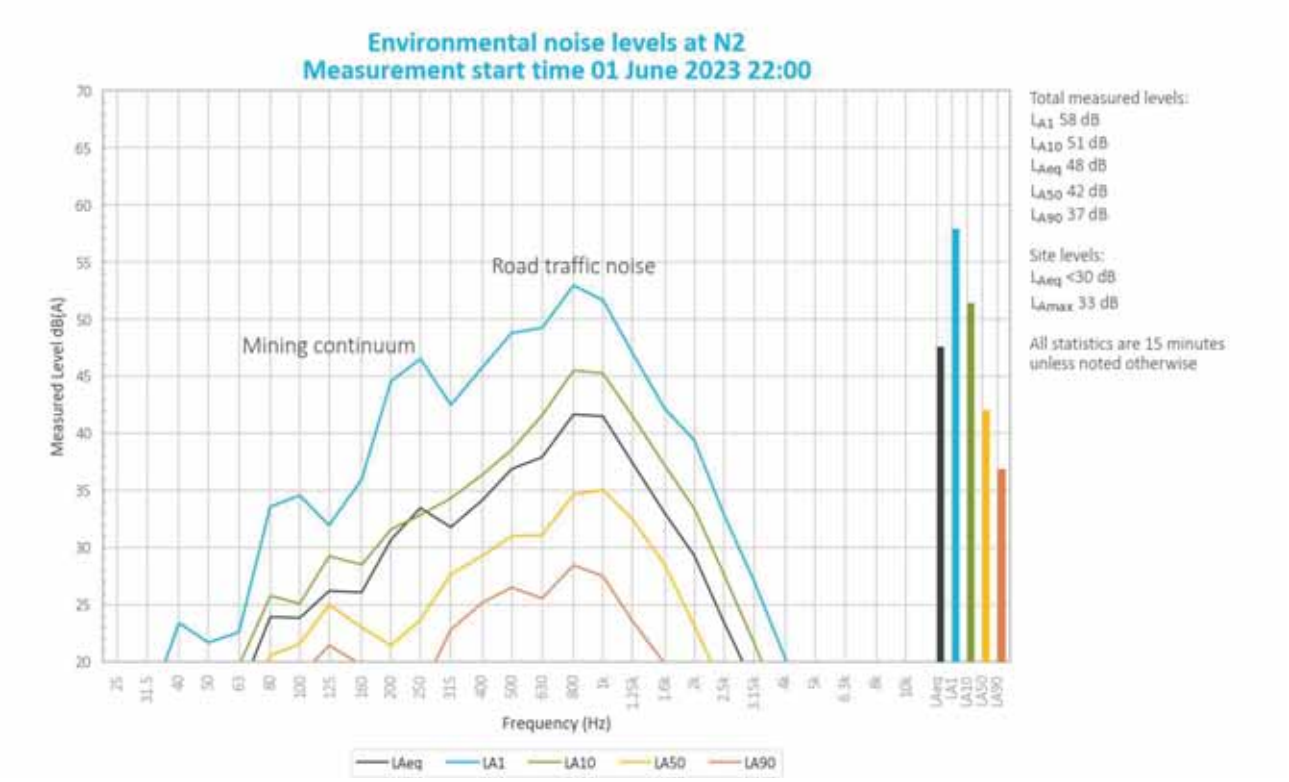


Figure 5.2 Environmental Noise Levels - N2, Camberwell Village (West)

Ashton Coal mine hum was consistently audible throughout the entire measurement, generating an Ashton Coal $L_{Aeq,15minute}$ of <30 dB $L_{Aeq,15minute}$. Engine Revs from site were responsible for the Ashton Coal L_{Amax} of 33 dB L_{Amax}.

Road traffic noise was primarily responsible for all measured levels.

Noise from insects, dogs barking, livestock and other mines in the vicinity (unrelated to Ashton Coal) was also noted.

5.2.1 Cumulative mining noise at N2

Other mining operations in the vicinity were consistently audible during the operator-attended noise survey at monitoring location N2. The cumulative mining noise level was estimated to be <30 dB $L_{Aeq,night}$ (i.e. Ashton Coal mine noise of <30 dB $L_{Aeq,15minute}$ + other mine noise of <30 dB $L_{Aeq,15minute}$ less 3 dB as per NPfI methodology) which is below the relevant 40 dB $L_{Aeq,night}$ limit. A graph of the total noise levels measured in the one-third octave frequency bands is shown in Figure 5.2.

5.3 N3

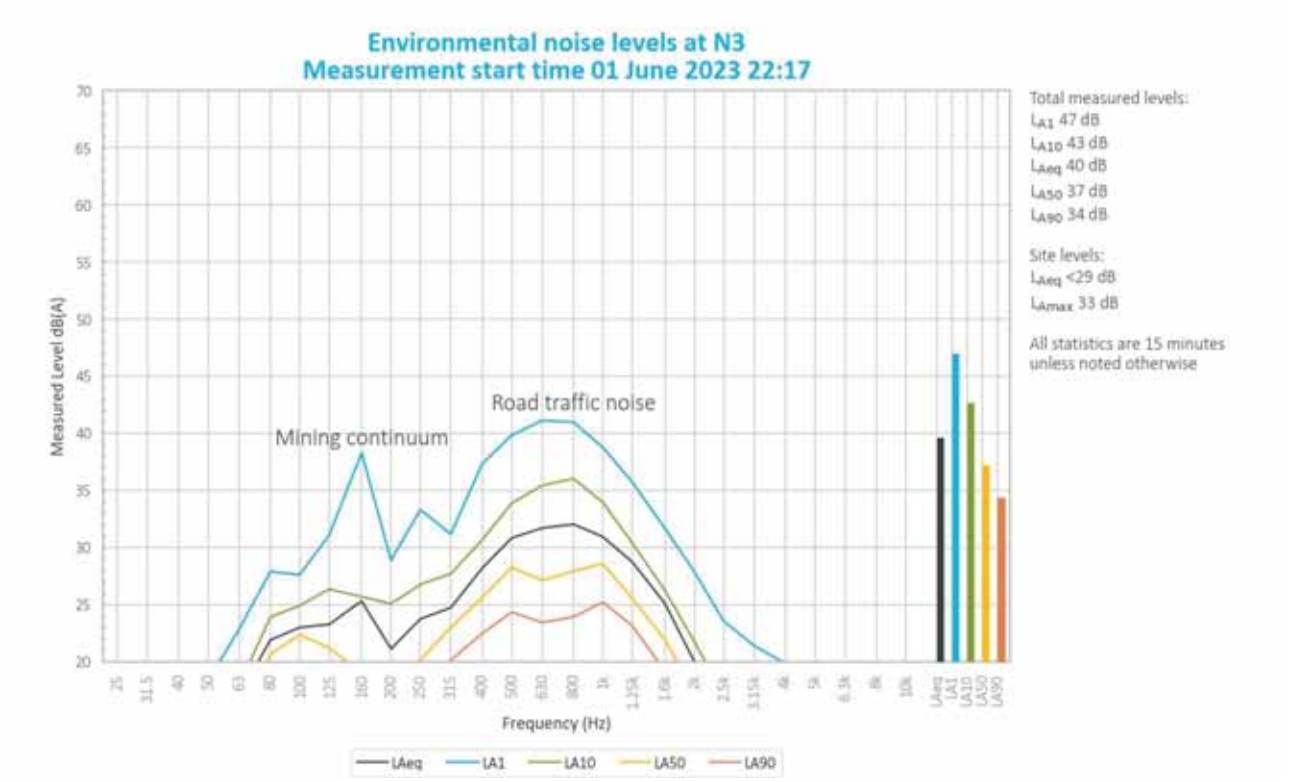


Figure 5.3 Environmental Noise Levels – N3, Camberwell Village (North-East)

Ashton Coal mine hum was consistently audible throughout the entire measurement, generating an Ashton Coal $L_{Aeq,15minute}$ of <29 dB $L_{Aeq,15minute}$. Engine revs from site were responsible for the Ashton Coal L_{Amax} of 33 dB L_{Amax}.

Road traffic noise was primarily responsible for all measured levels.

Noise from insects, dogs barking and other mines in the vicinity (unrelated to Ashton Coal) was also noted.

5.3.1 Cumulative mining noise at N3

Other mining operations in the vicinity were consistently audible during the operator-attended noise survey at monitoring location N3. The cumulative mining noise level was estimated to be <30 dB $L_{Aeq,night}$ (i.e. Ashton Coal mine noise of <29 dB $L_{Aeq,15minute}$ + other mine noise of <32 dB $L_{Aeq,15minute}$ less 3 dB as per NPfI methodology) which is below the relevant 40 dB $L_{Aeq,night}$ limit. A graph of the total noise levels measured in the one-third octave frequency bands is shown in Figure 5.3.

5.4 N4

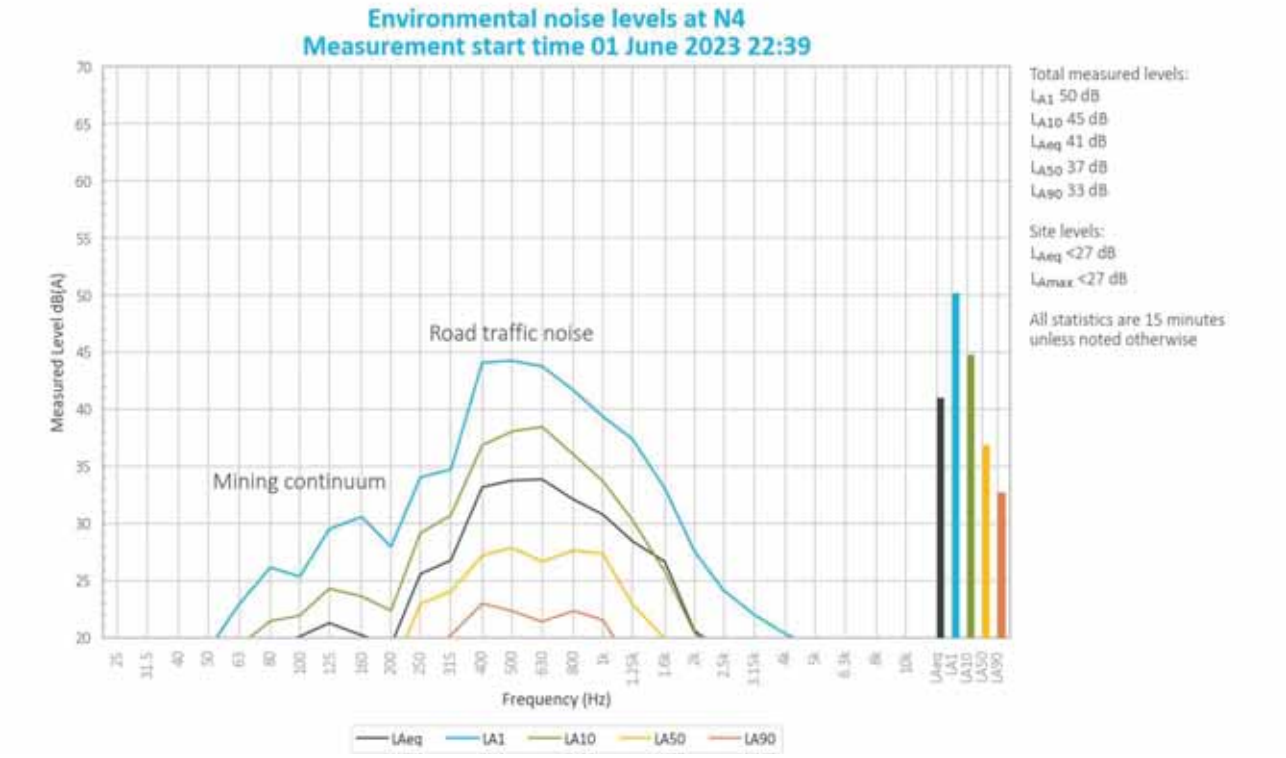


Figure 5.4 Environmental Noise Levels – N4, South of New England Highway

Ashton Coal mine hum was consistently audible throughout the entire measurement, generating an Ashton Coal $L_{Aeq,15minute}$ of <27 dB $L_{Aeq,15minute}$. Mine hum from site was also responsible for the Ashton Coal L_{Amax} of <27 dB L_{Amax}.

Road traffic noise was primarily responsible for all measured levels.

Noise from insects, a train on the main line (unrelated to Ashton Coal) and other mines in the vicinity (unrelated to Ashton Coal) was also noted.

5.4.1 Cumulative mining noise at N4

Other mining operations in the vicinity were consistently audible during the operator-attended noise survey at monitoring location N4. The cumulative mining noise level was estimated to be <28 dB $L_{Aeq,night}$ (i.e. Ashton Coal mine noise of <27 dB $L_{Aeq,15minute}$ + other mine noise of <30 dB $L_{Aeq,15minute}$ less 3 dB as per NPfI methodology) which is below the relevant 40 dB $L_{Aeq,night}$ limit. A graph of the total noise levels measured in the one-third octave frequency bands is shown in Figure 5.4.

6 Summary

EMM Consulting Pty Ltd (EMM) was engaged by Ashton Coal Operations Pty Ltd to conduct a monthly noise survey of operations at Ashton Coal. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified noise limits.

Attended environmental noise monitoring described in this report was done during the night period on Thursday 1 June 2023 at three monitoring locations.

Noise levels from site complied with relevant limits at all monitoring locations during the June 2023 survey.

Appendix A

Noise perception and examples

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A.1 Noise levels

Table A.1 gives an indication as to how an average person perceives changes in noise level. Examples of common noise levels are provided in Figure A.1.

Table A.1 Perceived change in noise

Change in sound pressure level (dB)	Perceived change in noise
up to 2	Not perceptible
3	Just perceptible
5	Noticeable difference
10	Twice (or half) as loud
15	Large change
20	Four times (or quarter) as loud

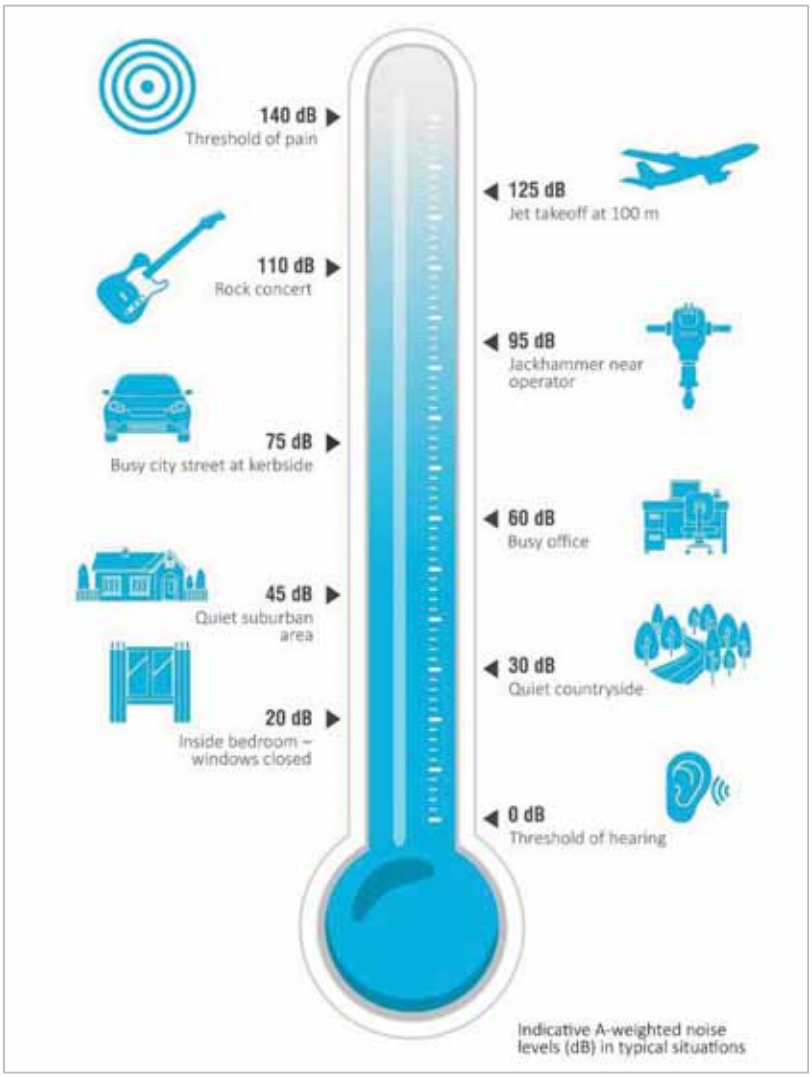

Figure A.1 Common noise levels

Appendix B
Regulator documents

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B.1 Project approval

APPENDIX 6

ALTERNATE NOISE CONDITIONS

NOISE

Application

1. Conditions 2 to 3 below have effect during times when open cut mining operations are not being undertaken at the Ashton Mine Complex, in the opinion of the Planning Secretary.

Noise Criteria

2. Except for the noise-affected land in Table 1 of Schedule 3, the Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 1 at any residence on privately-owned land or on more than 25 per cent of any privately-owned land.

Table 1: Noise Criteria dB(A)

Receiver No.	***Receiver***	***Day*** ($L_{Aeq\ (15min)}$)	***Evening*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{A1\ (1\ min)}$)
-	All privately-owned land	38	38	36	46

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy*. Appendix 8 sets out the requirements for evaluating compliance with these criteria.

However, these noise criteria do not apply if the Applicant has an agreement with the relevant owner/s of the residence/land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Additional Noise Mitigation Measures

3. Upon receiving a written request from the owner of any residence on any privately-owned land where subsequent operational noise monitoring shows the noise generated by the development exceeds the noise limits in Table 2, the Applicant must implement additional reasonable and feasible noise mitigation measures (such as double glazing, insulation, and/or air conditioning) at the residence in consultation with the owner.

If within 3 months of receiving this request from the landowner, the Applicant and the landowner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Planning Secretary for resolution.

Table 2: Additional Noise Mitigation Criteria dB(A) $L_{Aeq\ (15min)}$

Receiver No.	***Receiver***	***Day*** ($L_{Aeq\ (15min)}$)	***Evening*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{Aeq\ (15min)}$)
-	All privately-owned land	38	38	38

Notes:

- *Noise generated by the development is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 8 sets out the requirements for evaluating compliance with these criteria.*
- *For this condition to apply, the exceedance of the criteria must be systemic.*

APPENDIX 8

NOISE COMPLIANCE ASSESSMENT

Compliance Monitoring

1. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this approval.

2. Data collected for the purposes of determining compliance with the relevant conditions of this approval is to be excluded under the following meteorological conditions:
   a) during periods of rain or hail;
   b) average wind speed at microphone height exceeds 5 m/s;
   c) wind speeds greater than 3 m/s measures at 10 m above ground level; and
   d) temperature inversion conditions greater than 3°C/100m.

3. Unless otherwise agreed with the Planning Secretary, this monitoring is to be carried out in accordance with the relevant requirements relating for reviewing performance set out in the NSW Industrial Noise Policy (as amended from time to time), in particular the requirements relating to:
   a) monitoring locations for the collection of representative noise data;
   b) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
   c) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

4. To the extent that there is any inconsistency between the Industrial Noise Policy and the requirements set out in this Appendix, the Appendix prevails to the extent of the inconsistency.

Determination of Meteorological Conditions

5. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located in the vicinity of the site (as required by condition 18 of Schedule 3).

B.2 Environmental protection licence

Environment Protection Licence

24	Groundwater monitoring	Monitoring up-gradient of Glennies Creek alluvium at coordinates 319294, 6404588 (Easting, Northing), identified as WML120B in Figure 1.
25	Groundwater monitoring	Monitoring mid-gradient of Glennies Creek alluvium at coordinates 319468, 6403528 (Easting, Northing), identified as WML129 in Figure 1.
26	Groundwater monitoring	Monitoring down-gradient of Glennies Creek alluvium at coordinates 318965, 6402842 (Easting, Northing), identified as WMLP336 in Figure 1.
27	Groundwater monitoring	Monitoring up-gradient of Barrett coal seam at coordinates 318431, 6407214 (Easting, Northing), identified as GM1 in Figure 1.
28	Groundwater monitoring	Monitoring up-gradient of Pikes Gully coal seam at coordinates 319292, 6404580 (Easting, Northing), identified as WML120A in Figure 1.
29	Groundwater monitoring	Monitoring mid-gradient of Pikes Gully coal seam at coordinates 319220, 6403928 (Easting, Northing), identified as WML262 in Figure 1.
30	Groundwater monitoring	Monitoring up-gradient of Upper Liddell coal seam at coordinates 319215, 6403958 (Easting, Northing), identified as WML181 in Figure 1.
31	Groundwater monitoring	Monitoring mid-gradient of Upper Liddell coal seam at coordinates 319188, 6404325 (Easting, Northing), identified as WML183 in Figure 1.

P1.4 The following points referred to in the table below are identified in this licence for the purposes of weather and/or noise monitoring and/or setting limits for the emission of noise from the premises.

Noise/Weather

EPA identification no.	Type of monitoring point	Location description
12	Meteorological Station – to determine meteorological conditions for noise monitoring	Meteorological monitoring at coordinates 320522, 6406815 (Easting, Northing), identified as Repeater on Figure 2.
13	Noise monitoring	Monitoring at coordinates 320554, 6405839 (Easting, Northing), identified as N3 on Figure 2 and representative of Noise Assessment Group 2.

14	Noise monitoring	Monitoring at coordinates 320297, 6405670 (Easting, Northing), identified as N2 on Figure 2 and representative of Noise Assessment Group 1.
15	Noise monitoring	Monitoring at coordinates 319776, 6404101 (Easting, Northing), identified as N4 on Figure 2 and representative of Noise Assessment Group 3.
32	Meteorological Station – to determine meteorological conditions for noise monitoring	Monitoring of temperature at 'M1' at coordinates 320259, 6405971 (Easting, Northing).

P1.5 For the purposes of Condition P1.1, P1.2 and P1.3, Figure 1 refers to the plan titled "Ashton Underground Mine Environment Protection licence 11879 Premises Boundary, Surface Infrastructure" dated 30/08/19 (EPA reference DOC19/761196).

P1.6 For the purpose of Condition P1.4, Figure 2 refers to the plan titled "Ashton Underground Mine Environment Protection licence 11879 Premises Boundary, Monitoring" dated 30/08/19 (EPA reference DOC19/761196).

P1.7 The datum for grid references in this Licence is the Geodetic Datum of Australia 1994 (GDA94), Zone 56.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

L2.1 Flares must be operated by the licensee such that there is no visible emission other than for a total period of no more than 5 minutes in any 2 hours, except for heat haze.

L3 Waste

L3.1 The licensee must not cause, permit or allow any waste to be received at the premises unless specified in this licence.

L3.2 The Licensee must not dispose of waste on the premises unless authorised by a condition of this Licence.

L4 Noise limits

L4.1 Noise from the premises must not exceed the noise limits specified in the table below.

Residences referenced in this table are from the consent DA 309-11-2001-i and summarised in the EPA

reference DOC19/761196.

Location	Day LAeq(15 minute)	Evening LAeq(15 minute)	Night LAeq(15 minute)	Night LAeq(1 minute)
EPA Point 13	38	38	36	46
EPA Point 14	38	38	36	46
EPA Point 15	38	38	36	46
All other privately owned residences	38	38	36	46

L4.2 For the purpose of Condition L4.1:
a) Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays,
b) Evening is defined as the period from 6pm to 10pm, and
c) Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays

L4.3 The noise emission limits identified in condition L4.1 apply under the following meteorological conditions:

a) wind speeds up to 3m/s at 10m above ground level; and
b) temperature inversion conditions up to 3 degrees C/100m.

L4.4 For the purposes of condition L4.1:

a) Data recorded by the closest and most representative meteorological station installed on the premises at EPA Identification Point 12 must be used to determine meteorological conditions; and
b) Temperature inversion conditions (stability category) are to be determined by the methods referred to in Fact Sheet D of the Noise Policy for Industry (2017) using EPA Identification Points 12 and 32.

4 Operating Conditions

O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.
This includes:
a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
a) must be maintained in a proper and efficient condition; and
b) must be operated in a proper and efficient manner.

B.3 Noise management plan

Relevant parts of the DA have been reproduced in Appendix A along with reference to where they have been addressed in this document.

4.2 Applicable Criteria

Noise criteria for the ACP are divided into three categories:

- Impact assessment criteria;
- Additional noise mitigation criteria; and
- Cumulative noise acquisition criteria.

The RUM must adhere to a single set of noise criteria relating to noise generated by the RUM development.

4.2.1 Impact Assessment Criteria

In accordance with Condition 2, Appendix 6 of the Ashton DA and Condition L4.1 of EPL 11879, noise generated by the development within the ACP must not exceed the limits specified in **Table 3** at any privately-owned land or on more than 25 per cent of any privately-owned land. The noise limits are provided in decibels (dB).

Table 3: Ashton Noise Impact Criteria dB(A)

Location	Day	Evening	Night	
	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{A1} (1 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	38	38	36	46

In accordance with Condition 12, Schedule 3 of the RUM DA, noise generated by development in the ACOL-operated RUM must not exceed the limits specified in **Table 4** at any residence on privately-owned land or on more than 25 per cent of any privately-owned land.

Table 4 RUM Noise Impact Criteria dB(A)

Location	Day	Evening	Night	
	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{A1} (1 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	35	35	35	45

4.2.2 Additional Noise Mitigation Criteria

If noise emissions generated by the ACP exceed the criteria displayed in **Table 5** at any residence on privately-owned land, then, upon receiving a written request from the landowner, ACOL will implement additional reasonable and feasible noise mitigation measures (such as double glazing, insulation and/or air conditioning) at the residence in consultation with the owner.

Table 5 Additional Noise Mitigation Criteria dB(A)#

Location	Day	Evening	Night
	LAeq (15 minute)	LAeq (15 minute)	LAeq (15 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	38	38	38

* Exceedance of the criteria must be systemic.

4.2.3 Cumulative Noise Acquisition Criteria

If noise emissions generated by the ACP, and other mines exceed the criteria in **Table 6** at any residence on privately-owned land or on more than 25 per cent of any privately-owned land (except for noise affected residential receivers in Condition 1, Schedule 3 of the Ashton DA) then, upon receiving a written request for acquisition from the landowner, ACOL together with the relevant mines, will acquire the land in accordance with the Acquisition Process (as defined in Conditions 7 and 8, Schedule 4 of the Ashton DA).

Table 6 Cumulative Noise Acquisition Criteria dB(A)

Location	Day	Evening	Night
	LAeq (period)	LAeq (period)	LAeq (period)
Camberwell Village	60	50	45
All other privately-owned land	55	50	45

4.3 Existing Environment

The ACP is located in the Hunter Valley region of New South Wales and is bound by the Main Northern Railway to the north, Hunter River to the south and Glennies Creek to the east with the New England Highway dividing the open cut from the underground mining areas.

Other mining operations in the area include the Ravensworth Complex, the Mount Owen Complex, Rix's Creek Open Cut, Integra Underground and Hunter Valley Operations.

The closest sensitive receivers are located in Camberwell. There are currently 13 private landholdings in the local area, 11 of these have an occupied residence.

Ambient noise levels within the village of Camberwell are influenced by the New England Highway to the south, the railway line to the northeast and surrounding mining operations. Attended noise monitoring has confirmed that the major contributing noise source is usually the New England Highway. Noise from ACP has been noted at times in Camberwell Village, historical reports show this has been infrequent and at relatively low levels.

Based on the historical meteorological data collected by ACOL's M2 (repeater) weather station the most common winds in winter are from the west-northwest and the east-southeast in summer. Prevailing winds act to enhance noise from surrounding noise sources (road, rail and mining).

Appendix C
Calibration certificates

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C33872

EQUIPMENT TESTED : Sound Level Calibrator

Manufacturer: Svantek
Type No: SV-36 **Serial No:** 79952
Owner: EMM Consulting Pty Ltd
L3, 175 Scott Street
Newcastle, NSW 2300
Tests Performed: Measured Output Pressure level, Frequency & Distortion
Comments: See Details overleaf. All Test Passed.

Parameter	Pre-Adj	Adj Y/N	Output: (dB re 20 µPa)	Frequency (Hz)	THD&N (%)
Level1:	NA	N	94.09 dB	1000.00 Hz	1.12 %
Level2:	NA	N	114.06 dB	1000.00 Hz	0.71 %
Uncertainty			±0.11 dB	±0.05%	±0.20 %
Uncertainty (at 95% c.l.) k=2					

CONDITION OF TEST:

Ambient Pressure 1004 hPa ±1 hPa
Temperature 23 °C ±1° C
Relative Humidity 55 % ±5%

Date of Receipt : 26/09/2022
Date of Calibration : 29/09/2022
Date of Issue : 29/09/2022

Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2017

CHECKED BY: .....

AUTHORISED SIGNATURE: .....
Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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Head Office & Calibration Laboratory
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
(02) 9680 8133
www.acu-vib.com.au

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM31670

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	B & K		
Type No:	2250	**Serial No:**	2759405
Mic. Type:	4189	**Serial No:**	2983733
Pre-Amp. Type:	ZC0032	**Serial No:**	22666
Filter Type:	1/3 Octave	**Test No:**	F031671

Owner: EMM Consulting
Level 3, 175 Scott Street
Newcastle, NSW 2300

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	992	hPa ±1 hPa	**Date of Receipt :**	02/02/2022
Temperature	26	°C ±1° C	**Date of Calibration :**	02/02/2022
Relative Humidity	48	% ±5%	**Date of Issue :**	03/02/2022

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

Jack Kidt

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

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Spring Hill QLD 4000
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15 London Circuit
Canberra City ACT 2601

ADELAIDE
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Adelaide SA 5000
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Appendix G

Monthly attended noise monitoring report – July 2023

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Ashton Coal

Monthly attended noise monitoring - July 2023

Prepared for Ashton Coal Operations Pty Ltd

July 2023

Ashton Coal

Monthly attended noise monitoring - July 2023

Ashton Coal Operations Pty Ltd

E221164 RP7

July 2023

Version	Date	Prepared by	Reviewed by	Comments
1	7 July 2023	Lucas Adamson	Najah Ishac	Draft
2	10 July 2023	Lucas Adamson	Najah Ishac	Final

Approved by

Najah Ishac
Director
10 July 2023

Level 3 175 Scott Street
Newcastle NSW 2300

TABLE OF CONTENTS

Appendices

Tables

Figures

1 Introduction

1.1 Background

EMM Consulting Pty Ltd (EMM) was engaged by Ashton Coal Operations Pty Ltd to conduct a monthly noise survey of operations at Ashton Coal Operations (Ashton Coal, the site) located at Glennies Creek Rd, Camberwell NSW. The survey's purpose was to quantify the acoustic environment and compare site noise levels against specified limits.

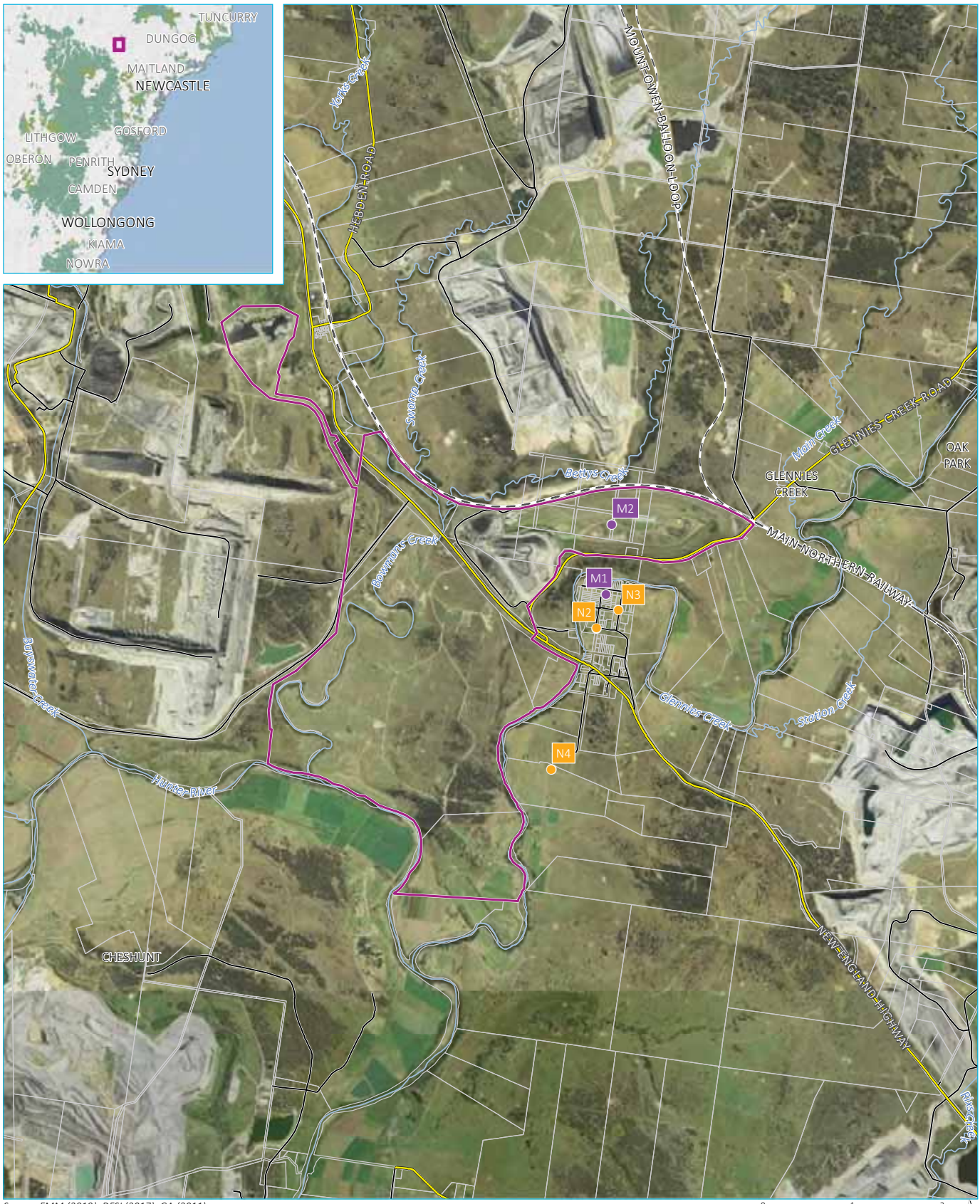
Attended environmental noise monitoring described in this report was conducted during the night period of Tuesday 4 July 2023 at three monitoring locations.

1.2 Attended monitoring locations

Site monitoring locations are detailed in Table 1.1 and shown on Figure 1.1. It should be noted that Figure 1.1 shows actual monitoring positions, not necessarily the location of residences.

Table 1.1 Attended noise monitoring locations

Location descriptor/ID	Description/address	Coordinates (MGA56)	
		Easting	Northing
N2	Camberwell Village (west)	320297	6405670
N3	Camberwell Village (north-east)	320554	6405839
N4	South of New England Highway	319776	6404101



Source: EMM (2019); DFSI (2017); GA (2011)

0 1 2 km

GDA 1994 MGA Zone 56

N

\\emmsvr1\EMM\Jobs\2019\H190081 - Ashton Coal Noise Monitoring\8 GIS\02_Maps\N001_NoiseMonitoring_20190312_02.mxd 12/03/2019

KEY

- Site boundary
- Noise monitoring location
- Meteorological station
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Cadastral boundary

Noise monitoring locations and Ashton colliery boundary

Ashton Coal
Monthly attended noise monitoring
Figure 1.1

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1.3 Terminology and abbreviations

Some definitions of terms and abbreviations which may be used in this report are provided in Table 1.2.

Table 1.2 Terminology and abbreviations

Term/descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to approximate how humans hear noise.
L_{Amax}	The maximum root mean squared A-weighted noise level over a time period.
L_{A1}	The A-weighted noise level which is exceeded for one per cent of the time.
$L_{A1,1minute}$	The A-weighted noise level which is exceeded for one per cent of the specified time period of one minute.
L_{A10}	The A-weighted noise level which is exceeded for 10 per cent of the time.
L_{Aeq}	The energy average A-weighted noise level.
L_{A50}	The A-weighted noise level which is exceeded for 50 per cent of the time, and is also the median noise level during a measurement period.
L_{A90}	The A-weighted noise level exceeded for 90 percent of the time, also referred to as the "background" noise level and commonly used to derive noise limits.
L_{Amin}	The minimum A-weighted noise level over a time period.
L_{Ceq}	The energy average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure are measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	The vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	Monday – Saturday: 7 am to 6 pm, on Sundays and Public Holidays: 8 am to 6 pm.
Evening	Monday – Saturday: 6 pm to 10 pm, on Sundays and Public Holidays: 6 pm to 10 pm.
Night	Monday – Saturday: 10 pm to 7 am, on Sundays and Public Holidays: 10 pm to 8 am.
Temperature inversion	A meteorological condition where the atmospheric temperature increases with altitude.

Appendix A provides further information that gives an indication as to how an average person perceives changes in noise level, and examples of common noise levels.

2 Noise limits

2.1 Development consent

Ashton Coal noise limits are provided in Table 1, Condition 2 of Appendix 6 of development consent 309-11-2001-I (DC). Relevant sections of the DC are reproduced in Appendix B.1.

2.2 Environment protection licence

Ashton Coal noise limits are provided in Condition L4.1 of EPL 11879 (EPL). Relevant sections of the EPL are reproduced in Appendix B.2.

2.3 Noise management plan

The approved NMP adopts three attended noise monitoring locations that are representative of residences outlined in the DC and EPL. Relevant sections of the NMP are reproduced in Appendix B.3.

2.4 Noise limits

Noise limits based on the NMP are as shown in Table 2.1.

Table 2.1 Noise impact limits, dB

Location	Day $L_{Aeq,15minute}$	Evening $L_{Aeq,15minute}$	Night $L_{Aeq,15minute}$	Night $L_{A1,1minute}$
N2	38	38	36	46
N3	38	38	36	46
N4	38	38	36	46

2.5 Meteorological conditions

The DC and EPL specify the following meteorological conditions under which noise limits do not apply:

- during periods of rain or hail
- average wind speed at microphone height exceeds 5 metres per second (m/s)
- wind speeds greater than 3 m/s at 10 metres above ground level
- temperature inversion conditions greater than 3°C/100 m.

2.6 Additional requirements

Monitoring and reporting have been done in accordance with the NSW EPA 'Noise Policy for Industry' (NPfI) issued in October 2017 and the 'Approved methods for the measurement and analysis of environmental noise in NSW' (Approved Methods) issued in January 2022.

3 Methodology

3.1 Overview

Attended environmental noise monitoring was done in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant EPA requirements. Meteorological data was obtained from the Ashton Coal on-site weather station (AWS) which allowed the correlation of atmospheric parameters with measured noise levels.

3.2 Attended noise monitoring

During this survey, attended noise monitoring was conducted during the night period at each location. The duration of each measurement was 15 minutes. Atmospheric conditions were measured at each monitoring location.

Measured sound levels from various sources were noted during each measurement, and particular attention was paid to the extent of the site's contribution (if any) to measured levels. At each monitoring location, the site-only $L_{Aeq,15minute}$ and L_{Amax} were measured directly or determined by other methods detailed in Section 7.1 of the NPfI.

If the exact noise levels from the site could not be established due to masking by other noise sources in a similar frequency range but was determined to be at least 5 dB lower than relevant limits, then a maximum estimate of it may be provided. This is expressed as a 'less than' quantity, such as <20 dB or <30 dB.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. When site noise is noted as NM, this means site noise was audible but could not be quantified. All results noted as NM in this report were due to one or more of the following:

- Site noise levels were extremely low and unlikely, in many cases, to be noticed.
- Site noise levels were masked by other more dominant noise sources that are characteristic of the environment, such as breeze in foliage or continuous road traffic noise, that cannot be eliminated by monitoring at an alternate or intermediate location.
- It was not feasible or reasonable to employ methods such as move closer and back calculate. Cases may include rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

For this assessment, the measured L_{Amax} has been used as a conservative estimate of $L_{A1,1minute}$. The EPA accepts sleep disturbance analysis based on either the $L_{A1,1minute}$ or L_{Amax} metrics, with the L_{Amax} representing a more conservative assessment of site noise emissions.

3.3 Meteorological data

As per Condition L4.4, this assessment determined stability categories for the attended monitoring period using the direct measurement method as per Fact Sheet D of the Noise Policy for Industry (2017).

The temperature lapse rate between the two weather stations (M1 – Sentinex Unit 40 located in Camberwell Village and M2 – Ashton Coal 'repeater' meteorological station, the site AWS, located in the north-eastern open cut (NEOC) area) was calculated using the following formula:

$$\text{Temperature lapse rate} = (\Delta T) \times (100/(\Delta H))$$

Where:

- ΔT = temperature measured at M2 (at 10 metres above ground level) minus temperature measured at M1 (at 10 metres above ground level); and
- ΔH = the vertical height difference between M2 and M1 (equal to 73 metres).

3.4 Modifying factors

All measurements were evaluated for potential modifying factors in accordance with the NPfI. Assessment of modifying factors is done at the time of measurement if the site was audible and directly quantifiable. If applicable, modifying factor penalties have been reported and added to the measured site only L_{Aeq} noise levels.

Low-frequency modifying factor penalties have only been applied to site-only L_{Aeq} levels if the site was the only contributing low-frequency noise source. Specific methodology for assessment of each modifying factor is outlined in Fact Sheet C of the NPfI.

3.5 Instrumentation

The equipment used to measure environmental noise levels is detailed in Table 3.1. Calibration certificates are provided in Appendix C.

Table 3.1 Attended noise monitoring equipment

Item	Serial number	Calibration due date	Relevant standard
Brüel & Kjær 2250 sound level meter	2759405	2/2/2024	IEC 61672-1:2002
Svantek SV-36 calibrator	79952	26/9/2024	IEC 60942

4 Results

4.1 Total measured noise levels and atmospheric conditions

Overall noise levels measured at each location during attended measurements are provided in Table 4.1. Discussion as to the noise sources responsible for measured levels is provided in Section 5 of this report.

Table 4.1 Total measured noise levels – July 2023[1]

Location	Start date	Time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB
N2	4/07/2023	00:14	66	54	46	43	37	32	28
N3	4/07/2023	00:31	65	47	42	39	36	33	30
N4	4/07/2023	00:52	68	40	35	34	31	30	28

Notes: 1. Levels in this table are not necessarily the result of activity at the site.

Atmospheric condition data measured by the operator during each measurement using a hand-held weather meter is shown in Table 4.2. The wind speed, direction and temperature were measured at approximately 1.5 metres above ground. Attended noise monitoring is not done during rain, hail, or wind speeds above 5 m/s at microphone height.

Table 4.2 Atmospheric conditions measured at microphone height – July 2023

Location	Date	Time	Temperature °C	Wind speed m/s	Wind direction °Magnetic north	Cloud cover 1/8s
N2	4/07/2023	00:14	11.2	<0.5	-	8
N3	4/07/2023	00:31	11.0	<0.5	-	8
N4	4/07/2023	00:52	11.1	<0.5	-	8

4.2 Site only noise levels

4.2.1 Modifying factors

There were no modifying factors, as defined in the NPfI, applicable during the survey.

4.2.2 Monitoring results

Table 4.3 provides site noise levels in the absence of other sources, where possible, and includes weather data from the site AWS. Limits are applicable if weather conditions were within specified parameters during each measurement.

Table 4.3 Site noise levels and limits – July 2023

Location	Start Date	Time	Wind		Stability Class	Lapse rate (VTG) °C/100m	Limits apply? [1]	Limit, dB		Site level, dB [2]		Exceedance, dB	
			Speed m/s	Direction [4]				$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
N2	4/07/2023	00:14	1.2	184^0	E	0.5	Yes	36	46	IA	IA	Nil	Nil
N3	4/07/2023	00:31	1.1	155^0	E	0.8	Yes	36	46	IA	IA	Nil	Nil
N4	4/07/2023	00:52	0.6	123^0	E	0.7	Yes	36	46	IA	IA	Nil	Nil

Notes:
1. Noise emission limits do not apply during periods of rainfall or winds greater than 3 metres per second (at a height of 10 metres).
2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties if applicable.
3. NA in the exceedance column means the criterion was not applicable due to atmospheric conditions outside those specified in project approval.
4. Degrees magnetic north, "-" indicates calm conditions.
5. IA in the site level column means that the site was deemed inaudible at that location.

5 Discussion

5.1 Noted noise sources

During attended monitoring, the time variations (temporal characteristics) of noise sources are considered in each measurement via statistical descriptors. From these observations, summaries have been derived for the location and provided in this chapter. Statistical 1/3 octave-band analysis of environmental noise was undertaken, and the following figures display frequency ranges of various noise sources at each location for L_{A1}, L_{A10}, L_{Aeq}, L_{A50}, and L_{A90} descriptors. These figures also provide, graphically, statistical information for these noise levels.

An example is provided as Figure 5.1, where frogs and insects are seen to be generating noise at frequencies above 1000 Hz, while industrial noise is observed at frequencies less than 1000 Hz.

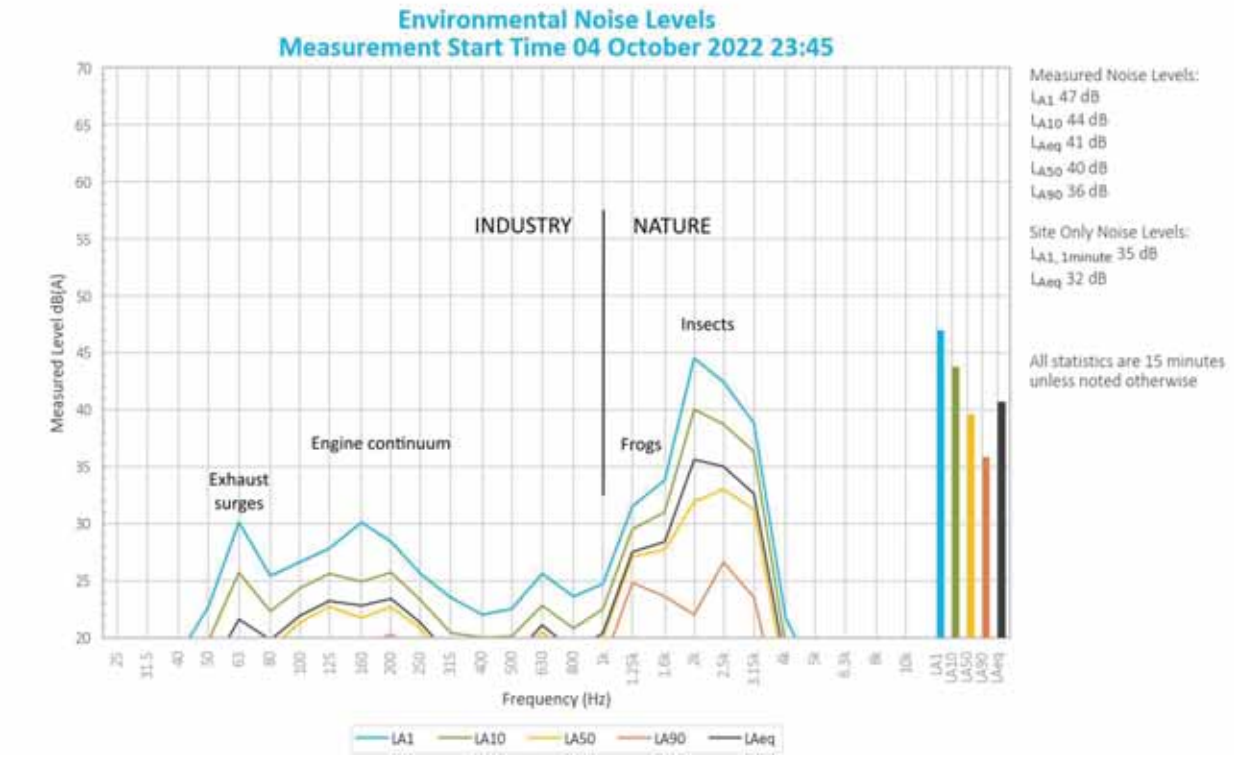

Figure 5.1 Example graph

5.2 N2 - Camberwell Village (West)

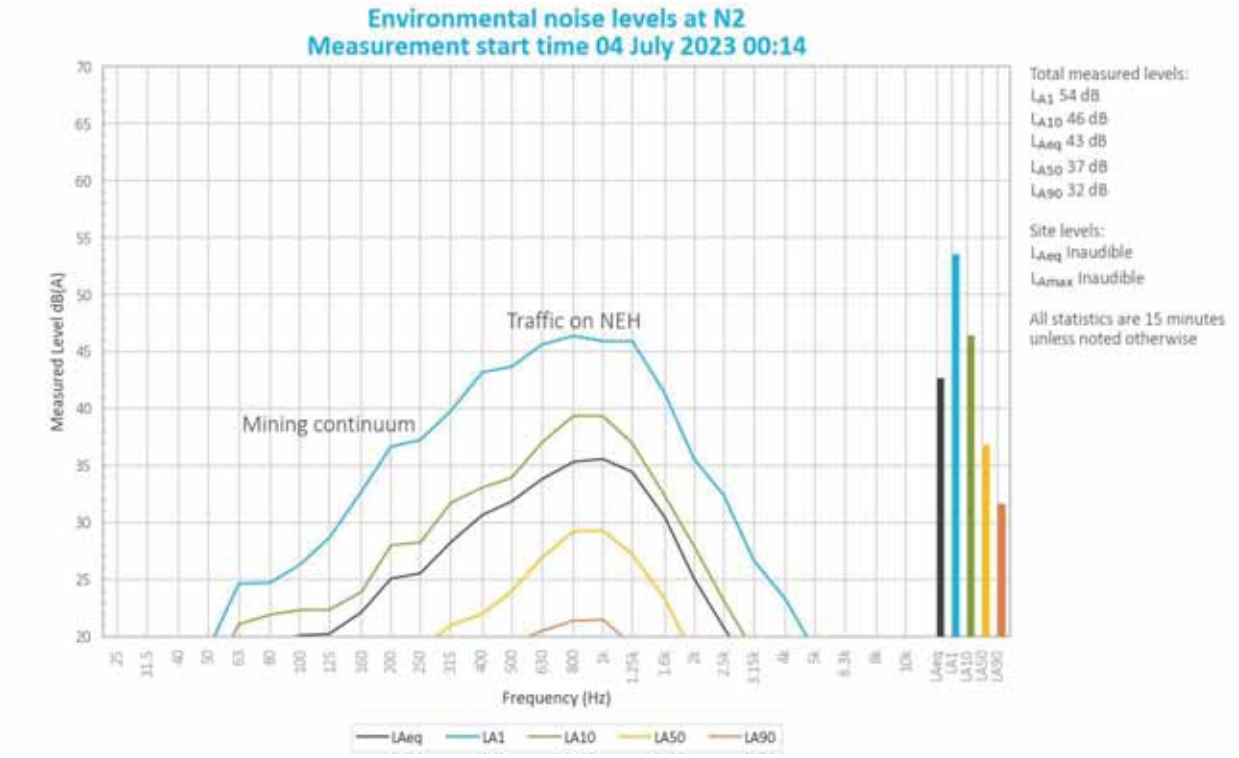

Figure 5.2 Environmental Noise Levels - N2, Camberwell Village (West)

Ashton Coal operations were inaudible during the entire measurement.

Road traffic noise was primarily responsible for measured levels.

Noise from insects, livestock, dogs barking and other mines in the vicinity (unrelated to Ashton Coal) was also noted.

5.2.1 Cumulative mining noise at N2

Ashton Coal was inaudible and, therefore, did not contribute to any mining noise at this location. A graph of the total noise levels measured in the one-third octave frequency bands is shown in Figure 5.2.

5.3 N3 - Camberwell Village (North-East)

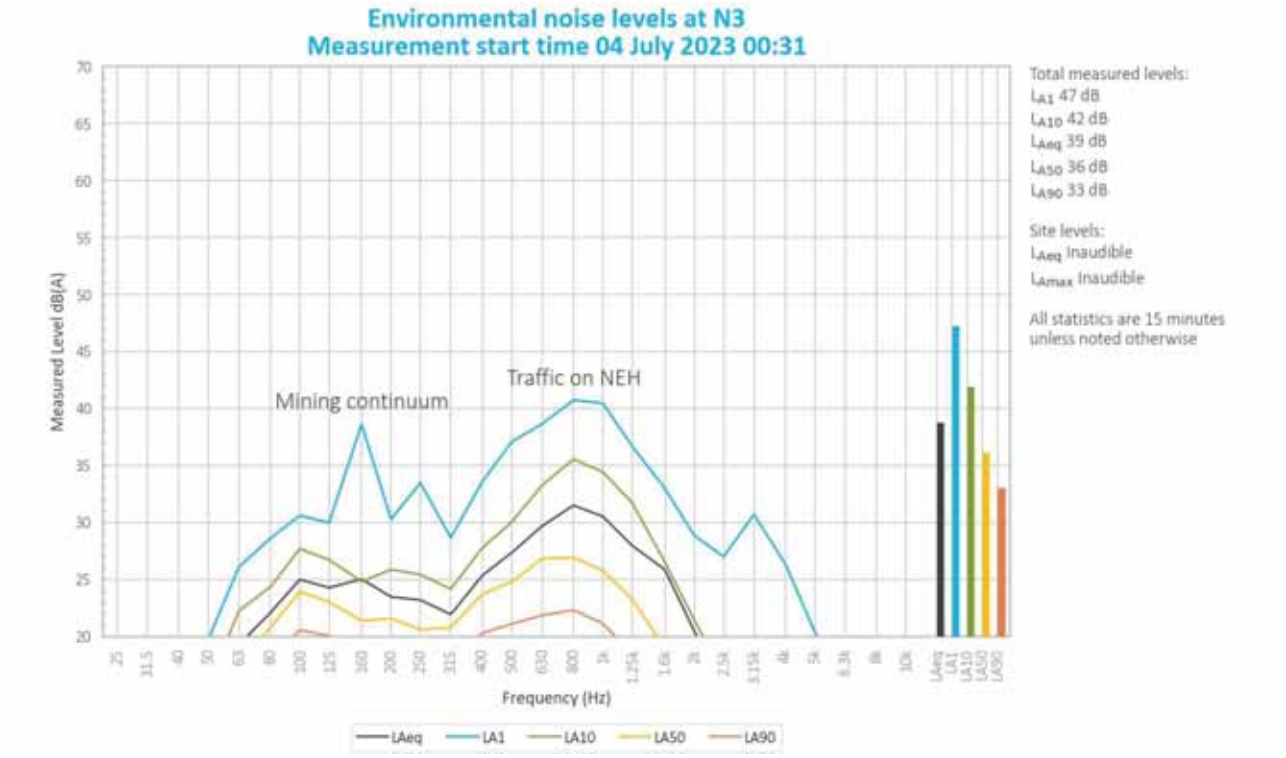

Figure 5.3 Environmental Noise Levels – N3, Camberwell Village (North-East)

Ashton Coal operations were inaudible during the entire measurement.

Road traffic noise was primarily responsible for measured levels.

Noise from insects, livestock and other mines in the vicinity (unrelated to Ashton Coal) was also noted.

5.3.1 Cumulative mining noise at N3

Ashton Coal was inaudible and, therefore, did not contribute to any mining noise at this location. A graph of the total noise levels measured in the one-third octave frequency bands is shown in Figure 5.3.

5.4 N4 - South of New England Highway

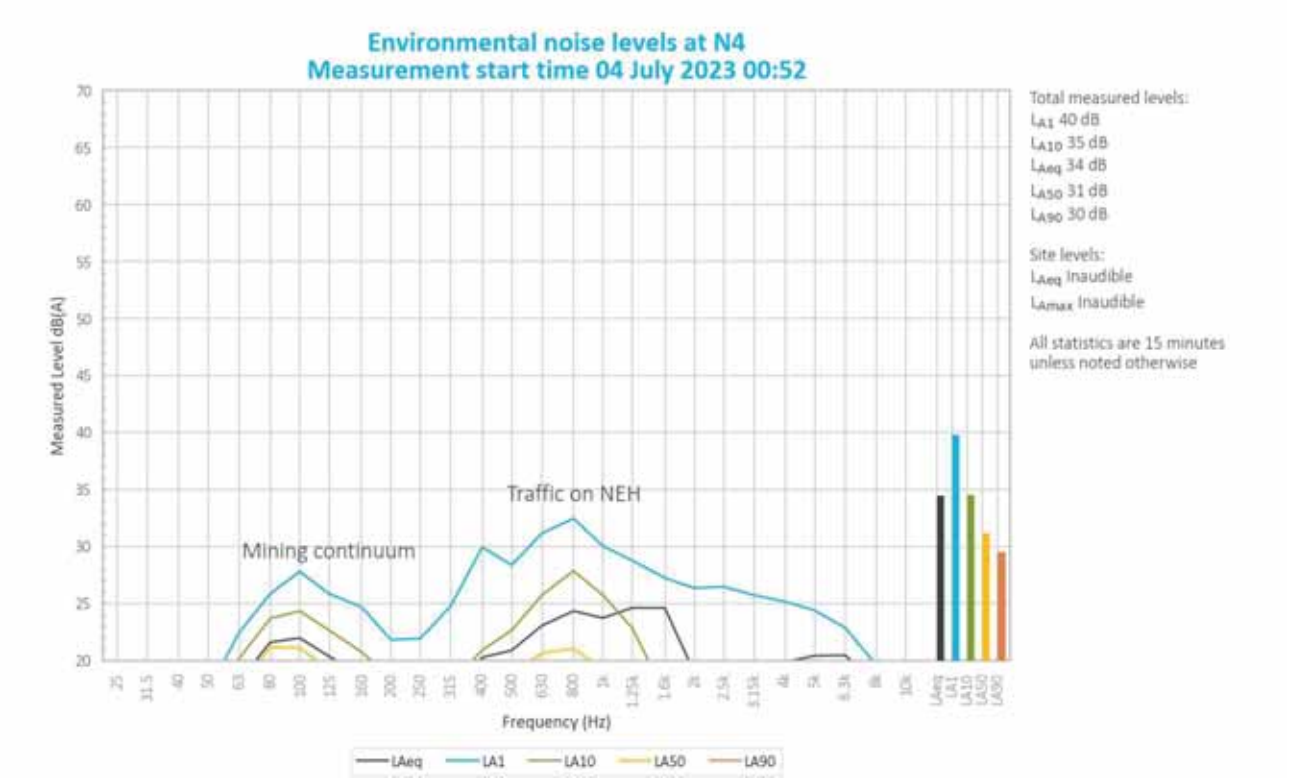

Figure 5.4 Environmental Noise Levels – N4, South of New England Highway

Ashton Coal operations were inaudible during the entire measurement.

Road traffic noise was primarily responsible for measured levels.

Noise from insects, livestock and other mines in the vicinity (unrelated to Ashton Coal) was also noted.

5.4.1 Cumulative mining noise at N4

Ashton Coal was inaudible and, therefore, did not contribute to any mining noise at this location. A graph of the total noise levels measured in the one-third octave frequency bands is shown in Figure 5.4.

6 Summary

EMM Consulting Pty Ltd (EMM) was engaged by Ashton Coal Operations Pty Ltd to conduct a monthly noise survey of operations at Ashton Coal. The survey's purpose was to quantify the acoustic environment and compare site noise levels against specified noise limits.

Attended environmental noise monitoring described in this report was done during the night period on Tuesday 4 July 2023 at three monitoring locations.

Noise levels from the site complied with relevant limits at all monitoring locations during the July 2023 survey.

Appendix A

Noise perception and examples

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A.1 Noise levels

Table A.1 gives an indication as to how an average person perceives changes in noise level. Examples of common noise levels are provided in Figure A.1.

Table A.1 Perceived change in noise

Change in sound pressure level (dB)	Perceived change in noise
up to 2	Not perceptible
3	Just perceptible
5	Noticeable difference
10	Twice (or half) as loud
15	Large change
20	Four times (or a quarter) as loud

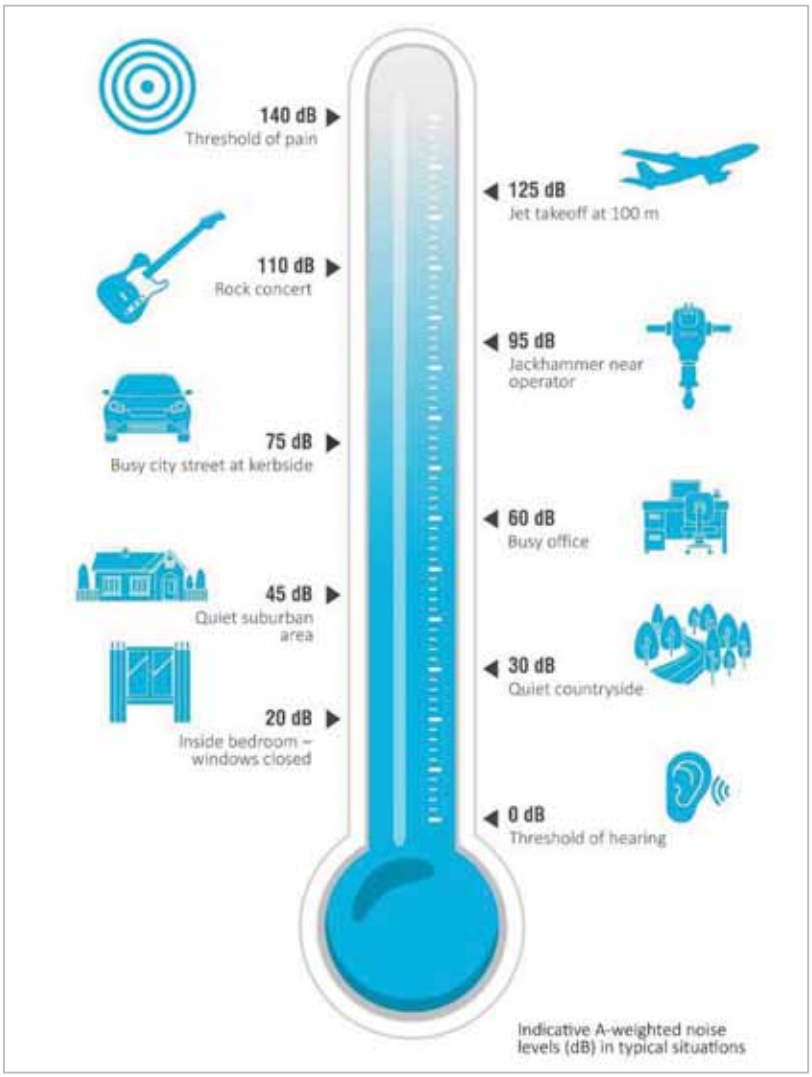

Figure A.1 Common noise levels

Appendix B
Regulator documents

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B.1 Project approval

APPENDIX 6

ALTERNATE NOISE CONDITIONS

NOISE

Application

1. Conditions 2 to 3 below have effect during times when open cut mining operations are not being undertaken at the Ashton Mine Complex, in the opinion of the Planning Secretary.

Noise Criteria

2. Except for the noise-affected land in Table 1 of Schedule 3, the Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 1 at any residence on privately-owned land or on more than 25 per cent of any privately-owned land.

Table 1: Noise Criteria dB(A)

Receiver No.	***Receiver***	***Day*** ($L_{Aeq\ (15min)}$)	***Evening*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{A1\ (1\ min)}$)
-	All privately-owned land	38	38	36	46

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy*. Appendix 8 sets out the requirements for evaluating compliance with these criteria.

However, these noise criteria do not apply if the Applicant has an agreement with the relevant owner/s of the residence/land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Additional Noise Mitigation Measures

3. Upon receiving a written request from the owner of any residence on any privately-owned land where subsequent operational noise monitoring shows the noise generated by the development exceeds the noise limits in Table 2, the Applicant must implement additional reasonable and feasible noise mitigation measures (such as double glazing, insulation, and/or air conditioning) at the residence in consultation with the owner.

If within 3 months of receiving this request from the landowner, the Applicant and the landowner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Planning Secretary for resolution.

Table 2: Additional Noise Mitigation Criteria dB(A) $L_{Aeq\ (15min)}$

Receiver No.	***Receiver***	***Day*** ($L_{Aeq\ (15min)}$)	***Evening*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{Aeq\ (15min)}$)
-	All privately-owned land	38	38	38

Notes:

- *Noise generated by the development is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 8 sets out the requirements for evaluating compliance with these criteria.*
- *For this condition to apply, the exceedance of the criteria must be systemic.*

APPENDIX 8

NOISE COMPLIANCE ASSESSMENT

Compliance Monitoring

1. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this approval.

2. Data collected for the purposes of determining compliance with the relevant conditions of this approval is to be excluded under the following meteorological conditions:
   a) during periods of rain or hail;
   b) average wind speed at microphone height exceeds 5 m/s;
   c) wind speeds greater than 3 m/s measures at 10 m above ground level; and
   d) temperature inversion conditions greater than 3°C/100m.

3. Unless otherwise agreed with the Planning Secretary, this monitoring is to be carried out in accordance with the relevant requirements relating for reviewing performance set out in the NSW Industrial Noise Policy (as amended from time to time), in particular the requirements relating to:
   a) monitoring locations for the collection of representative noise data;
   b) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
   c) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

4. To the extent that there is any inconsistency between the Industrial Noise Policy and the requirements set out in this Appendix, the Appendix prevails to the extent of the inconsistency.

Determination of Meteorological Conditions

5. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located in the vicinity of the site (as required by condition 18 of Schedule 3).

B.2 Environmental protection licence

Environment Protection Licence

24	Groundwater monitoring	Monitoring up-gradient of Glennies Creek alluvium at coordinates 319294, 6404588 (Easting, Northing), identified as WML120B in Figure 1.
25	Groundwater monitoring	Monitoring mid-gradient of Glennies Creek alluvium at coordinates 319468, 6403528 (Easting, Northing), identified as WML129 in Figure 1.
26	Groundwater monitoring	Monitoring down-gradient of Glennies Creek alluvium at coordinates 318965, 6402842 (Easting, Northing), identified as WMLP336 in Figure 1.
27	Groundwater monitoring	Monitoring up-gradient of Barrett coal seam at coordinates 318431, 6407214 (Easting, Northing), identified as GM1 in Figure 1.
28	Groundwater monitoring	Monitoring up-gradient of Pikes Gully coal seam at coordinates 319292, 6404580 (Easting, Northing), identified as WML120A in Figure 1.
29	Groundwater monitoring	Monitoring mid-gradient of Pikes Gully coal seam at coordinates 319220, 6403928 (Easting, Northing), identified as WML262 in Figure 1.
30	Groundwater monitoring	Monitoring up-gradient of Upper Liddell coal seam at coordinates 319215, 6403958 (Easting, Northing), identified as WML181 in Figure 1.
31	Groundwater monitoring	Monitoring mid-gradient of Upper Liddell coal seam at coordinates 319188, 6404325 (Easting, Northing), identified as WML183 in Figure 1.

P1.4 The following points referred to in the table below are identified in this licence for the purposes of weather and/or noise monitoring and/or setting limits for the emission of noise from the premises.

Noise/Weather

EPA identification no.	Type of monitoring point	Location description
12	Meteorological Station – to determine meteorological conditions for noise monitoring	Meteorological monitoring at coordinates 320522, 6406815 (Easting, Northing), identified as Repeater on Figure 2.
13	Noise monitoring	Monitoring at coordinates 320554, 6405839 (Easting, Northing), identified as N3 on Figure 2 and representative of Noise Assessment Group 2.

14	Noise monitoring	Monitoring at coordinates 320297, 6405670 (Easting, Northing), identified as N2 on Figure 2 and representative of Noise Assessment Group 1.
15	Noise monitoring	Monitoring at coordinates 319776, 6404101 (Easting, Northing), identified as N4 on Figure 2 and representative of Noise Assessment Group 3.
32	Meteorological Station – to determine meteorological conditions for noise monitoring	Monitoring of temperature at 'M1' at coordinates 320259, 6405971 (Easting, Northing).

P1.5 For the purposes of Condition P1.1, P1.2 and P1.3, Figure 1 refers to the plan titled "Ashton Underground Mine Environment Protection licence 11879 Premises Boundary, Surface Infrastructure" dated 30/08/19 (EPA reference DOC19/761196).

P1.6 For the purpose of Condition P1.4, Figure 2 refers to the plan titled "Ashton Underground Mine Environment Protection licence 11879 Premises Boundary, Monitoring" dated 30/08/19 (EPA reference DOC19/761196).

P1.7 The datum for grid references in this Licence is the Geodetic Datum of Australia 1994 (GDA94), Zone 56.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

L2.1 Flares must be operated by the licensee such that there is no visible emission other than for a total period of no more than 5 minutes in any 2 hours, except for heat haze.

L3 Waste

L3.1 The licensee must not cause, permit or allow any waste to be received at the premises unless specified in this licence.

L3.2 The Licensee must not dispose of waste on the premises unless authorised by a condition of this Licence.

L4 Noise limits

L4.1 Noise from the premises must not exceed the noise limits specified in the table below.

Residences referenced in this table are from the consent DA 309-11-2001-i and summarised in the EPA

reference DOC19/761196.

Location	Day LAeq(15 minute)	Evening LAeq(15 minute)	Night LAeq(15 minute)	Night LAeq(1 minute)
EPA Point 13	38	38	36	46
EPA Point 14	38	38	36	46
EPA Point 15	38	38	36	46
All other privately owned residences	38	38	36	46

L4.2 For the purpose of Condition L4.1:
a) Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays,
b) Evening is defined as the period from 6pm to 10pm, and
c) Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays

L4.3 The noise emission limits identified in condition L4.1 apply under the following meteorological conditions:

a) wind speeds up to 3m/s at 10m above ground level; and
b) temperature inversion conditions up to 3 degrees C/100m.

L4.4 For the purposes of condition L4.1:

a) Data recorded by the closest and most representative meteorological station installed on the premises at EPA Identification Point 12 must be used to determine meteorological conditions; and
b) Temperature inversion conditions (stability category) are to be determined by the methods referred to in Fact Sheet D of the Noise Policy for Industry (2017) using EPA Identification Points 12 and 32.

4 Operating Conditions

O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.
This includes:
a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
a) must be maintained in a proper and efficient condition; and
b) must be operated in a proper and efficient manner.

B.3 Noise management plan

Relevant parts of the DA have been reproduced in Appendix A along with reference to where they have been addressed in this document.

4.2 Applicable Criteria

Noise criteria for the ACP are divided into three categories:

- Impact assessment criteria;
- Additional noise mitigation criteria; and
- Cumulative noise acquisition criteria.

The RUM must adhere to a single set of noise criteria relating to noise generated by the RUM development.

4.2.1 Impact Assessment Criteria

In accordance with Condition 2, Appendix 6 of the Ashton DA and Condition L4.1 of EPL 11879, noise generated by the development within the ACP must not exceed the limits specified in **Table 3** at any privately-owned land or on more than 25 per cent of any privately-owned land. The noise limits are provided in decibels (dB).

Table 3: Ashton Noise Impact Criteria dB(A)

Location	Day	Evening	Night	
	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{A1} (1 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	38	38	36	46

In accordance with Condition 12, Schedule 3 of the RUM DA, noise generated by development in the ACOL-operated RUM must not exceed the limits specified in **Table 4** at any residence on privately-owned land or on more than 25 per cent of any privately-owned land.

Table 4 RUM Noise Impact Criteria dB(A)

Location	Day	Evening	Night	
	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{A1} (1 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	35	35	35	45

4.2.2 Additional Noise Mitigation Criteria

If noise emissions generated by the ACP exceed the criteria displayed in **Table 5** at any residence on privately-owned land, then, upon receiving a written request from the landowner, ACOL will implement additional reasonable and feasible noise mitigation measures (such as double glazing, insulation and/or air conditioning) at the residence in consultation with the owner.

Table 5 Additional Noise Mitigation Criteria dB(A)#

Location	Day	Evening	Night
	LAeq (15 minute)	LAeq (15 minute)	LAeq (15 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	38	38	38

* Exceedance of the criteria must be systemic.

4.2.3 Cumulative Noise Acquisition Criteria

If noise emissions generated by the ACP, and other mines exceed the criteria in **Table 6** at any residence on privately-owned land or on more than 25 per cent of any privately-owned land (except for noise affected residential receivers in Condition 1, Schedule 3 of the Ashton DA) then, upon receiving a written request for acquisition from the landowner, ACOL together with the relevant mines, will acquire the land in accordance with the Acquisition Process (as defined in Conditions 7 and 8, Schedule 4 of the Ashton DA).

Table 6 Cumulative Noise Acquisition Criteria dB(A)

Location	Day	Evening	Night
	LAeq (period)	LAeq (period)	LAeq (period)
Camberwell Village	60	50	45
All other privately-owned land	55	50	45

4.3 Existing Environment

The ACP is located in the Hunter Valley region of New South Wales and is bound by the Main Northern Railway to the north, Hunter River to the south and Glennies Creek to the east with the New England Highway dividing the open cut from the underground mining areas.

Other mining operations in the area include the Ravensworth Complex, the Mount Owen Complex, Rix's Creek Open Cut, Integra Underground and Hunter Valley Operations.

The closest sensitive receivers are located in Camberwell. There are currently 13 private landholdings in the local area, 11 of these have an occupied residence.

Ambient noise levels within the village of Camberwell are influenced by the New England Highway to the south, the railway line to the northeast and surrounding mining operations. Attended noise monitoring has confirmed that the major contributing noise source is usually the New England Highway. Noise from ACP has been noted at times in Camberwell Village, historical reports show this has been infrequent and at relatively low levels.

Based on the historical meteorological data collected by ACOL's M2 (repeater) weather station the most common winds in winter are from the west-northwest and the east-southeast in summer. Prevailing winds act to enhance noise from surrounding noise sources (road, rail and mining).

Appendix C
Calibration certificates

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C33872

EQUIPMENT TESTED : Sound Level Calibrator

Manufacturer: Svantek
Type No: SV-36 **Serial No:** 79952
Owner: EMM Consulting Pty Ltd
L3, 175 Scott Street
Newcastle, NSW 2300
Tests Performed: Measured Output Pressure level, Frequency & Distortion
Comments: See Details overleaf. All Test Passed.

Parameter	Pre-Adj	Adj Y/N	Output: (dB re 20 µPa)	Frequency (Hz)	THD&N (%)
Level1:	NA	N	94.09 dB	1000.00 Hz	1.12 %
Level2:	NA	N	114.06 dB	1000.00 Hz	0.71 %
Uncertainty			±0.11 dB	±0.05%	±0.20 %
Uncertainty (at 95% c.l.) k=2					

CONDITION OF TEST:

Ambient Pressure 1004 hPa ±1 hPa
Temperature 23 °C ±1° C
Relative Humidity 55 % ±5%

Date of Receipt : 26/09/2022
Date of Calibration : 29/09/2022
Date of Issue : 29/09/2022

Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2017

CHECKED BY: .....

AUTHORISED SIGNATURE: .....
Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

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Acu-Vib Electronics
CALIBRATIONS SALES RENTALS REPAIRS

Head Office & Calibration Laboratory
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM31670

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	B & K		
Type No:	2250	**Serial No:**	2759405
Mic. Type:	4189	**Serial No:**	2983733
Pre-Amp. Type:	ZC0032	**Serial No:**	22666
Filter Type:	1/3 Octave	**Test No:**	F031671

Owner: EMM Consulting
Level 3, 175 Scott Street
Newcastle, NSW 2300

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	992	hPa ±1 hPa	**Date of Receipt :**	02/02/2022
Temperature	26	°C ±1° C	**Date of Calibration :**	02/02/2022
Relative Humidity	48	% ±5%	**Date of Issue :**	03/02/2022

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

Jack Kidt

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Appendix H

Monthly attended noise monitoring report – August 2023

EMM
creating opportunities

Ashton Coal

Monthly attended noise monitoring - August 2023

Prepared for Ashton Coal Operations Pty Ltd

September 2023

Ashton Coal

Monthly attended noise monitoring - August 2023

Ashton Coal Operations Pty Ltd

E221164 RP8

September 2023

Version	Date	Prepared by	Reviewed by	Comments
1	25 August 2023	Lucas Adamson	Tony Welbourne	Draft
2	7 September 2023	Lucas Adamson	Tony Welbourne	Final

Approved by

Tony Welbourne
Associate Director
7 September 2023

Level 3 175 Scott Street
Newcastle NSW 2300

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Appendices

Tables

Figures

1 Introduction

1.1 Background

EMM Consulting Pty Ltd (EMM) was engaged by Ashton Coal Operations Pty Ltd to conduct a monthly noise survey of operations at Ashton Coal Operations (Ashton Coal, the site) located at Glennies Creek Rd, Camberwell NSW. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified limits.

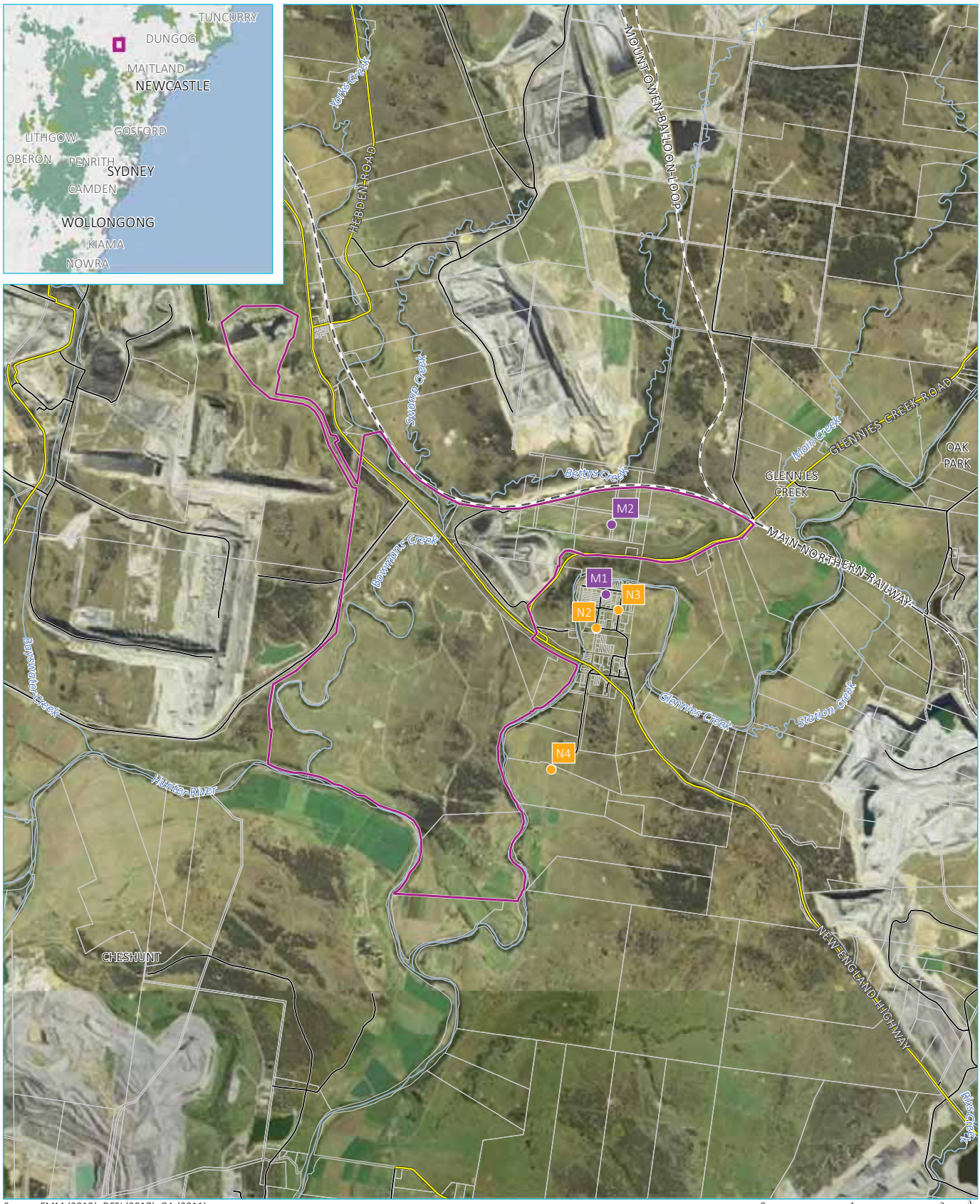
Attended environmental noise monitoring described in this report was done during the night period of Tuesday 22 August 2023 at three monitoring locations.

1.2 Attended monitoring locations

Site monitoring locations are detailed in Table 1.1 and shown on Figure 1.1. It should be noted that Figure 1.1 shows actual monitoring positions, not necessarily the location of residences.

Table 1.1 Attended noise monitoring locations

Location descriptor/ID	Description/address	Coordinates (MGA56)	
		Easting	Northing
N2	Camberwell Village (west)	320297	6405670
N3	Camberwell Village (north-east)	320554	6405839
N4	South of New England Highway	319776	6404101



Source: EMM (2019); DFSI (2017); GA (2011)

0 1 2 km

GDA 1994 MGA Zone 56

N

\\emmsvr1\EMM\Jobs\2019\H190081 - Ashton Coal Noise Monitoring\8 GIS\02_Maps\N001_NoiseMonitoring_20190312_02.mxd 12/03/2019

KEY

- Site boundary
- Noise monitoring location
- Meteorological station
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Cadastral boundary

Noise monitoring locations and Ashton colliery boundary

Ashton Coal
Monthly attended noise monitoring
Figure 1.1

EMM
creating opportunities

1.3 Terminology and abbreviations

Some definitions of terms and abbreviations which may be used in this report are provided in Table 1.2.

Table 1.2 Terminology and abbreviations

Term/descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to approximate how humans hear noise.
L_{Amax}	The maximum root mean squared A-weighted noise level over a time period.
L_{A1}	The A-weighted noise level which is exceeded for one per cent of the time.
$L_{A1,1minute}$	The A-weighted noise level which is exceeded for one per cent of the specified time period of one minute.
L_{A10}	The A-weighted noise level which is exceeded for 10 per cent of the time.
L_{Aeq}	The energy average A-weighted noise level.
L_{A50}	The A-weighted noise level which is exceeded for 50 per cent of the time, and is also the median noise level during a measurement period.
L_{A90}	The A-weighted noise level exceeded for 90 percent of the time, also referred to as the "background" noise level and commonly used to derive noise limits.
L_{Amin}	The minimum A-weighted noise level over a time period.
L_{Ceq}	The energy average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure are measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	The vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	Monday – Saturday: 7 am to 6 pm, on Sundays and Public Holidays: 8 am to 6 pm.
Evening	Monday – Saturday: 6 pm to 10 pm, on Sundays and Public Holidays: 6 pm to 10 pm.
Night	Monday – Saturday: 10 pm to 7 am, on Sundays and Public Holidays: 10 pm to 8 am.
Temperature inversion	A meteorological condition where the atmospheric temperature increases with altitude.

Appendix A provides further information that gives an indication as to how an average person perceives changes in noise level, and examples of common noise levels.

2 Noise limits

2.1 Development consent

Ashton Coal noise limits are provided in Table 1, Condition 2 of Appendix 6 of development consent 309-11-2001-I (DC). Relevant sections of the DC are reproduced in Appendix B.1.

2.2 Environment protection licence

Ashton Coal noise limits are provided in Condition L4.1 of EPL 11879 (EPL). Relevant sections of the EPL are reproduced in Appendix B.2.

2.3 Noise management plan

The approved NMP adopts three attended noise monitoring locations that are representative of residences outlined in the DC and EPL. Relevant sections of the NMP are reproduced in Appendix B.3.

2.4 Noise limits

Noise limits based on the NMP are as shown in Table 2.1.

Table 2.1 Noise impact limits, dB

Location	Day $L_{Aeq,15minute}$	Evening $L_{Aeq,15minute}$	Night $L_{Aeq,15minute}$	Night $L_{A1,1minute}$
N2	38	38	36	46
N3	38	38	36	46
N4	38	38	36	46

2.5 Meteorological conditions

The DC and EPL specify the following meteorological conditions under which noise limits do not apply:

- during periods of rain or hail
- average wind speed at microphone height exceeds 5 metres per second (m/s)
- wind speeds greater than 3 m/s at 10 metres above ground level
- temperature inversion conditions greater than 3°C/100 m.

2.6 Additional requirements

Monitoring and reporting have been done in accordance with the NSW EPA 'Noise Policy for Industry' (NPfI) issued in October 2017 and the 'Approved methods for the measurement and analysis of environmental noise in NSW' (Approved Methods) issued in January 2022.

3 Methodology

3.1 Overview

Attended environmental noise monitoring was done in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant EPA requirements. Meteorological data was obtained from the Ashton Coal on-site weather station (AWS) which allowed the correlation of atmospheric parameters with measured noise levels.

3.2 Attended noise monitoring

During this survey, attended noise monitoring was done during the night period at each location. The duration of each measurement was 15 minutes. Atmospheric conditions were measured at each monitoring location.

Measured sound levels from various sources were noted during each measurement, and particular attention was paid to the extent of site contribution (if any) to measured levels. At each monitoring location, the site-only $L_{Aeq,15minute}$ and L_{Amax} were measured directly or determined by other methods detailed in Section 7.1 of the NPfI.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, it was inaudible at the monitoring location. When site noise is noted as NM, this means it was audible but could not be quantified. All results noted as IA or NM in this report were due to one or more of the following:

- Site noise levels were very low, typically more than 10 dB below the measured background (L_{A90}), and unlikely to be noticed.
- Site noise levels were masked by more dominant sources that are characteristic of the environment (such as breeze in foliage or continuous road traffic noise) that cannot be eliminated by monitoring at an alternate or intermediate location.
- It was not feasible or reasonable to employ methods, such as to move closer and back calculate. Cases may include rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

If exact noise levels from site could not be established due to masking by other noise sources in a similar frequency range but were determined to be at least 5 dB lower than relevant limits, then a maximum estimate may be provided. This is expressed as a 'less than' quantity, such as <20 dB or <30 dB.

For this assessment, the measured L_{Amax} has been used as a conservative estimate of $L_{A1,1minute}$. The EPA accepts sleep disturbance analysis based on either the $L_{A1,1minute}$ or L_{Amax} metrics, with the L_{Amax} representing a more conservative assessment of site noise emissions.

3.3 Meteorological data

As per Condition L4.4, this assessment determined stability categories for the attended monitoring period using the direct measurement method as per Fact Sheet D of the Noise Policy for Industry (2017).

The temperature lapse rate between the two weather stations (M1 – Sentinex Unit 40 located in Camberwell Village and M2 – Ashton Coal 'repeater' meteorological station, the site AWS, located in the north-eastern open cut (NEOC) area) was calculated using the following formula:

$$\text{Temperature lapse rate} = (\Delta T) \times (100/(\Delta H))$$

Where:

- ΔT = temperature measured at M2 (at 10 metres above ground level) minus temperature measured at M1 (at 10 metres above ground level); and
- ΔH = the vertical height difference between M2 and M1 (equal to 73 metres).

3.4 Modifying factors

All measurements were evaluated for potential modifying factors in accordance with the NPfI. Assessment of modifying factors is done at the time of measurement if the site was audible and directly quantifiable. If applicable, modifying factor penalties have been reported and added to the measured site only L_{Aeq} noise levels.

Low-frequency modifying factor penalties have only been applied to site-only L_{Aeq} levels if the site was the only contributing low-frequency noise source. Specific methodology for assessment of each modifying factor is outlined in Fact Sheet C of the NPfI.

3.5 Instrumentation

The equipment used to measure environmental noise levels is detailed in Table 3.1. Calibration certificates are provided in Appendix C.

Table 3.1 Attended noise monitoring equipment

Item	Serial number	Calibration due date	Relevant standard
Brüel & Kjær 2250 sound level meter	2759405	2/2/2024	IEC 61672-1:2002
Svantek SV-36 calibrator	79952	26/9/2024	IEC 60942

4 Results

4.1 Total measured noise levels and atmospheric conditions

Overall noise levels measured at each location during attended measurements are provided in Table 4.1. Discussion as to the sources responsible for measured levels is provided in Section 5 of this report.

Table 4.1 Total measured noise levels, dB – August 2023[1]

Location	Start date	Time	L_{Amax}	L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	L_{Amin}
N2	22/08/2023	22:00	58	56	53	50	48	43	40
N3	22/08/2023	22:17	66	55	49	46	43	40	37
N4	22/08/2023	22:38	60	46	41	39	37	34	31

Notes: 1. Levels in this table are not necessarily the result of activity at the site.

Atmospheric condition data measured by the operator during each measurement using a hand-held weather meter is shown in Table 4.2. The wind speed, direction and temperature were measured at approximately 1.5 metres above ground. Attended noise monitoring is not done during rain, hail, or wind speeds above 5 m/s at microphone height.

Table 4.2 Atmospheric conditions measured at microphone height – August 2023

Location	Date	Time	Temperature °C	Wind speed m/s	Wind direction °Magnetic north	Cloud cover 1/8s
N2	22/08/2023	22:00	15.9	<0.5	-	0
N3	22/08/2023	22:17	15.7	<0.5	-	0
N4	22/08/2023	22:38	15.3	<0.5	-	0

4.2 Site only noise levels

4.2.1 Modifying factors

There were no modifying factors, as defined in the NPfI, applicable during the survey.

4.2.2 Monitoring results

Table 4.3 provides site noise levels in the absence of other sources, where possible, and includes weather data from the site AWS. Limits are applicable if weather conditions were within specified parameters during each measurement.

Table 4.3 Site noise levels and limits – August 2023

Location	Start Date	Time	Wind		Stability Class	VTG °C/100m	Limits apply? [1]	Limit, dB		Site level, dB [2]		Exceedance, dB	
			Speed m/s	Direction° [4]				$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
N2	22/08/2023	22:00	2.4	182	F	2.7	Yes	36	46	<32	<32	Nil	Nil
N3	22/08/2023	22:17	3.0	181	F	3.4	No	36	46	<32	<32	N/A	N/A
N4	22/08/2023	22:38	2.3	187	G	5.1	No	36	46	<28	<28	N/A	N/A

Notes:
1. Noise emission limits do not apply during periods of rainfall or winds greater than 3 metres per second (at a height of 10 metres).
2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties if applicable.
3. N/A in the exceedance columns means the criterion was not applicable due to atmospheric conditions outside those specified in project approval.
4. Degrees magnetic north, "-" indicates calm conditions.
5. IA in the site level column means that the site was deemed inaudible at that location.

5 Discussion

5.1 Noted noise sources

During attended monitoring, the time variations (temporal characteristics) of noise sources are considered in each measurement via statistical descriptors. From these observations, summaries have been derived for the location and provided in this chapter. Statistical 1/3 octave-band analysis of environmental noise was undertaken, and the following figures display frequency ranges of various noise sources at each location for L_{A1}, L_{A10}, L_{Aeq}, L_{A50}, and L_{A90} descriptors. These figures also provide, graphically, statistical information for these noise levels.

An example is provided as Figure 5.1, where frogs and insects are seen to be generating noise at frequencies above 1000 Hz, while industrial noise is observed at frequencies less than 1000 Hz.

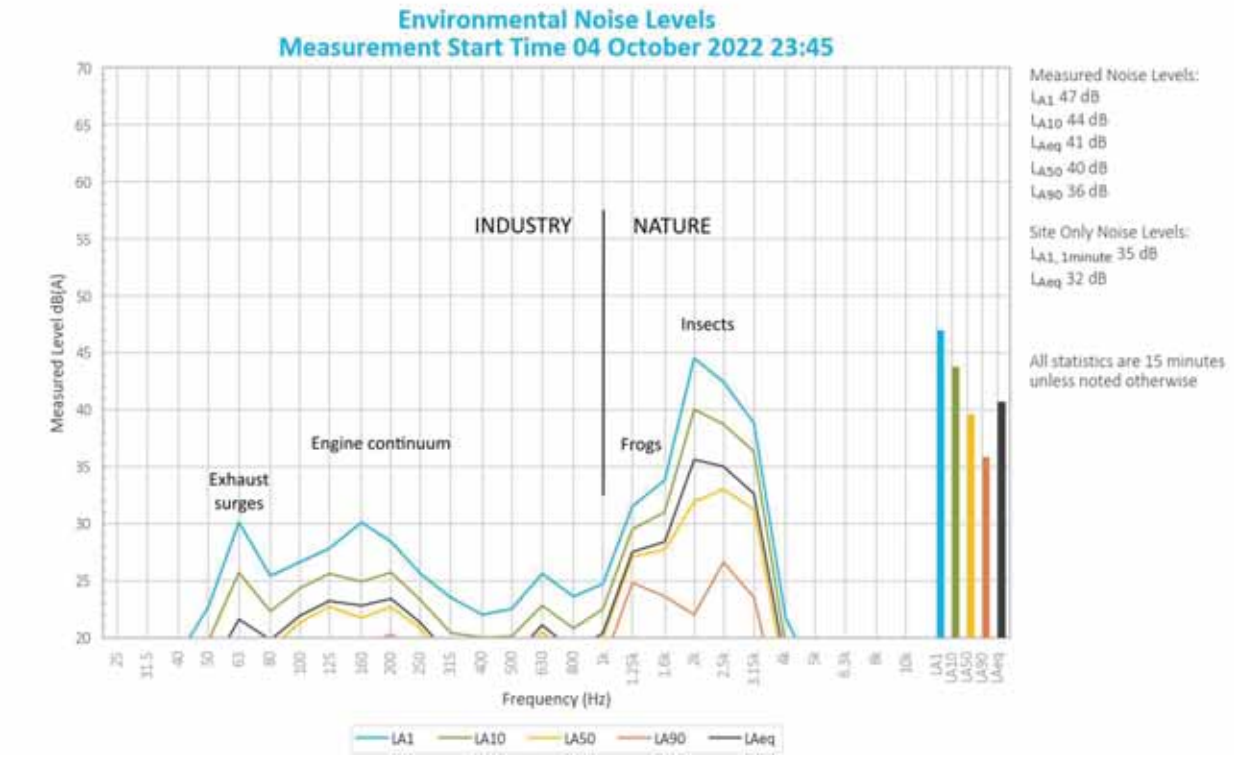


Figure 5.1 Example graph

5.2 N2 - Camberwell Village (West)

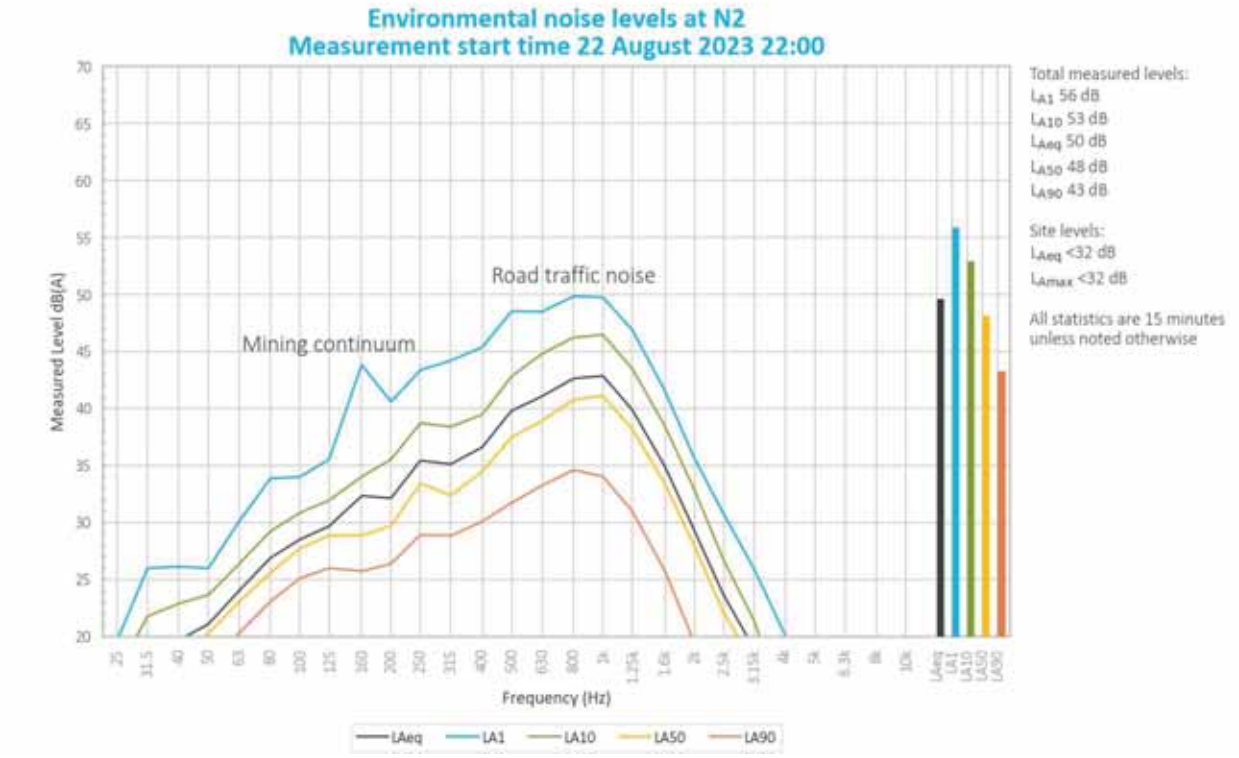


Figure 5.2 Environmental noise levels - N2, Camberwell Village (West)

Ashton Coal mine hum was consistently audible throughout the entire measurement, generating Ashton Coal L_{Amax} and $L_{Aeq,15minute}$ both <32 dB.

Road traffic noise was primarily responsible for measured levels.

Noise from insects, frogs, nearby animals, other mines in the vicinity (unrelated to Ashton Coal) and a train on the main line was also noted.

5.2.1 Cumulative mining noise at N2

Other mining operations in the vicinity were consistently audible. Cumulative mining noise was estimated to be $L_{Aeq,night}$ <33 dB (i.e. Ashton Coal mine noise of $L_{Aeq,15minute}$ <32 dB + other mine noise of $L_{Aeq,15minute}$ <35 dB less 3 dB as per NPfI methodology) which is below the relevant limit of $L_{Aeq,night}$ 40 dB.

5.3 N3 - Camberwell Village (North-East)

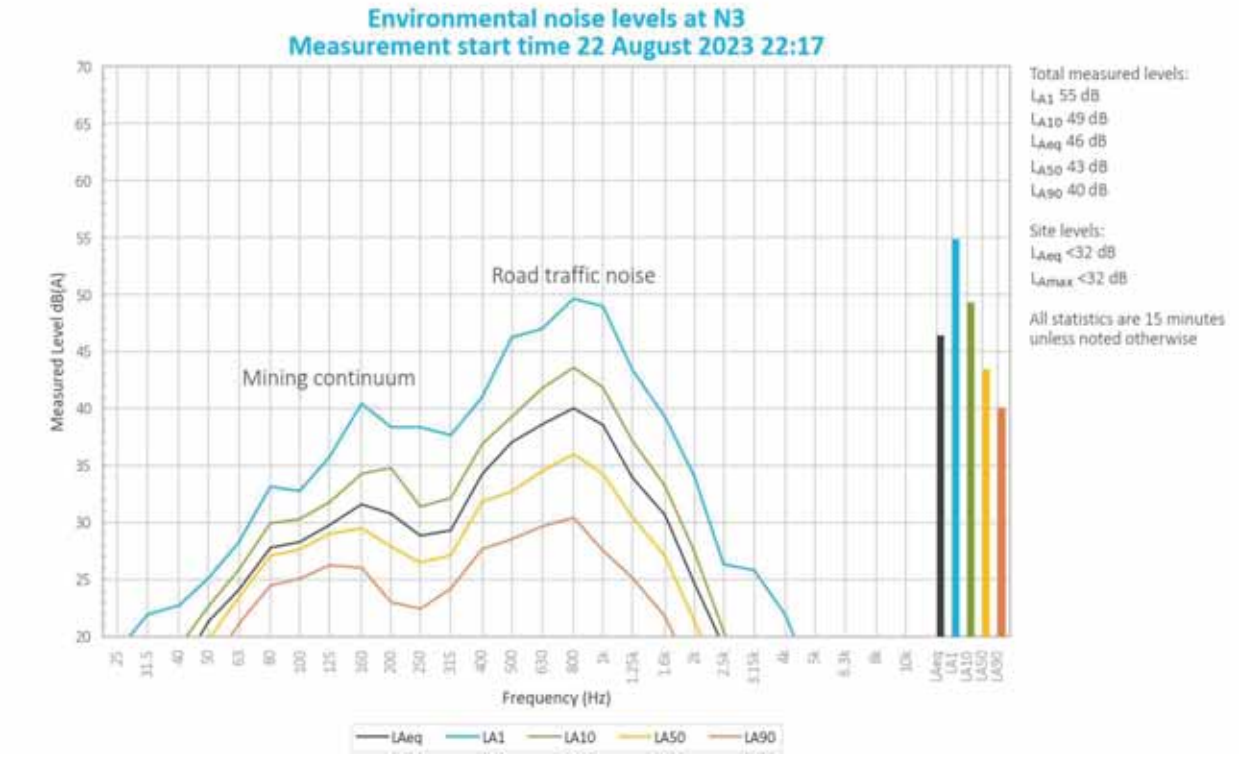


Figure 5.3 Environmental noise levels – N3, Camberwell Village (North-East)

Ashton Coal mine hum was consistently audible throughout the entire measurement, generating Ashton Coal L_{Amax} and $L_{Aeq,15minute}$ both <32 dB.

Road traffic noise was primarily responsible for measured levels.

Noise from insects, frogs, aircraft noise, dogs barking, other mines in the vicinity (unrelated to Ashton Coal) and a train on the main line was also noted.

5.3.1 Cumulative mining noise at N3

Other mining operations in the vicinity were consistently audible. Cumulative mining noise was estimated to be $L_{Aeq,night}$ <33 dB (i.e. Ashton Coal mine noise of $L_{Aeq,15minute}$ <32 dB + other mine noise of $L_{Aeq,15minute}$ <35 dB less 3 dB as per NPfI methodology) which is below the relevant limit of $L_{Aeq,night}$ 40 dB.

5.4 N4 - South of New England Highway

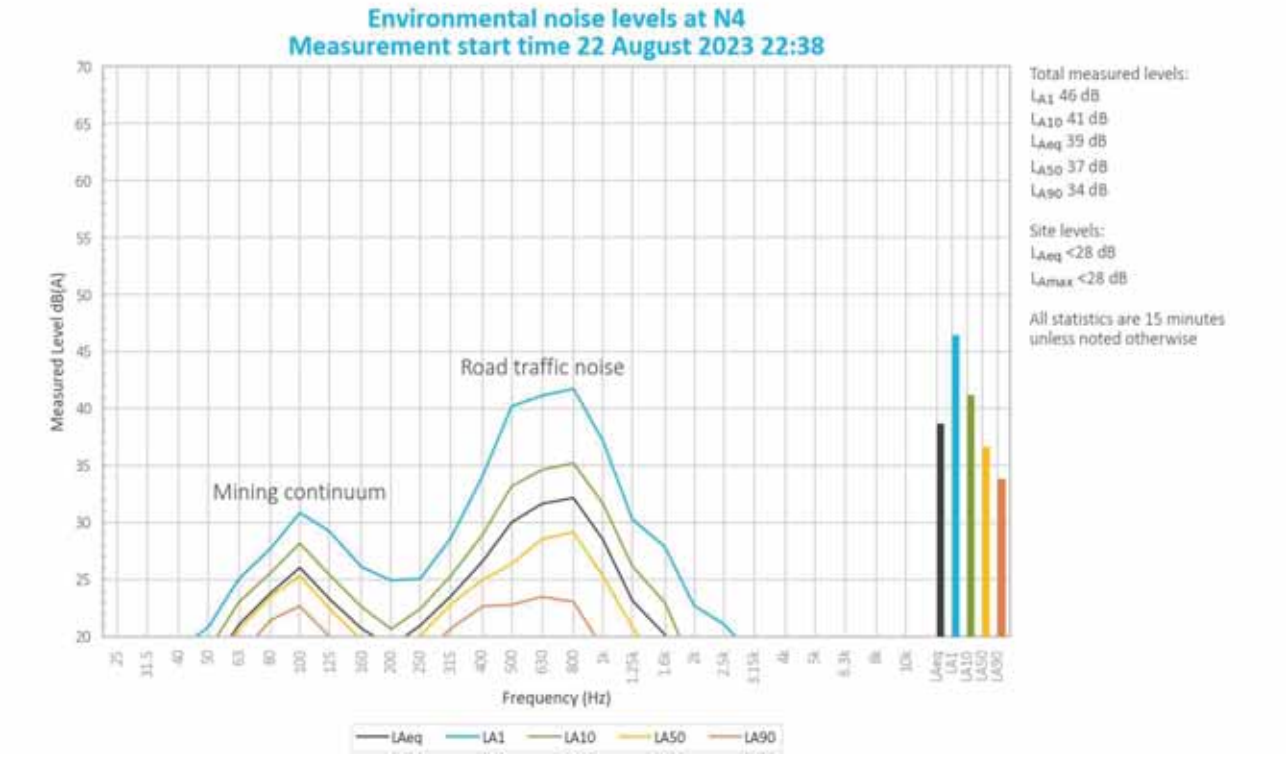


Figure 5.4 Environmental noise levels – N4, South of New England Highway

Ashton Coal mine hum was consistently audible throughout the entire measurement, generating Ashton Coal L_{Amax} and $L_{Aeq,15minute}$ both <28 dB.

Road traffic noise was primarily responsible for measured levels.

Noise from insects, frogs, and other mines in the vicinity (unrelated to Ashton Coal) was also noted.

5.4.1 Cumulative mining noise at N4

Other mining operations in the vicinity were consistently audible. Cumulative mining noise was estimated to be $L_{Aeq,night}$ <31 dB (i.e. Ashton Coal mine noise of $L_{Aeq,15minute}$ <28 dB + other mine noise of $L_{Aeq,15minute}$ <33 dB less 3 dB as per NPfI methodology) which is below the relevant limit of $L_{Aeq,night}$ 40 dB.

6 Summary

EMM Consulting Pty Ltd (EMM) was engaged by Ashton Coal Operations Pty Ltd to conduct a monthly noise survey of operations at Ashton Coal. The survey's purpose was to quantify the acoustic environment and compare site noise levels against specified noise limits.

Attended environmental noise monitoring described in this report was done during the night period on Tuesday 22 August 2023 at three monitoring locations.

Noise levels from the site complied with relevant limits at all monitoring locations during the August 2023 survey.

Appendix A
Noise perception and examples

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A.1 Noise levels

Table A.1 gives an indication as to how an average person perceives changes in noise level. Examples of common noise levels are provided in Figure A.1.

Table A.1 Perceived change in noise

Change in sound pressure level (dB)	Perceived change in noise
up to 2	Not perceptible
3	Just perceptible
5	Noticeable difference
10	Twice (or half) as loud
15	Large change
20	Four times (or a quarter) as loud

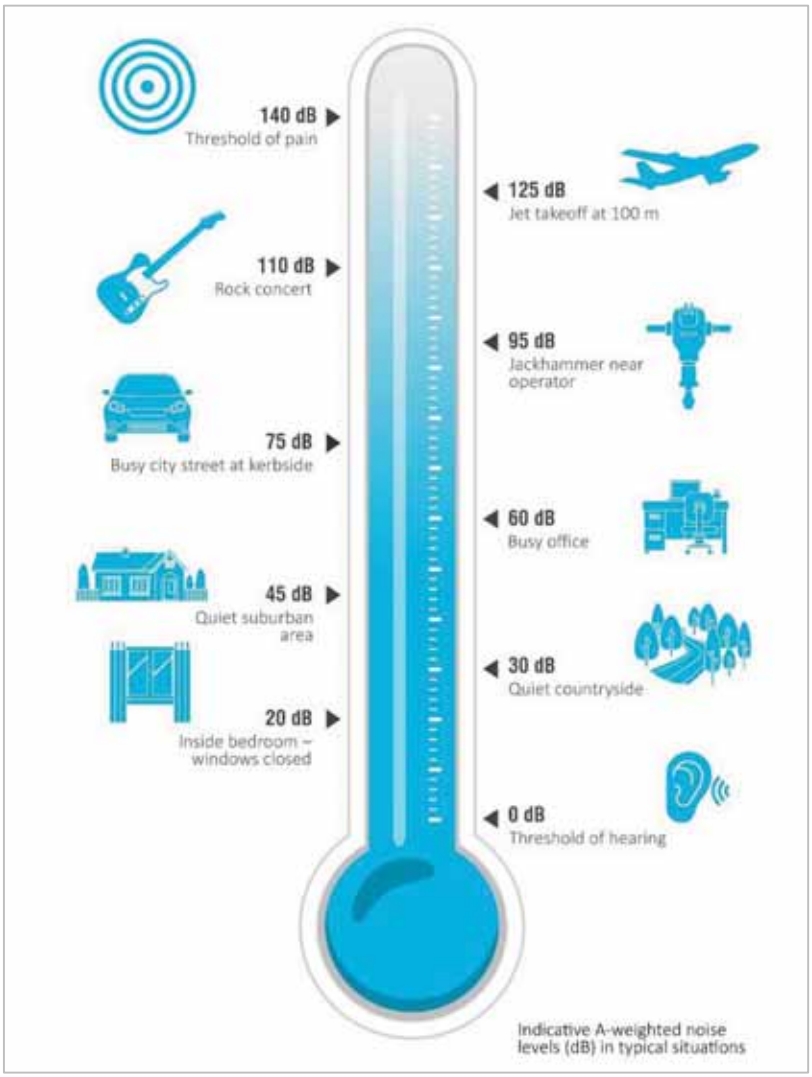

Figure A.1 Common noise levels

Appendix B
Regulator documents

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B.1 Project approval

APPENDIX 6

ALTERNATE NOISE CONDITIONS

NOISE

Application

1. Conditions 2 to 3 below have effect during times when open cut mining operations are not being undertaken at the Ashton Mine Complex, in the opinion of the Planning Secretary.

Noise Criteria

2. Except for the noise-affected land in Table 1 of Schedule 3, the Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 1 at any residence on privately-owned land or on more than 25 per cent of any privately-owned land.

Table 1: Noise Criteria dB(A)

Receiver No.	***Receiver***	***Day*** ($L_{Aeq\ (15min)}$)	***Evening*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{A1\ (1\ min)}$)
-	All privately-owned land	38	38	36	46

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy*. Appendix 8 sets out the requirements for evaluating compliance with these criteria.

However, these noise criteria do not apply if the Applicant has an agreement with the relevant owner/s of the residence/land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Additional Noise Mitigation Measures

3. Upon receiving a written request from the owner of any residence on any privately-owned land where subsequent operational noise monitoring shows the noise generated by the development exceeds the noise limits in Table 2, the Applicant must implement additional reasonable and feasible noise mitigation measures (such as double glazing, insulation, and/or air conditioning) at the residence in consultation with the owner.

If within 3 months of receiving this request from the landowner, the Applicant and the landowner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Planning Secretary for resolution.

Table 2: Additional Noise Mitigation Criteria dB(A) $L_{Aeq\ (15min)}$

Receiver No.	***Receiver***	***Day*** ($L_{Aeq\ (15min)}$)	***Evening*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{Aeq\ (15min)}$)
-	All privately-owned land	38	38	38

Notes:

- *Noise generated by the development is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 8 sets out the requirements for evaluating compliance with these criteria.*
- *For this condition to apply, the exceedance of the criteria must be systemic.*

APPENDIX 8

NOISE COMPLIANCE ASSESSMENT

Compliance Monitoring

1. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this approval.

2. Data collected for the purposes of determining compliance with the relevant conditions of this approval is to be excluded under the following meteorological conditions:
   a) during periods of rain or hail;
   b) average wind speed at microphone height exceeds 5 m/s;
   c) wind speeds greater than 3 m/s measures at 10 m above ground level; and
   d) temperature inversion conditions greater than 3°C/100m.

3. Unless otherwise agreed with the Planning Secretary, this monitoring is to be carried out in accordance with the relevant requirements relating for reviewing performance set out in the NSW Industrial Noise Policy (as amended from time to time), in particular the requirements relating to:
   a) monitoring locations for the collection of representative noise data;
   b) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
   c) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

4. To the extent that there is any inconsistency between the Industrial Noise Policy and the requirements set out in this Appendix, the Appendix prevails to the extent of the inconsistency.

Determination of Meteorological Conditions

5. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located in the vicinity of the site (as required by condition 18 of Schedule 3).

B.2 Environmental protection licence

Environment Protection Licence

24	Groundwater monitoring	Monitoring up-gradient of Glennies Creek alluvium at coordinates 319294, 6404588 (Easting, Northing), identified as WML120B in Figure 1.
25	Groundwater monitoring	Monitoring mid-gradient of Glennies Creek alluvium at coordinates 319468, 6403528 (Easting, Northing), identified as WML129 in Figure 1.
26	Groundwater monitoring	Monitoring down-gradient of Glennies Creek alluvium at coordinates 318965, 6402842 (Easting, Northing), identified as WMLP336 in Figure 1.
27	Groundwater monitoring	Monitoring up-gradient of Barrett coal seam at coordinates 318431, 6407214 (Easting, Northing), identified as GM1 in Figure 1.
28	Groundwater monitoring	Monitoring up-gradient of Pikes Gully coal seam at coordinates 319292, 6404580 (Easting, Northing), identified as WML120A in Figure 1.
29	Groundwater monitoring	Monitoring mid-gradient of Pikes Gully coal seam at coordinates 319220, 6403928 (Easting, Northing), identified as WML262 in Figure 1.
30	Groundwater monitoring	Monitoring up-gradient of Upper Liddell coal seam at coordinates 319215, 6403958 (Easting, Northing), identified as WML181 in Figure 1.
31	Groundwater monitoring	Monitoring mid-gradient of Upper Liddell coal seam at coordinates 319188, 6404325 (Easting, Northing), identified as WML183 in Figure 1.

P1.4 The following points referred to in the table below are identified in this licence for the purposes of weather and/or noise monitoring and/or setting limits for the emission of noise from the premises.

Noise/Weather

EPA identification no.	Type of monitoring point	Location description
12	Meteorological Station – to determine meteorological conditions for noise monitoring	Meteorological monitoring at coordinates 320522, 6406815 (Easting, Northing), identified as Repeater on Figure 2.
13	Noise monitoring	Monitoring at coordinates 320554, 6405839 (Easting, Northing), identified as N3 on Figure 2 and representative of Noise Assessment Group 2.

14	Noise monitoring	Monitoring at coordinates 320297, 6405670 (Easting, Northing), identified as N2 on Figure 2 and representative of Noise Assessment Group 1.
15	Noise monitoring	Monitoring at coordinates 319776, 6404101 (Easting, Northing), identified as N4 on Figure 2 and representative of Noise Assessment Group 3.
32	Meteorological Station – to determine meteorological conditions for noise monitoring	Monitoring of temperature at 'M1' at coordinates 320259, 6405971 (Easting, Northing).

P1.5 For the purposes of Condition P1.1, P1.2 and P1.3, Figure 1 refers to the plan titled "Ashton Underground Mine Environment Protection licence 11879 Premises Boundary, Surface Infrastructure" dated 30/08/19 (EPA reference DOC19/761196).

P1.6 For the purpose of Condition P1.4, Figure 2 refers to the plan titled "Ashton Underground Mine Environment Protection licence 11879 Premises Boundary, Monitoring" dated 30/08/19 (EPA reference DOC19/761196).

P1.7 The datum for grid references in this Licence is the Geodetic Datum of Australia 1994 (GDA94), Zone 56.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

L2.1 Flares must be operated by the licensee such that there is no visible emission other than for a total period of no more than 5 minutes in any 2 hours, except for heat haze.

L3 Waste

L3.1 The licensee must not cause, permit or allow any waste to be received at the premises unless specified in this licence.

L3.2 The Licensee must not dispose of waste on the premises unless authorised by a condition of this Licence.

L4 Noise limits

L4.1 Noise from the premises must not exceed the noise limits specified in the table below.

Residences referenced in this table are from the consent DA 309-11-2001-i and summarised in the EPA

reference DOC19/761196.

Location	Day LAeq(15 minute)	Evening LAeq(15 minute)	Night LAeq(15 minute)	Night LAeq(1 minute)
EPA Point 13	38	38	36	46
EPA Point 14	38	38	36	46
EPA Point 15	38	38	36	46
All other privately owned residences	38	38	36	46

L4.2 For the purpose of Condition L4.1:
a) Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays,
b) Evening is defined as the period from 6pm to 10pm, and
c) Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays

L4.3 The noise emission limits identified in condition L4.1 apply under the following meteorological conditions:

a) wind speeds up to 3m/s at 10m above ground level; and
b) temperature inversion conditions up to 3 degrees C/100m.

L4.4 For the purposes of condition L4.1:

a) Data recorded by the closest and most representative meteorological station installed on the premises at EPA Identification Point 12 must be used to determine meteorological conditions; and
b) Temperature inversion conditions (stability category) are to be determined by the methods referred to in Fact Sheet D of the Noise Policy for Industry (2017) using EPA Identification Points 12 and 32.

4 Operating Conditions

O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.
This includes:
a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
a) must be maintained in a proper and efficient condition; and
b) must be operated in a proper and efficient manner.

B.3 Noise management plan

Relevant parts of the DA have been reproduced in Appendix A along with reference to where they have been addressed in this document.

4.2 Applicable Criteria

Noise criteria for the ACP are divided into three categories:

- Impact assessment criteria;
- Additional noise mitigation criteria; and
- Cumulative noise acquisition criteria.

The RUM must adhere to a single set of noise criteria relating to noise generated by the RUM development.

4.2.1 Impact Assessment Criteria

In accordance with Condition 2, Appendix 6 of the Ashton DA and Condition L4.1 of EPL 11879, noise generated by the development within the ACP must not exceed the limits specified in **Table 3** at any privately-owned land or on more than 25 per cent of any privately-owned land. The noise limits are provided in decibels (dB).

Table 3: Ashton Noise Impact Criteria dB(A)

Location	Day	Evening	Night	
	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{A1} (1 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	38	38	36	46

In accordance with Condition 12, Schedule 3 of the RUM DA, noise generated by development in the ACOL-operated RUM must not exceed the limits specified in **Table 4** at any residence on privately-owned land or on more than 25 per cent of any privately-owned land.

Table 4 RUM Noise Impact Criteria dB(A)

Location	Day	Evening	Night	
	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{A1} (1 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	35	35	35	45

4.2.2 Additional Noise Mitigation Criteria

If noise emissions generated by the ACP exceed the criteria displayed in **Table 5** at any residence on privately-owned land, then, upon receiving a written request from the landowner, ACOL will implement additional reasonable and feasible noise mitigation measures (such as double glazing, insulation and/or air conditioning) at the residence in consultation with the owner.

Table 5 Additional Noise Mitigation Criteria dB(A)#

Location	Day	Evening	Night
	LAeq (15 minute)	LAeq (15 minute)	LAeq (15 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	38	38	38

* Exceedance of the criteria must be systemic.

4.2.3 Cumulative Noise Acquisition Criteria

If noise emissions generated by the ACP, and other mines exceed the criteria in **Table 6** at any residence on privately-owned land or on more than 25 per cent of any privately-owned land (except for noise affected residential receivers in Condition 1, Schedule 3 of the Ashton DA) then, upon receiving a written request for acquisition from the landowner, ACOL together with the relevant mines, will acquire the land in accordance with the Acquisition Process (as defined in Conditions 7 and 8, Schedule 4 of the Ashton DA).

Table 6 Cumulative Noise Acquisition Criteria dB(A)

Location	Day	Evening	Night
	LAeq (period)	LAeq (period)	LAeq (period)
Camberwell Village	60	50	45
All other privately-owned land	55	50	45

4.3 Existing Environment

The ACP is located in the Hunter Valley region of New South Wales and is bound by the Main Northern Railway to the north, Hunter River to the south and Glennies Creek to the east with the New England Highway dividing the open cut from the underground mining areas.

Other mining operations in the area include the Ravensworth Complex, the Mount Owen Complex, Rix's Creek Open Cut, Integra Underground and Hunter Valley Operations.

The closest sensitive receivers are located in Camberwell. There are currently 13 private landholdings in the local area, 11 of these have an occupied residence.

Ambient noise levels within the village of Camberwell are influenced by the New England Highway to the south, the railway line to the northeast and surrounding mining operations. Attended noise monitoring has confirmed that the major contributing noise source is usually the New England Highway. Noise from ACP has been noted at times in Camberwell Village, historical reports show this has been infrequent and at relatively low levels.

Based on the historical meteorological data collected by ACOL's M2 (repeater) weather station the most common winds in winter are from the west-northwest and the east-southeast in summer. Prevailing winds act to enhance noise from surrounding noise sources (road, rail and mining).

Appendix C
Calibration certificates

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C33872

EQUIPMENT TESTED : Sound Level Calibrator

Manufacturer: Svantek
Type No: SV-36 **Serial No:** 79952
Owner: EMM Consulting Pty Ltd
L3, 175 Scott Street
Newcastle, NSW 2300
Tests Performed: Measured Output Pressure level, Frequency & Distortion
Comments: See Details overleaf. All Test Passed.

Parameter	Pre-Adj	Adj Y/N	Output: (dB re 20 µPa)	Frequency (Hz)	THD&N (%)
Level1:	NA	N	94.09 dB	1000.00 Hz	1.12 %
Level2:	NA	N	114.06 dB	1000.00 Hz	0.71 %
Uncertainty			±0.11 dB	±0.05%	±0.20 %
Uncertainty (at 95% c.l.) k=2					

CONDITION OF TEST:

Ambient Pressure 1004 hPa ±1 hPa
Temperature 23 °C ±1° C
Relative Humidity 55 % ±5%

Date of Receipt : 26/09/2022
Date of Calibration : 29/09/2022
Date of Issue : 29/09/2022

Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2017

CHECKED BY: .....

AUTHORISED SIGNATURE: .....
Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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Acu-Vib Electronics
CALIBRATIONS SALES RENTALS REPAIRS

Head Office & Calibration Laboratory
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(02) 9680 8133
www.acu-vib.com.au

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM31670

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	B & K		
Type No:	2250	**Serial No:**	2759405
Mic. Type:	4189	**Serial No:**	2983733
Pre-Amp. Type:	ZC0032	**Serial No:**	22666
Filter Type:	1/3 Octave	**Test No:**	F031671

Owner: EMM Consulting
Level 3, 175 Scott Street
Newcastle, NSW 2300

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	992	hPa ±1 hPa	**Date of Receipt :**	02/02/2022
Temperature	26	°C ±1° C	**Date of Calibration :**	02/02/2022
Relative Humidity	48	% ±5%	**Date of Issue :**	03/02/2022

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

Jack Kidt

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

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Appendix I

Monthly attended noise monitoring report – September 2023

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Ashton Coal

Monthly attended noise monitoring - September 2023

Prepared for Ashton Coal Operations Pty Ltd

September 2023

Ashton Coal

Monthly attended noise monitoring - September 2023

Ashton Coal Operations Pty Ltd

E221164 RP9

September 2023

Version	Date	Prepared by	Reviewed by	Comments
1	22 September 2023	Lucas Adamson	Tony Welbourne	Draft
2	27 September 2023	Lucas Adamson	Tony Welbourne	Final

Approved by

Tony Welbourne
Associate director
27 September 2023

Level 3 175 Scott Street
Newcastle NSW 2300

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Appendices

Tables

Figures

1 Introduction

1.1 Background

EMM Consulting Pty Ltd (EMM) was engaged by Ashton Coal Operations Pty Ltd to conduct a monthly noise survey of operations at Ashton Coal Operations (Ashton Coal, the site) located at Glennies Creek Rd, Camberwell NSW. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified limits.

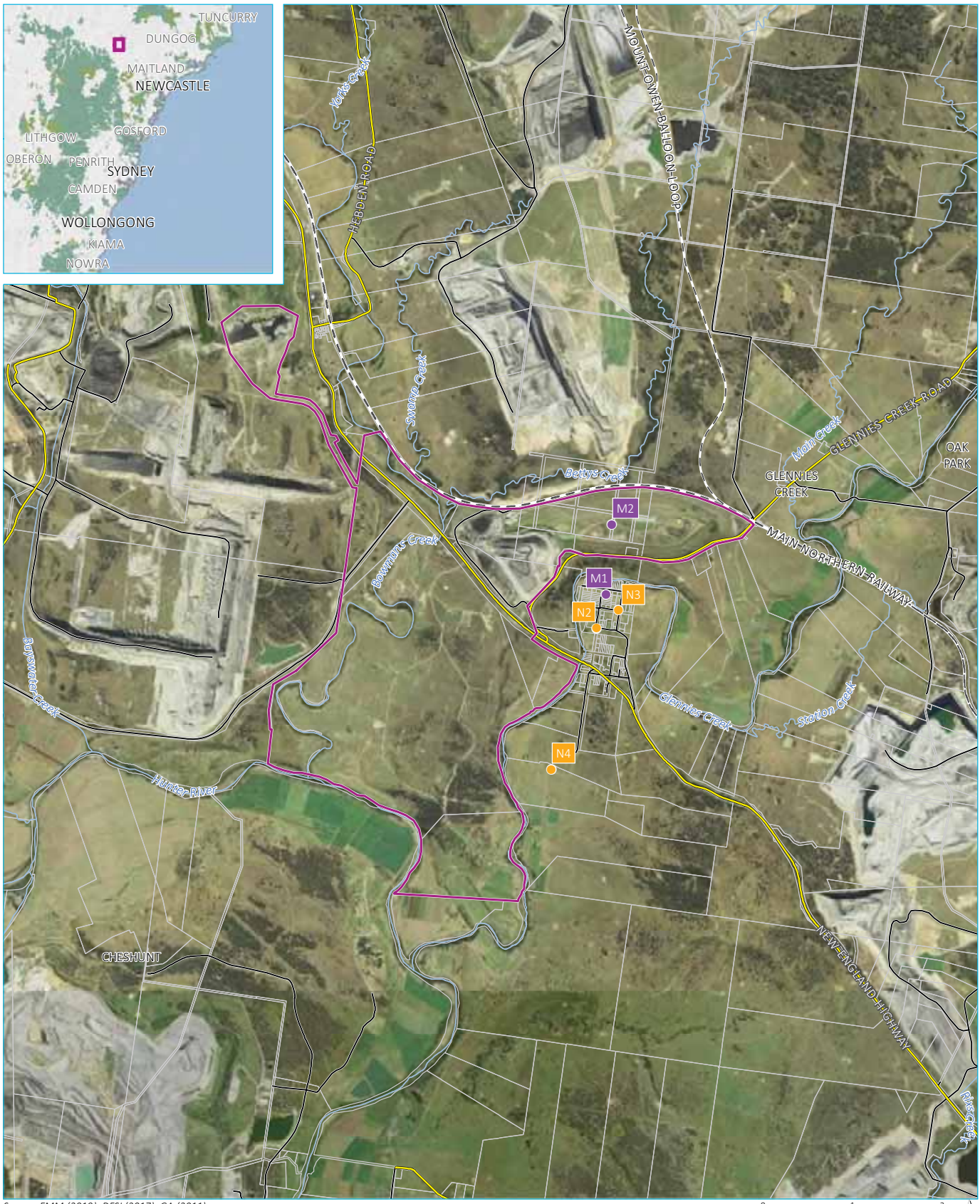
Attended environmental noise monitoring described in this report was done during the night period of Monday 18 September 2023 at three monitoring locations.

1.2 Attended monitoring locations

Site monitoring locations are detailed in Table 1.1 and shown on Figure 1.1. It should be noted that Figure 1.1 shows actual monitoring positions, not necessarily the location of residences.

Table 1.1 Attended noise monitoring locations

Location descriptor/ID	Description/address	Coordinates (MGA56)	
		Easting	Northing
N2	Camberwell Village (west)	320297	6405670
N3	Camberwell Village (north-east)	320554	6405839
N4	South of New England Highway	319776	6404101



Source: EMM (2019); DFSI (2017); GA (2011)

0 1 2 km

GDA 1994 MGA Zone 56

N

\\emmsvr1\EMM\Jobs\2019\H190081 - Ashton Coal Noise Monitoring\8 GIS\02_Maps\N001_NoiseMonitoring_20190312_02.mxd 12/03/2019

KEY

- Site boundary
- Noise monitoring location
- Meteorological station
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Cadastral boundary

Noise monitoring locations and Ashton colliery boundary

Ashton Coal
Monthly attended noise monitoring
Figure 1.1

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creating opportunities

1.3 Terminology and abbreviations

Some definitions of terms and abbreviations which may be used in this report are provided in Table 1.2.

Table 1.2 Terminology and abbreviations

Term/descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to approximate how humans hear noise.
L_{Amax}	The maximum root mean squared A-weighted noise level over a time period.
L_{A1}	The A-weighted noise level which is exceeded for one per cent of the time.
$L_{A1,1minute}$	The A-weighted noise level which is exceeded for one per cent of the specified time period of one minute.
L_{A10}	The A-weighted noise level which is exceeded for 10 per cent of the time.
L_{Aeq}	The energy average A-weighted noise level.
L_{A50}	The A-weighted noise level which is exceeded for 50 per cent of the time, and is also the median noise level during a measurement period.
L_{A90}	The A-weighted noise level exceeded for 90 percent of the time, also referred to as the "background" noise level and commonly used to derive noise limits.
L_{Amin}	The minimum A-weighted noise level over a time period.
L_{Ceq}	The energy average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure are measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	The vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	Monday – Saturday: 7 am to 6 pm, on Sundays and Public Holidays: 8 am to 6 pm.
Evening	Monday – Saturday: 6 pm to 10 pm, on Sundays and Public Holidays: 6 pm to 10 pm.
Night	Monday – Saturday: 10 pm to 7 am, on Sundays and Public Holidays: 10 pm to 8 am.
Temperature inversion	A meteorological condition where the atmospheric temperature increases with altitude.

Appendix A provides further information that gives an indication as to how an average person perceives changes in noise level, and examples of common noise levels.

2 Noise limits

2.1 Development consent

Ashton Coal noise limits are provided in Table 1, Condition 2 of Appendix 6 of development consent 309-11-2001-I (DC). Relevant sections of the DC are reproduced in Appendix B.1.

2.2 Environment protection licence

Ashton Coal noise limits are provided in Condition L4.1 of EPL 11879 (EPL). Relevant sections of the EPL are reproduced in Appendix B.2.

2.3 Noise management plan

The approved NMP adopts three attended noise monitoring locations that are representative of residences outlined in the DC and EPL. Relevant sections of the NMP are reproduced in Appendix B.3.

2.4 Noise limits

Noise limits based on the NMP are as shown in Table 2.1.

Table 2.1 Noise impact limits, dB

Location	Day $L_{Aeq,15minute}$	Evening $L_{Aeq,15minute}$	Night $L_{Aeq,15minute}$	Night $L_{A1,1minute}$
N2	38	38	36	46
N3	38	38	36	46
N4	38	38	36	46

2.5 Meteorological conditions

The DC and EPL specify the following meteorological conditions under which noise limits do not apply:

- during periods of rain or hail
- average wind speed at microphone height exceeds 5 metres per second (m/s)
- wind speeds greater than 3 m/s at 10 metres above ground level
- temperature inversion conditions greater than 3°C/100 m.

2.6 Additional requirements

Monitoring and reporting have been done in accordance with the NSW EPA 'Noise Policy for Industry' (NPfI) issued in October 2017 and the 'Approved methods for the measurement and analysis of environmental noise in NSW' (Approved Methods) issued in January 2022.

3 Methodology

3.1 Overview

Attended environmental noise monitoring was done in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant EPA requirements. Meteorological data was obtained from the Ashton Coal on-site weather station (AWS) which allowed the correlation of atmospheric parameters with measured noise levels.

3.2 Attended noise monitoring

During this survey, attended noise monitoring was done during the night period at each location. The duration of each measurement was 15 minutes. Atmospheric conditions were measured at each monitoring location.

Measured sound levels from various sources were noted during each measurement, and particular attention was paid to the extent of site contribution (if any) to measured levels. At each monitoring location, the site-only $L_{Aeq,15minute}$ and L_{Amax} were measured directly or determined by other methods detailed in Section 7.1 of the NPfI.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, it was inaudible at the monitoring location. When site noise is noted as NM, this means it was audible but could not be quantified. All results noted as IA or NM in this report were due to one or more of the following:

- Site noise levels were very low, typically more than 10 dB below the measured background (L_{A90}), and unlikely to be noticed.
- Site noise levels were masked by more dominant sources that are characteristic of the environment (such as breeze in foliage or continuous road traffic noise) that cannot be eliminated by monitoring at an alternate or intermediate location.
- It was not feasible or reasonable to employ methods, such as to move closer and back calculate. Cases may include rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

If exact noise levels from site could not be established due to masking by other noise sources in a similar frequency range but were determined to be at least 5 dB lower than relevant limits, then a maximum estimate may be provided. This is expressed as a 'less than' quantity, such as <20 dB or <30 dB.

For this assessment, the measured L_{Amax} has been used as a conservative estimate of $L_{A1,1minute}$. The EPA accepts sleep disturbance analysis based on either the $L_{A1,1minute}$ or L_{Amax} metrics, with the L_{Amax} representing a more conservative assessment of site noise emissions.

3.3 Meteorological data

As per Condition L4.4, this assessment determined stability categories for the attended monitoring period using the direct measurement method as per Fact Sheet D of the Noise Policy for Industry (2017).

The temperature lapse rate between the two weather stations (M1 – Sentinex Unit 40 located in Camberwell Village and M2 – Ashton Coal 'repeater' meteorological station, the site AWS, located in the north-eastern open cut (NEOC) area) was calculated using the following formula:

$$\text{Temperature lapse rate} = (\Delta T) \times (100/(\Delta H))$$

Where:

- ΔT = temperature measured at M2 (at 10 metres above ground level) minus temperature measured at M1 (at 10 metres above ground level); and
- ΔH = the vertical height difference between M2 and M1 (equal to 73 metres).

3.4 Modifying factors

All measurements were evaluated for potential modifying factors in accordance with the NPfI. Assessment of modifying factors is done at the time of measurement if the site was audible and directly quantifiable. If applicable, modifying factor penalties have been reported and added to the measured site only L_{Aeq} noise levels.

Low-frequency modifying factor penalties have only been applied to site-only L_{Aeq} if the site was the only contributing low-frequency noise source. Specific methodology for assessment of each modifying factor is outlined in Fact Sheet C of the NPfI.

3.5 Instrumentation

The equipment used to measure environmental noise levels is detailed in Table 3.1. Calibration certificates are provided in Appendix C.

Table 3.1 Attended noise monitoring equipment

Item	Serial number	Calibration due date	Relevant standard
Brüel & Kjær 2250 sound level meter	2759405	2/2/2024	IEC 61672-1:2013
Svantek SV-36 calibrator	79952	29/9/2024	IEC 60942:2017

4 Results

4.1 Total measured noise levels and atmospheric conditions

Overall noise levels measured at each location during attended measurements are provided in Table 4.1. Discussion as to the sources responsible for measured levels is provided in Section 5 of this report.

Table 4.1 Total measured noise levels, dB – September 2023[1]

Location	Start date	Time	L_{Amax}	L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	L_{Amin}
N2	18/09/2023	22:00	61	56	52	48	44	40	34
N3	18/09/2023	22:18	57	54	50	46	44	35	32
N4	18/09/2023	22:39	65	55	41	42	33	28	25

Notes: 1. Levels in this table are not necessarily the result of activity at the site.

Atmospheric condition data measured by the operator during each measurement using a hand-held weather meter is shown in Table 4.2. The wind speed, direction and temperature were measured at approximately 1.5 metres above ground. Attended noise monitoring is not done during rain, hail, or wind speeds above 5 m/s at microphone height.

Table 4.2 Atmospheric conditions measured at microphone height – September 2023

Location	Date	Time	Temperature °C	Wind speed m/s	Wind direction °Magnetic north	Cloud cover 1/8s
N2	18/09/2023	22:00	23.4	<0.5	-	0
N3	18/09/2023	22:18	23.3	<0.5	-	0
N4	18/09/2023	22:39	23.4	<0.5	-	0

4.2 Site only noise levels

4.2.1 Modifying factors

There were no modifying factors, as defined in the NPfI, applicable during the survey.

4.2.2 Monitoring results

Table 4.3 provides site noise levels in the absence of other sources, where possible, and includes weather data from the site AWS. Limits are applicable if weather conditions were within specified parameters during each measurement.

Table 4.3 Site noise levels and limits – September 2023

Location	Start Date	Time	Wind		Stability Class	VTG °C/100m	Limits apply? [1]	Limit, dB		Site level, dB [2]		Exceedance, dB	
			Speed m/s	Direction° [4]				$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
N2	18/09/2023	22:00	1.7	288	G	11.2	No	36	46	32	33	N/A	N/A
N3	18/09/2023	22:18	1.0	299	G	11.4	No	36	46	33	34	N/A	N/A
N4	18/09/2023	22:39	1.6	258	G	9.0	No	36	46	IA	IA	N/A	N/A

Notes:
1. Noise emission limits do not apply during periods of rainfall or winds greater than 3 metres per second (at a height of 10 metres).
2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties if applicable.
3. N/A in the exceedance columns means the criterion was not applicable due to atmospheric conditions outside those specified in project approval.
4. Degrees magnetic north, "-" indicates calm conditions.
5. IA in the site level column means that the site was deemed inaudible at that location.

5 Discussion

5.1 Noted noise sources

During attended monitoring, the time variations (temporal characteristics) of noise sources are considered in each measurement via statistical descriptors. From these observations, summaries have been derived for the location and provided in this chapter. Statistical 1/3 octave-band analysis of environmental noise was undertaken, and the following figures display frequency ranges of various noise sources at each location for L_{A1}, L_{A10}, L_{Aeq}, L_{A50}, and L_{A90} descriptors. These figures also provide, graphically, statistical information for these noise levels.

An example is provided as Figure 5.1, where frogs and insects are seen to be generating noise at frequencies above 1000 Hz, while industrial noise is observed at frequencies less than 1000 Hz.

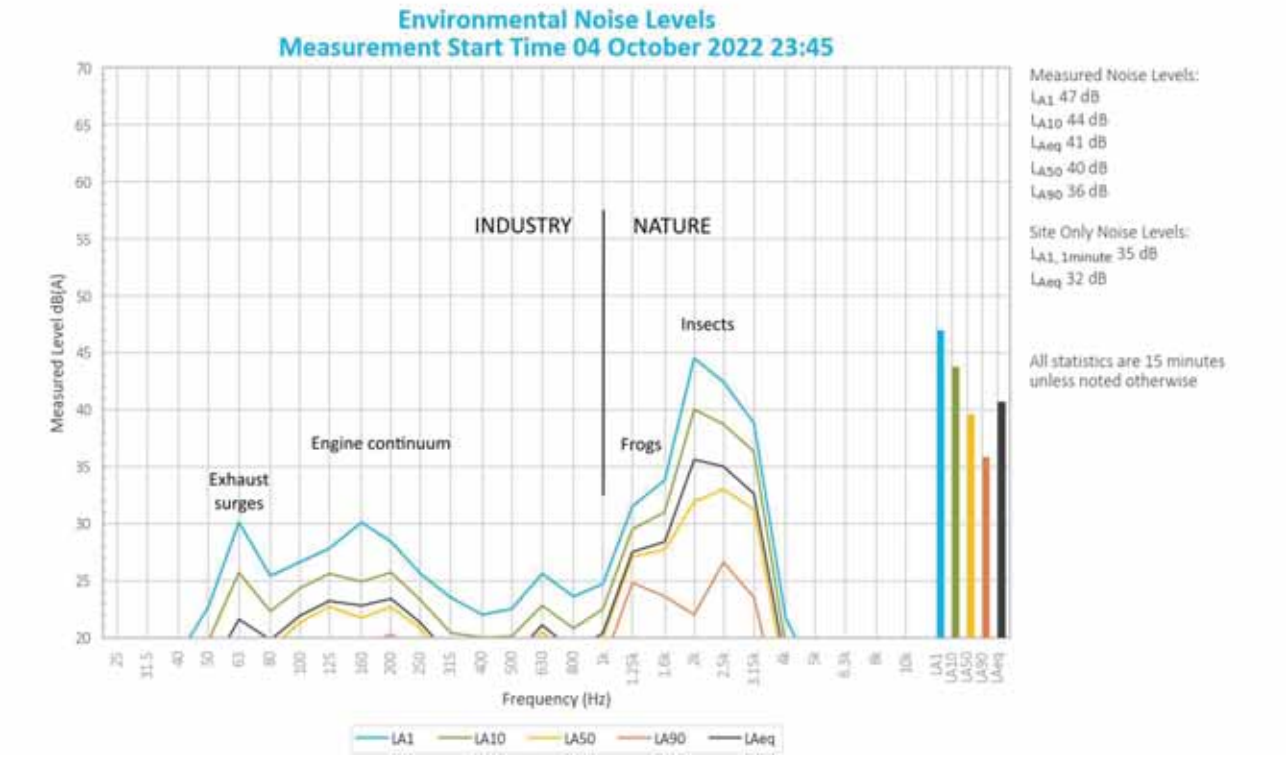

Figure 5.1 Example graph

5.2 N2 - Camberwell Village (West)

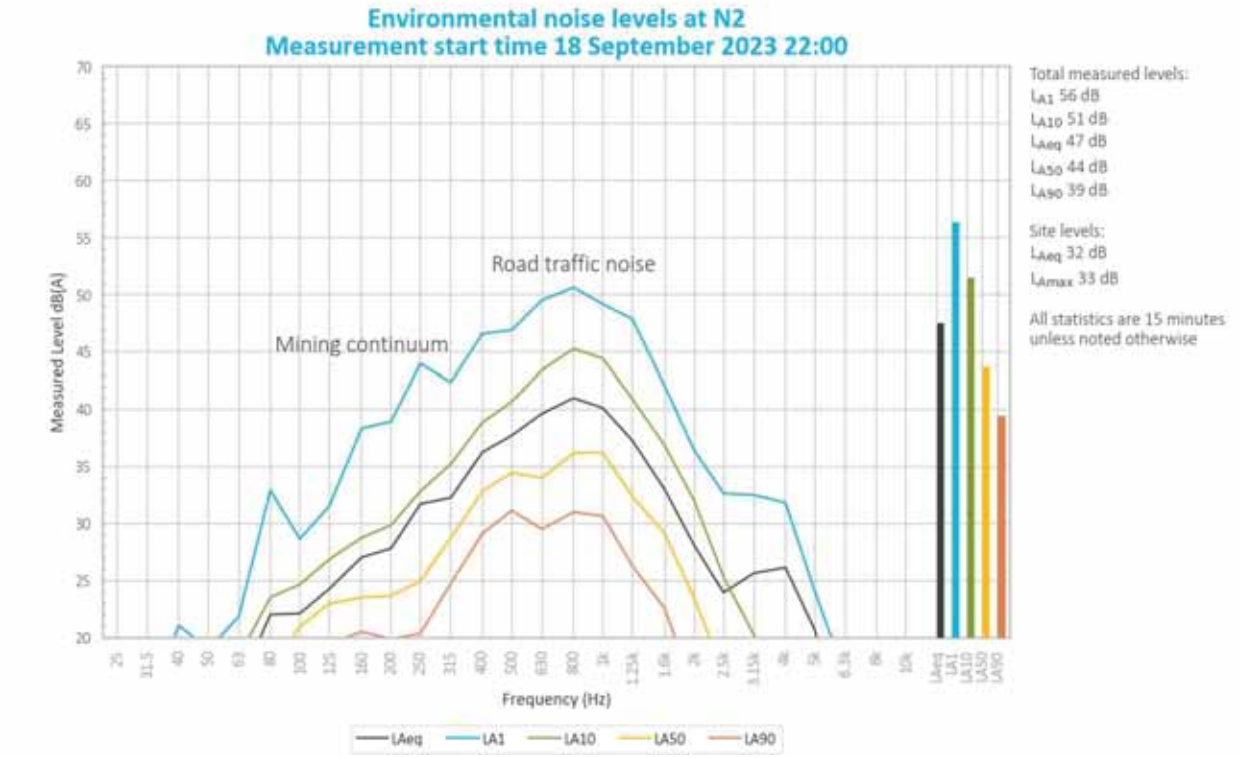

Figure 5.2 Environmental noise levels - N2, Camberwell Village (West)

Ashton Coal mine hum was consistently audible throughout the entire measurement, generating Ashton Coal $L_{Aeq,15minute}$ 32 dB and L_{Amax} 33 dB.

Road traffic noise was primarily responsible for measured levels.

Noise from insects, frogs, bird noise, dogs barking, resident noise and other mines in the vicinity (unrelated to Ashton Coal) was also noted.

5.2.1 Cumulative mining noise at N2

Other mining operations in the vicinity were consistently audible. Cumulative mining noise was estimated to be $L_{Aeq,night}$ 32 dB (i.e. Ashton Coal mine noise of $L_{Aeq,15minute}$ 32 dB + other mine noise of $L_{Aeq,15minute}$ 32 dB less 3 dB as per NPfI methodology) which is below the relevant limit of $L_{Aeq,night}$ 40 dB.

5.3 N3 - Camberwell Village (North-East)

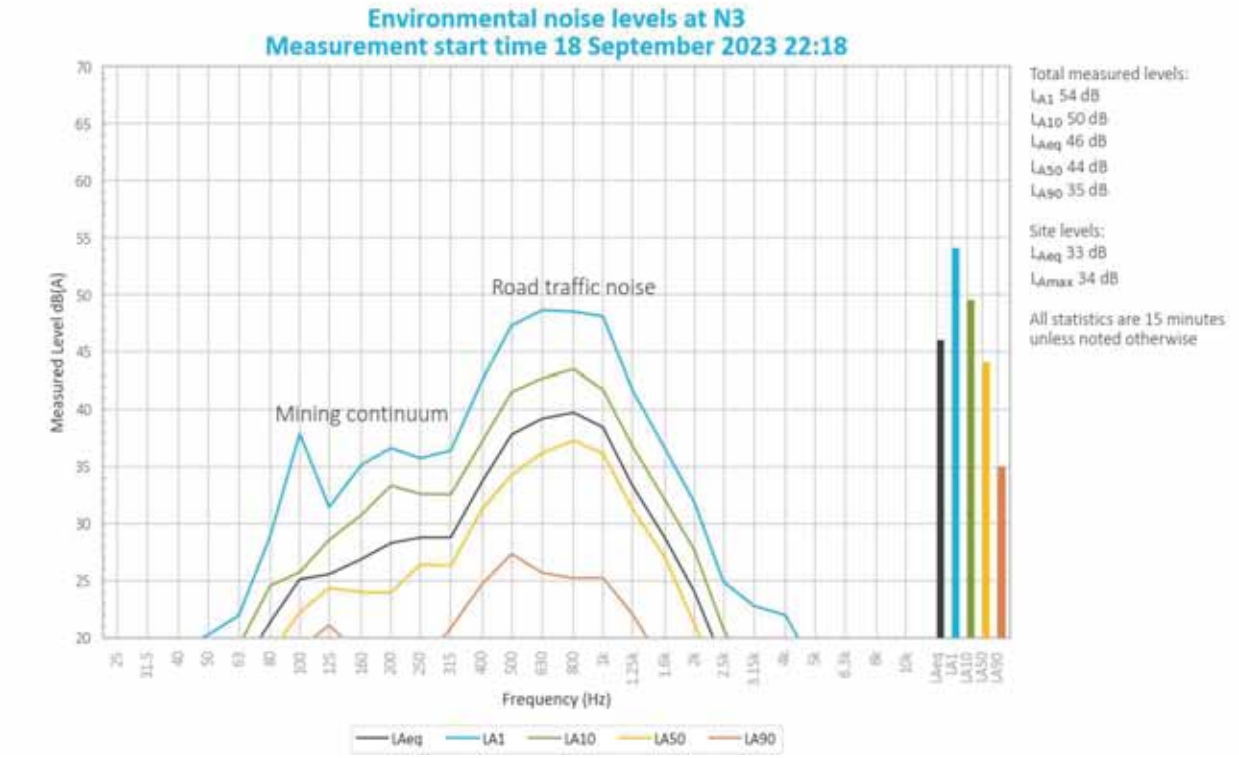

Figure 5.3 Environmental noise levels – N3, Camberwell Village (North-East)

Ashton Coal mine hum was consistently audible throughout the entire measurement, generating Ashton Coal $L_{Aeq,15minute}$ 33 dB and L_{Amax} 34 dB.

Road traffic noise was primarily responsible for measured levels.

Noise from insects, frogs, dogs barking, other mines in the vicinity (unrelated to Ashton Coal) and a train on the main line (unrelated to Ashton Coal) was also noted.

5.3.1 Cumulative mining noise at N3

Other mining operations in the vicinity were consistently audible. Cumulative mining noise was estimated to be $L_{Aeq,night}$ 33 dB (i.e. Ashton Coal mine noise of $L_{Aeq,15minute}$ 33 dB + other mine noise of $L_{Aeq,15minute}$ 33 dB less 3 dB as per NPfI methodology) which is below the relevant limit of $L_{Aeq,night}$ 40 dB.

5.4 N4 - South of New England Highway

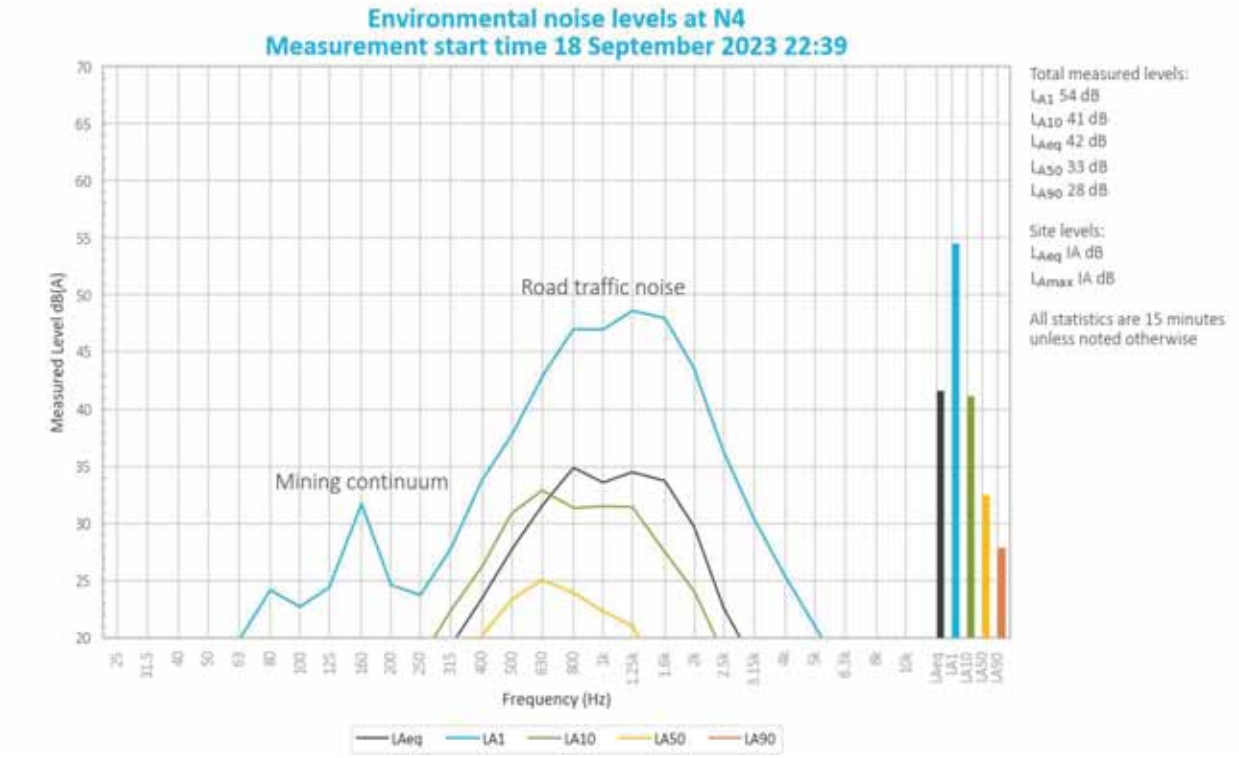

Figure 5.4 Environmental noise levels – N4, South of New England Highway

Ashton Coal was inaudible throughout the entire measurement.

Road traffic noise was primarily responsible for measured levels.

Noise from insects, frogs, livestock and other mines in the vicinity (unrelated to Ashton Coal) was also noted.

5.4.1 Cumulative mining noise at N4

Ashton Coal was inaudible and therefore no cumulative mining noise was associated with it.

6 Summary

EMM Consulting Pty Ltd (EMM) was engaged by Ashton Coal Operations Pty Ltd to conduct a monthly noise survey of operations at Ashton Coal. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified noise limits.

Attended environmental noise monitoring described in this report was done during the night period on Monday 18 September 2023 at three monitoring locations.

Noise levels from the site complied with relevant limits at all monitoring locations during the September 2023 survey.

Appendix A
Noise perception and examples

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A.1 Noise levels

Table A.1 gives an indication as to how an average person perceives changes in noise level. Examples of common noise levels are provided in Figure A.1.

Table A.1 Perceived change in noise

Change in sound pressure level (dB)	Perceived change in noise
up to 2	Not perceptible
3	Just perceptible
5	Noticeable difference
10	Twice (or half) as loud
15	Large change
20	Four times (or a quarter) as loud

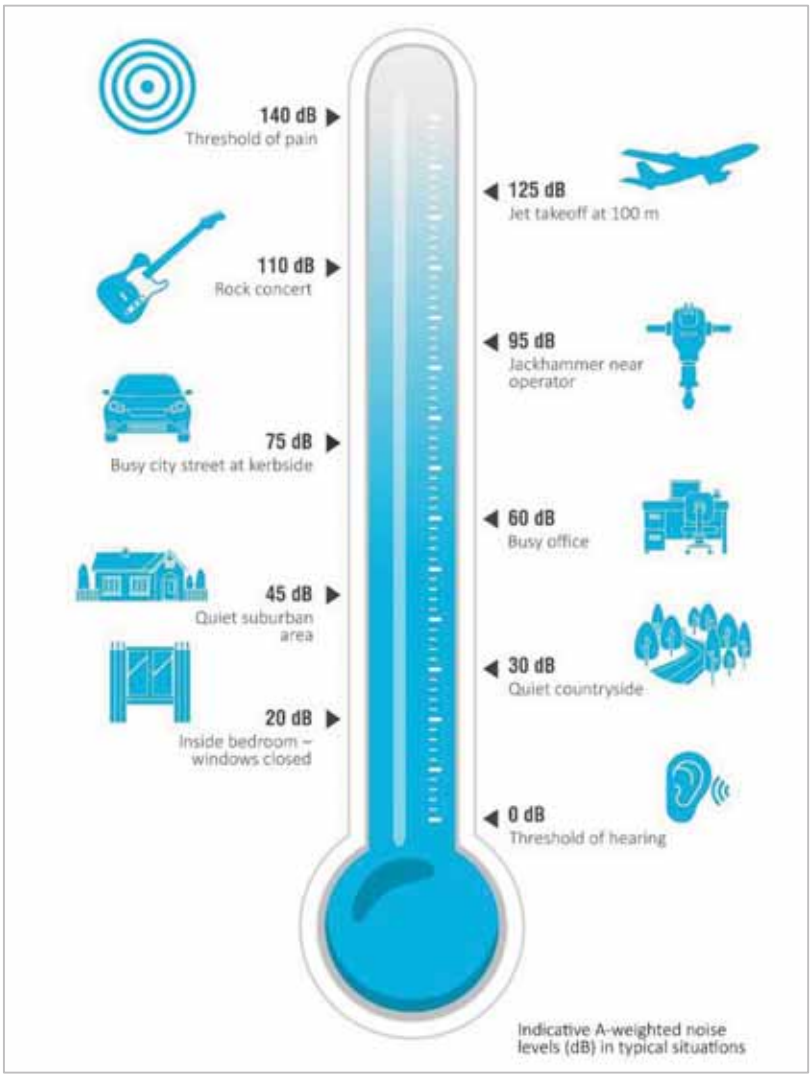

Figure A.1 Common noise levels

Appendix B
Regulator documents

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B.1 Project approval

APPENDIX 6

ALTERNATE NOISE CONDITIONS

NOISE

Application

1. Conditions 2 to 3 below have effect during times when open cut mining operations are not being undertaken at the Ashton Mine Complex, in the opinion of the Planning Secretary.

Noise Criteria

2. Except for the noise-affected land in Table 1 of Schedule 3, the Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 1 at any residence on privately-owned land or on more than 25 per cent of any privately-owned land.

Table 1: Noise Criteria dB(A)

Receiver No.	***Receiver***	***Day*** ($L_{Aeq\ (15min)}$)	***Evening*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{A1\ (1\ min)}$)
-	All privately-owned land	38	38	36	46

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy*. Appendix 8 sets out the requirements for evaluating compliance with these criteria.

However, these noise criteria do not apply if the Applicant has an agreement with the relevant owner/s of the residence/land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Additional Noise Mitigation Measures

3. Upon receiving a written request from the owner of any residence on any privately-owned land where subsequent operational noise monitoring shows the noise generated by the development exceeds the noise limits in Table 2, the Applicant must implement additional reasonable and feasible noise mitigation measures (such as double glazing, insulation, and/or air conditioning) at the residence in consultation with the owner.

If within 3 months of receiving this request from the landowner, the Applicant and the landowner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Planning Secretary for resolution.

Table 2: Additional Noise Mitigation Criteria dB(A) $L_{Aeq\ (15min)}$

Receiver No.	***Receiver***	***Day*** ($L_{Aeq\ (15min)}$)	***Evening*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{Aeq\ (15min)}$)
-	All privately-owned land	38	38	38

Notes:

- *Noise generated by the development is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 8 sets out the requirements for evaluating compliance with these criteria.*
- *For this condition to apply, the exceedance of the criteria must be systemic.*

APPENDIX 8

NOISE COMPLIANCE ASSESSMENT

Compliance Monitoring

1. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this approval.

2. Data collected for the purposes of determining compliance with the relevant conditions of this approval is to be excluded under the following meteorological conditions:
   a) during periods of rain or hail;
   b) average wind speed at microphone height exceeds 5 m/s;
   c) wind speeds greater than 3 m/s measures at 10 m above ground level; and
   d) temperature inversion conditions greater than 3°C/100m.

3. Unless otherwise agreed with the Planning Secretary, this monitoring is to be carried out in accordance with the relevant requirements relating for reviewing performance set out in the NSW Industrial Noise Policy (as amended from time to time), in particular the requirements relating to:
   a) monitoring locations for the collection of representative noise data;
   b) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
   c) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

4. To the extent that there is any inconsistency between the Industrial Noise Policy and the requirements set out in this Appendix, the Appendix prevails to the extent of the inconsistency.

Determination of Meteorological Conditions

5. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located in the vicinity of the site (as required by condition 18 of Schedule 3).

B.2 Environmental protection licence

Environment Protection Licence

24	Groundwater monitoring	Monitoring up-gradient of Glennies Creek alluvium at coordinates 319294, 6404588 (Easting, Northing), identified as WML120B in Figure 1.
25	Groundwater monitoring	Monitoring mid-gradient of Glennies Creek alluvium at coordinates 319468, 6403528 (Easting, Northing), identified as WML129 in Figure 1.
26	Groundwater monitoring	Monitoring down-gradient of Glennies Creek alluvium at coordinates 318965, 6402842 (Easting, Northing), identified as WMLP336 in Figure 1.
27	Groundwater monitoring	Monitoring up-gradient of Barrett coal seam at coordinates 318431, 6407214 (Easting, Northing), identified as GM1 in Figure 1.
28	Groundwater monitoring	Monitoring up-gradient of Pikes Gully coal seam at coordinates 319292, 6404580 (Easting, Northing), identified as WML120A in Figure 1.
29	Groundwater monitoring	Monitoring mid-gradient of Pikes Gully coal seam at coordinates 319220, 6403928 (Easting, Northing), identified as WML262 in Figure 1.
30	Groundwater monitoring	Monitoring up-gradient of Upper Liddell coal seam at coordinates 319215, 6403958 (Easting, Northing), identified as WML181 in Figure 1.
31	Groundwater monitoring	Monitoring mid-gradient of Upper Liddell coal seam at coordinates 319188, 6404325 (Easting, Northing), identified as WML183 in Figure 1.

P1.4 The following points referred to in the table below are identified in this licence for the purposes of weather and/or noise monitoring and/or setting limits for the emission of noise from the premises.

Noise/Weather

EPA identification no.	Type of monitoring point	Location description
12	Meteorological Station – to determine meteorological conditions for noise monitoring	Meteorological monitoring at coordinates 320522, 6406815 (Easting, Northing), identified as Repeater on Figure 2.
13	Noise monitoring	Monitoring at coordinates 320554, 6405839 (Easting, Northing), identified as N3 on Figure 2 and representative of Noise Assessment Group 2.

14	Noise monitoring	Monitoring at coordinates 320297, 6405670 (Easting, Northing), identified as N2 on Figure 2 and representative of Noise Assessment Group 1.
15	Noise monitoring	Monitoring at coordinates 319776, 6404101 (Easting, Northing), identified as N4 on Figure 2 and representative of Noise Assessment Group 3.
32	Meteorological Station – to determine meteorological conditions for noise monitoring	Monitoring of temperature at 'M1' at coordinates 320259, 6405971 (Easting, Northing).

P1.5 For the purposes of Condition P1.1, P1.2 and P1.3, Figure 1 refers to the plan titled "Ashton Underground Mine Environment Protection licence 11879 Premises Boundary, Surface Infrastructure" dated 30/08/19 (EPA reference DOC19/761196).

P1.6 For the purpose of Condition P1.4, Figure 2 refers to the plan titled "Ashton Underground Mine Environment Protection licence 11879 Premises Boundary, Monitoring" dated 30/08/19 (EPA reference DOC19/761196).

P1.7 The datum for grid references in this Licence is the Geodetic Datum of Australia 1994 (GDA94), Zone 56.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

L2.1 Flares must be operated by the licensee such that there is no visible emission other than for a total period of no more than 5 minutes in any 2 hours, except for heat haze.

L3 Waste

L3.1 The licensee must not cause, permit or allow any waste to be received at the premises unless specified in this licence.

L3.2 The Licensee must not dispose of waste on the premises unless authorised by a condition of this Licence.

L4 Noise limits

L4.1 Noise from the premises must not exceed the noise limits specified in the table below.

Residences referenced in this table are from the consent DA 309-11-2001-i and summarised in the EPA

reference DOC19/761196.

Location	Day LAeq(15 minute)	Evening LAeq(15 minute)	Night LAeq(15 minute)	Night LAeq(1 minute)
EPA Point 13	38	38	36	46
EPA Point 14	38	38	36	46
EPA Point 15	38	38	36	46
All other privately owned residences	38	38	36	46

L4.2 For the purpose of Condition L4.1:
a) Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays,
b) Evening is defined as the period from 6pm to 10pm, and
c) Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays

L4.3 The noise emission limits identified in condition L4.1 apply under the following meteorological conditions:

a) wind speeds up to 3m/s at 10m above ground level; and
b) temperature inversion conditions up to 3 degrees C/100m.

L4.4 For the purposes of condition L4.1:

a) Data recorded by the closest and most representative meteorological station installed on the premises at EPA Identification Point 12 must be used to determine meteorological conditions; and
b) Temperature inversion conditions (stability category) are to be determined by the methods referred to in Fact Sheet D of the Noise Policy for Industry (2017) using EPA Identification Points 12 and 32.

4 Operating Conditions

O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.
This includes:
a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
a) must be maintained in a proper and efficient condition; and
b) must be operated in a proper and efficient manner.

B.3 Noise management plan

Relevant parts of the DA have been reproduced in Appendix A along with reference to where they have been addressed in this document.

4.2 Applicable Criteria

Noise criteria for the ACP are divided into three categories:

- Impact assessment criteria;
- Additional noise mitigation criteria; and
- Cumulative noise acquisition criteria.

The RUM must adhere to a single set of noise criteria relating to noise generated by the RUM development.

4.2.1 Impact Assessment Criteria

In accordance with Condition 2, Appendix 6 of the Ashton DA and Condition L4.1 of EPL 11879, noise generated by the development within the ACP must not exceed the limits specified in **Table 3** at any privately-owned land or on more than 25 per cent of any privately-owned land. The noise limits are provided in decibels (dB).

Table 3: Ashton Noise Impact Criteria dB(A)

Location	Day	Evening	Night	
	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{A1} (1 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	38	38	36	46

In accordance with Condition 12, Schedule 3 of the RUM DA, noise generated by development in the ACOL-operated RUM must not exceed the limits specified in **Table 4** at any residence on privately-owned land or on more than 25 per cent of any privately-owned land.

Table 4 RUM Noise Impact Criteria dB(A)

Location	Day	Evening	Night	
	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{A1} (1 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	35	35	35	45

4.2.2 Additional Noise Mitigation Criteria

If noise emissions generated by the ACP exceed the criteria displayed in **Table 5** at any residence on privately-owned land, then, upon receiving a written request from the landowner, ACOL will implement additional reasonable and feasible noise mitigation measures (such as double glazing, insulation and/or air conditioning) at the residence in consultation with the owner.

Table 5 Additional Noise Mitigation Criteria dB(A)#

Location	Day	Evening	Night
	LAeq (15 minute)	LAeq (15 minute)	LAeq (15 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	38	38	38

* Exceedance of the criteria must be systemic.

4.2.3 Cumulative Noise Acquisition Criteria

If noise emissions generated by the ACP, and other mines exceed the criteria in **Table 6** at any residence on privately-owned land or on more than 25 per cent of any privately-owned land (except for noise affected residential receivers in Condition 1, Schedule 3 of the Ashton DA) then, upon receiving a written request for acquisition from the landowner, ACOL together with the relevant mines, will acquire the land in accordance with the Acquisition Process (as defined in Conditions 7 and 8, Schedule 4 of the Ashton DA).

Table 6 Cumulative Noise Acquisition Criteria dB(A)

Location	Day	Evening	Night
	LAeq (period)	LAeq (period)	LAeq (period)
Camberwell Village	60	50	45
All other privately-owned land	55	50	45

4.3 Existing Environment

The ACP is located in the Hunter Valley region of New South Wales and is bound by the Main Northern Railway to the north, Hunter River to the south and Glennies Creek to the east with the New England Highway dividing the open cut from the underground mining areas.

Other mining operations in the area include the Ravensworth Complex, the Mount Owen Complex, Rix's Creek Open Cut, Integra Underground and Hunter Valley Operations.

The closest sensitive receivers are located in Camberwell. There are currently 13 private landholdings in the local area, 11 of these have an occupied residence.

Ambient noise levels within the village of Camberwell are influenced by the New England Highway to the south, the railway line to the northeast and surrounding mining operations. Attended noise monitoring has confirmed that the major contributing noise source is usually the New England Highway. Noise from ACP has been noted at times in Camberwell Village, historical reports show this has been infrequent and at relatively low levels.

Based on the historical meteorological data collected by ACOL's M2 (repeater) weather station the most common winds in winter are from the west-northwest and the east-southeast in summer. Prevailing winds act to enhance noise from surrounding noise sources (road, rail and mining).

Appendix C
Calibration certificates

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C33872

EQUIPMENT TESTED : Sound Level Calibrator

Manufacturer: Svantek
Type No: SV-36 **Serial No:** 79952
Owner: EMM Consulting Pty Ltd
L3, 175 Scott Street
Newcastle, NSW 2300
Tests Performed: Measured Output Pressure level, Frequency & Distortion
Comments: See Details overleaf. All Test Passed.

Parameter	Pre-Adj	Adj Y/N	Output: (dB re 20 µPa)	Frequency (Hz)	THD&N (%)
Level1:	NA	N	94.09 dB	1000.00 Hz	1.12 %
Level2:	NA	N	114.06 dB	1000.00 Hz	0.71 %
Uncertainty			±0.11 dB	±0.05%	±0.20 %
Uncertainty (at 95% c.l.) k=2					

CONDITION OF TEST:

Ambient Pressure 1004 hPa ±1 hPa
Temperature 23 °C ±1° C
Relative Humidity 55 % ±5%

Date of Receipt : 26/09/2022
Date of Calibration : 29/09/2022
Date of Issue : 29/09/2022

Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2017

CHECKED BY: .....

AUTHORISED SIGNATURE: .....
Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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Head Office & Calibration Laboratory
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
(02) 9680 8133
www.acu-vib.com.au

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM31670

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	B & K		
Type No:	2250	**Serial No:**	2759405
Mic. Type:	4189	**Serial No:**	2983733
Pre-Amp. Type:	ZC0032	**Serial No:**	22666
Filter Type:	1/3 Octave	**Test No:**	F031671

Owner: EMM Consulting
Level 3, 175 Scott Street
Newcastle, NSW 2300

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	992	hPa ±1 hPa	**Date of Receipt :**	02/02/2022
Temperature	26	°C ±1° C	**Date of Calibration :**	02/02/2022
Relative Humidity	48	% ±5%	**Date of Issue :**	03/02/2022

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

Jack Kidt

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Canberra City ACT 2601

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Adelaide SA 5000
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emmconsulting.com.au

Appendix J

Monthly attended noise monitoring report – October 2023

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Ashton Coal

Monthly attended noise monitoring - October 2023

Prepared for Ashton Coal Operations Pty Ltd

December 2023

Ashton Coal

Monthly attended noise monitoring - October 2023

Ashton Coal Operations Pty Ltd

E221164 RP10

December 2023

Version	Date	Prepared by	Reviewed by	Comments
1	7 November 2023	Teanuanua Villierme	Tony Welbourne	Draft
2	4 December 2023	Teanuanua Villierme	Tony Welbourne	Final

Approved by

Tony Welbourne
Associate Director
4 December 2023

Level 3 175 Scott Street
Newcastle NSW 2300

TABLE OF CONTENTS

Appendices

Tables

Figures

1 Introduction

1.1 Background

EMM Consulting Pty Ltd (EMM) was engaged by Ashton Coal Operations Pty Ltd to conduct a monthly noise survey of operations at Ashton Coal Operations (Ashton Coal, the site) located at Glennies Creek Road, Camberwell NSW. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified limits.

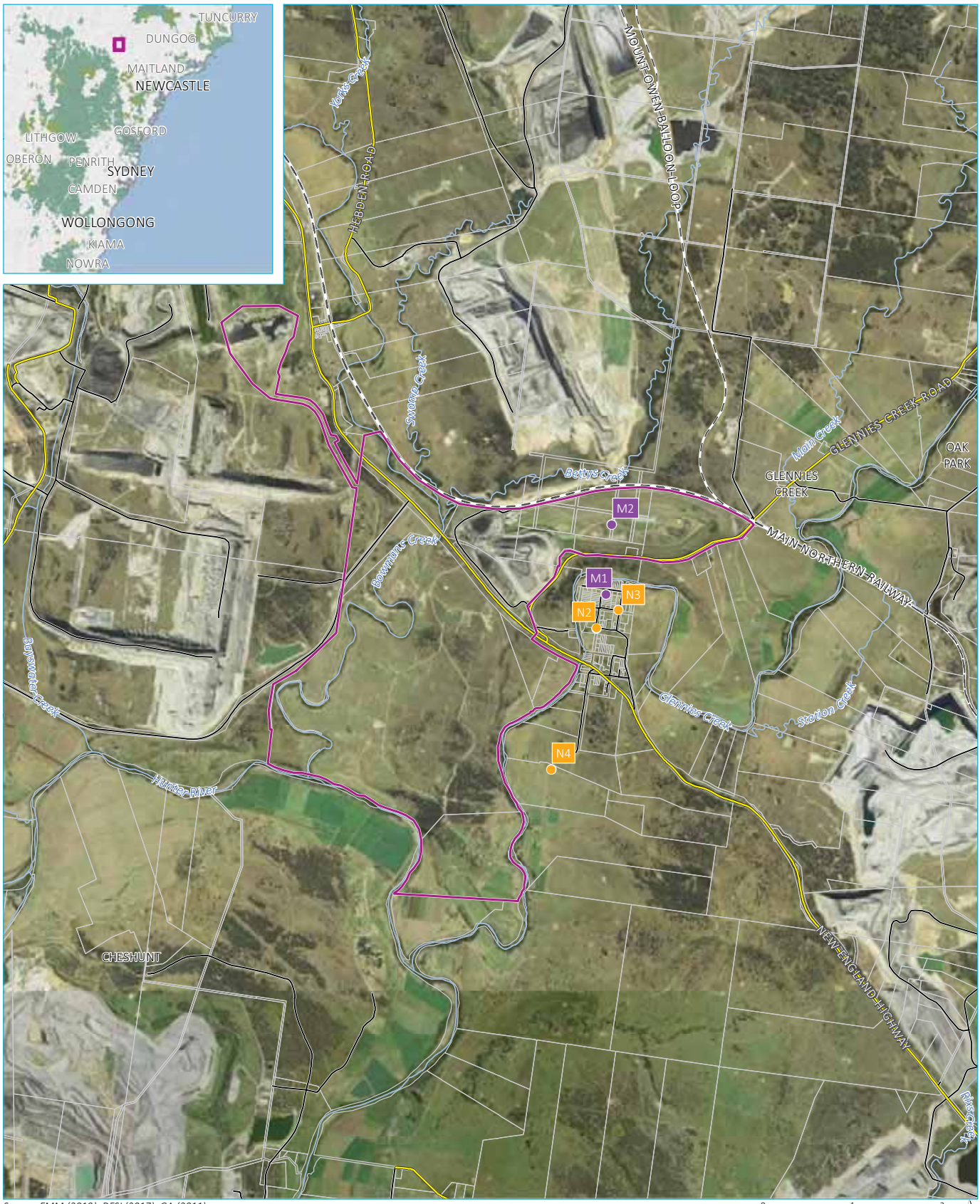
Attended environmental noise monitoring described in this report was done during the night period of Monday 23 October 2023 at three monitoring locations.

1.2 Attended monitoring locations

Site monitoring locations are detailed in Table 1.1 and shown on Figure 1.1. It should be noted that Figure 1.1 shows actual monitoring positions, not necessarily the location of residences.

Table 1.1 Attended noise monitoring locations

Location descriptor/ID	Description/address	Coordinates (MGA56)	
		Easting	Northing
N2	Camberwell Village (west)	320297	6405670
N3	Camberwell Village (north-east)	320554	6405839
N4	South of New England Highway	319776	6404101



Source: EMM (2019); DFSI (2017); GA (2011)

0 1 2 km

GDA 1994 MGA Zone 56

N

\\emmsvr1\EMM\Jobs\2019\H190081 - Ashton Coal Noise Monitoring\8 GIS\02_Maps\N001_NoiseMonitoring_20190312_02.mxd 12/03/2019

KEY

- Site boundary
- Noise monitoring location
- Meteorological station
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Cadastral boundary

Noise monitoring locations and Ashton colliery boundary

Ashton Coal
Monthly attended noise monitoring
Figure 1.1

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1.3 Terminology and abbreviations

Some definitions of terms and abbreviations which may be used in this report are provided in Table 1.2.

Table 1.2 Terminology and abbreviations

Term/descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to approximate how humans hear noise.
L_{Amax}	The maximum root mean squared A-weighted noise level over a time period.
L_{A1}	The A-weighted noise level which is exceeded for one per cent of the time.
$L_{A1,1minute}$	The A-weighted noise level which is exceeded for one per cent of the specified time period of one minute.
L_{A10}	The A-weighted noise level which is exceeded for 10 per cent of the time.
L_{Aeq}	The energy average A-weighted noise level.
L_{A50}	The A-weighted noise level which is exceeded for 50 per cent of the time, and is also the median noise level during a measurement period.
L_{A90}	The A-weighted noise level exceeded for 90 percent of the time, also referred to as the "background" noise level and commonly used to derive noise limits.
L_{Amin}	The minimum A-weighted noise level over a time period.
L_{Ceq}	The energy average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure are measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	The vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	Monday – Saturday: 7 am to 6 pm, on Sundays and Public Holidays: 8 am to 6 pm.
Evening	Monday – Saturday: 6 pm to 10 pm, on Sundays and Public Holidays: 6 pm to 10 pm.
Night	Monday – Saturday: 10 pm to 7 am, on Sundays and Public Holidays: 10 pm to 8 am.
Temperature inversion	A meteorological condition where the atmospheric temperature increases with altitude.

Appendix A provides further information that gives an indication as to how an average person perceives changes in noise level, and examples of common noise levels.

2 Noise limits

2.1 Development consent

Ashton Coal noise limits are provided in Table 1, Condition 2 of Appendix 6 of development consent 309-11-2001-I (DC). Relevant sections of the DC are reproduced in Appendix B.1.

2.2 Environment protection licence

Ashton Coal noise limits are provided in Condition L4.1 of EPL 11879 (EPL). Relevant sections of the EPL are reproduced in Appendix B.2.

2.3 Noise management plan

The approved NMP adopts three attended noise monitoring locations that are representative of residences outlined in the DC and EPL. Relevant sections of the NMP are reproduced in Appendix B.3.

2.4 Noise limits

Noise limits based on the NMP are as shown in Table 2.1.

Table 2.1 Noise impact limits, dB

Location	Day $L_{Aeq,15minute}$	Evening $L_{Aeq,15minute}$	Night $L_{Aeq,15minute}$	Night $L_{A1,1minute}$
N2	38	38	36	46
N3	38	38	36	46
N4	38	38	36	46

2.5 Meteorological conditions

The DC and EPL specify the following meteorological conditions under which noise limits do not apply:

- during periods of rain or hail
- average wind speed at microphone height exceeds 5 metres per second (m/s)
- wind speeds greater than 3 m/s at 10 metres above ground level
- temperature inversion conditions greater than 3°C/100 m.

2.6 Additional requirements

Monitoring and reporting have been done in accordance with the NSW EPA 'Noise Policy for Industry' (NPfI) issued in October 2017 and the 'Approved methods for the measurement and analysis of environmental noise in NSW' (Approved Methods) issued in January 2022.

3 Methodology

3.1 Overview

Attended environmental noise monitoring was done in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant EPA requirements. Meteorological data was obtained from the Ashton Coal on-site weather station (AWS) which allowed the correlation of atmospheric parameters with measured noise levels.

3.2 Attended noise monitoring

During this survey, attended noise monitoring was done during the night period at each location. The duration of each measurement was 15 minutes. Atmospheric conditions were measured at each monitoring location.

Measured sound levels from various sources were noted during each measurement, and particular attention was paid to the extent of site contribution (if any) to measured levels. At each monitoring location, the site-only $L_{Aeq,15minute}$ and L_{Amax} were measured directly or determined by other methods detailed in Section 7.1 of the NPfI.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, it was inaudible at the monitoring location. When site noise is noted as NM, this means it was audible but could not be quantified. All results noted as IA or NM in this report were due to one or more of the following:

- Site noise levels were very low, typically more than 10 dB below the measured background (L_{A90}), and unlikely to be noticed.
- Site noise levels were masked by more dominant sources that are characteristic of the environment (such as breeze in foliage or continuous road traffic noise) that cannot be eliminated by monitoring at an alternate or intermediate location.
- It was not feasible or reasonable to employ methods, such as to move closer and back calculate. Cases may include rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

If exact noise levels from site could not be established due to masking by other noise sources in a similar frequency range but were determined to be at least 5 dB lower than relevant limits, then a maximum estimate may be provided. This is expressed as a 'less than' quantity, such as <20 dB or <30 dB.

For this assessment, the measured L_{Amax} has been used as a conservative estimate of $L_{A1,1minute}$. The EPA accepts sleep disturbance analysis based on either the $L_{A1,1minute}$ or L_{Amax} metrics, with the L_{Amax} representing a more conservative assessment of site noise emissions.

3.3 Meteorological data

As per Condition L4.4, this assessment determined stability categories for the attended monitoring period using the direct measurement method as per Fact Sheet D of the Noise Policy for Industry (2017).

The temperature lapse rate was calculated using data from two weather stations; Sentinex Unit 40 weather station (M1) located in Camberwell Village and Ashton Coal 'repeater' weather station (M2 – the site AWS) located in the north-eastern open cut area). This was calculated for each 15-minute measurement using the following formula:

$$\text{Temperature lapse rate} = (\Delta T) \times (100/(\Delta H))$$

Where:

- ΔT = temperature measured at M2 (at 10 metres above ground level) minus temperature measured at M1 (at 10 metres above ground level); and
- ΔH = the vertical height difference between M2 and M1 (equal to 73 metres).

3.4 Modifying factors

All measurements were evaluated for potential modifying factors in accordance with the NPfI. Assessment of modifying factors is done at the time of measurement if the site was audible and directly quantifiable. If applicable, modifying factor penalties have been reported and added to the measured site only L_{Aeq} noise levels.

Low-frequency modifying factor penalties have only been applied to site-only L_{Aeq} if the site was the only contributing low-frequency noise source. Specific methodology for assessment of each modifying factor is outlined in Fact Sheet C of the NPfI.

3.5 Instrumentation

The equipment used to measure environmental noise levels is detailed in Table 3.1. Calibration certificates are provided in Appendix C.

Table 3.1 Attended noise monitoring equipment

Item	Serial number	Calibration due date	Relevant standard
Brüel & Kjær 2250 sound level meter	3029363	3/11/2024	IEC 61672-1:2013
Svantek SV-36 calibrator	79952	27/9/2025	IEC 60942:2017

4 Results

4.1 Total measured noise levels and atmospheric conditions

Overall noise levels measured at each location during attended measurements are provided in Table 4.1. Discussion as to the sources responsible for measured levels is provided in Section 5 of this report.

Table 4.1 Total measured noise levels, dB – October 2023[1]

Location	Start date	Time	L_{Amax}	L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	L_{Amin}
N2	23/10/2023	22:35	60	56	50	46	42	35	31
N3	23/10/2023	22:57	61	45	40	38	37	34	32
N4	23/10/2023	22:07	53	42	37	35	33	30	27

Notes: 1. Levels in this table are not necessarily the result of activity at the site.

Atmospheric condition data measured by the operator during each measurement using a hand-held weather meter is shown in Table 4.2. The wind speed, direction and temperature were measured at approximately 1.5 metres above ground. Attended noise monitoring is not done during rain, hail, or wind speeds above 5 m/s at microphone height.

Table 4.2 Atmospheric conditions measured at microphone height – October 2023

Location	Date	Time	Temperature °C	Wind speed m/s	Wind direction °Magnetic north	Cloud cover 1/8s
N2	23/10/2023	22:35	13	<0.5	-	0
N3	23/10/2023	22:57	15	<0.5	-	0
N4	23/10/2023	22:07	16	<0.5	-	0

4.2 Site only noise levels

4.2.1 Modifying factors

There were no modifying factors, as defined in the NPfI, applicable during the survey.

4.2.2 Monitoring results

Table 4.3 provides site noise levels in the absence of other sources, where possible, and includes weather data from the site AWS. Limits are applicable if weather conditions were within specified parameters during each measurement.

Table 4.3 Site noise levels and limits – October 2023

Location	Start Date	Time	Wind		Stability Class	VTG °C/100m	Limits apply? [1]	Limit, dB		Site level, dB [2]		Exceedance, dB	
			Speed m/s	Direction° [4]				$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
N2	23/10/2023	22:35	0.5	140	F	2.6	Yes	36	46	IA	IA	N/A	N/A
N3	23/10/2023	22:57	0.4	197	E	-0.5	Yes	36	46	IA	IA	N/A	N/A
N4	23/10/2023	22:07	2.1	170	F	1.6	Yes	36	46	IA	IA	N/A	N/A

Notes:
1. Noise emission limits do not apply during periods of rainfall or winds greater than 3 metres per second (at a height of 10 metres).
2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties if applicable.
3. N/A in the exceedance columns means the criterion was not applicable due to atmospheric conditions outside those specified in project approval.
4. Degrees magnetic north, "-" indicates calm conditions.
5. IA in the site level column means that the site was deemed inaudible at that location.

5 Discussion

5.1 Noted noise sources

During attended monitoring, the time variations (temporal characteristics) of noise sources are considered in each measurement via statistical descriptors. From these observations, summaries have been derived for the location and provided in this chapter. Statistical 1/3 octave-band analysis of environmental noise was undertaken, and the following figures display frequency ranges of various noise sources at each location for L_{A1}, L_{A10}, L_{Aeq}, L_{A50}, and L_{A90} descriptors. These figures also provide, graphically, statistical information for these noise levels.

An example is provided as Figure 5.1, where frogs and insects are seen to be generating noise at frequencies above 1000 Hz, while industrial noise is observed at frequencies less than 1000 Hz.

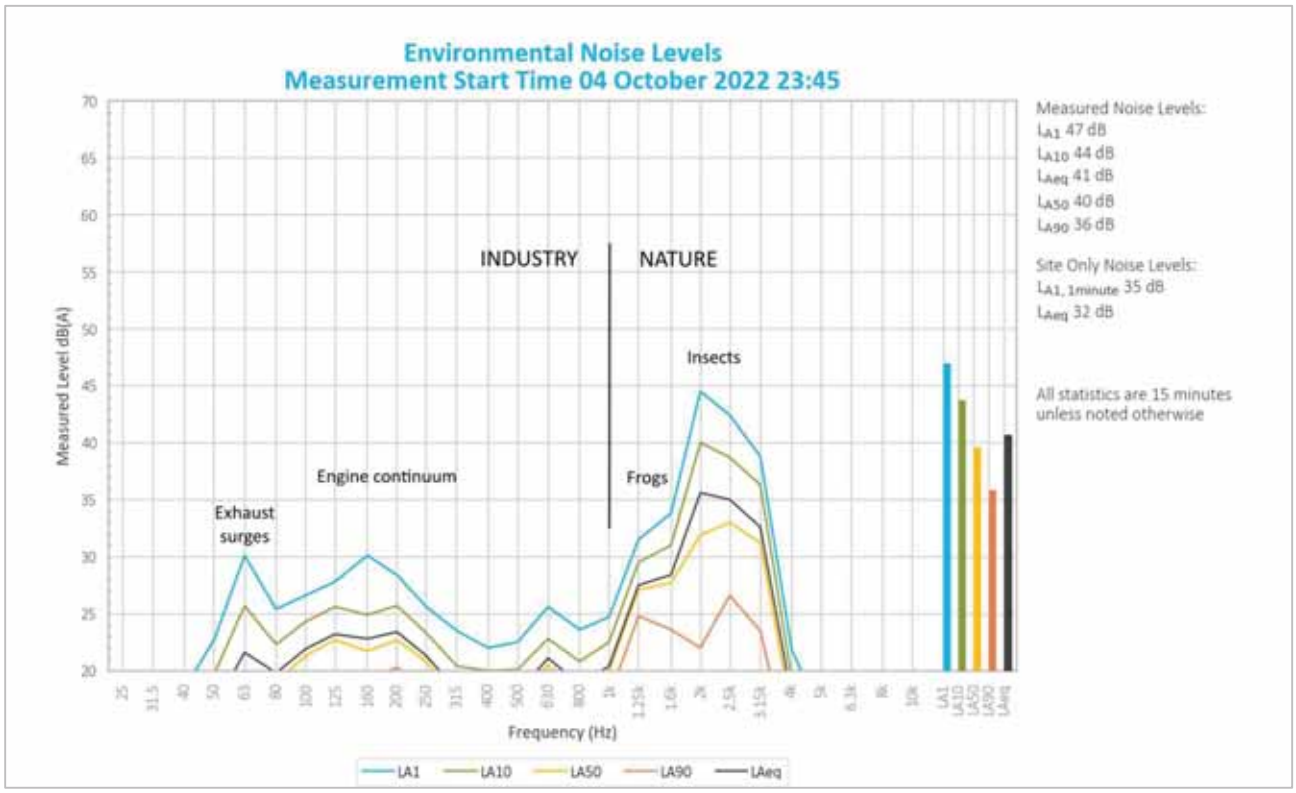

Figure 5.1 Example graph

5.2 N2 – Camberwell Village (west)

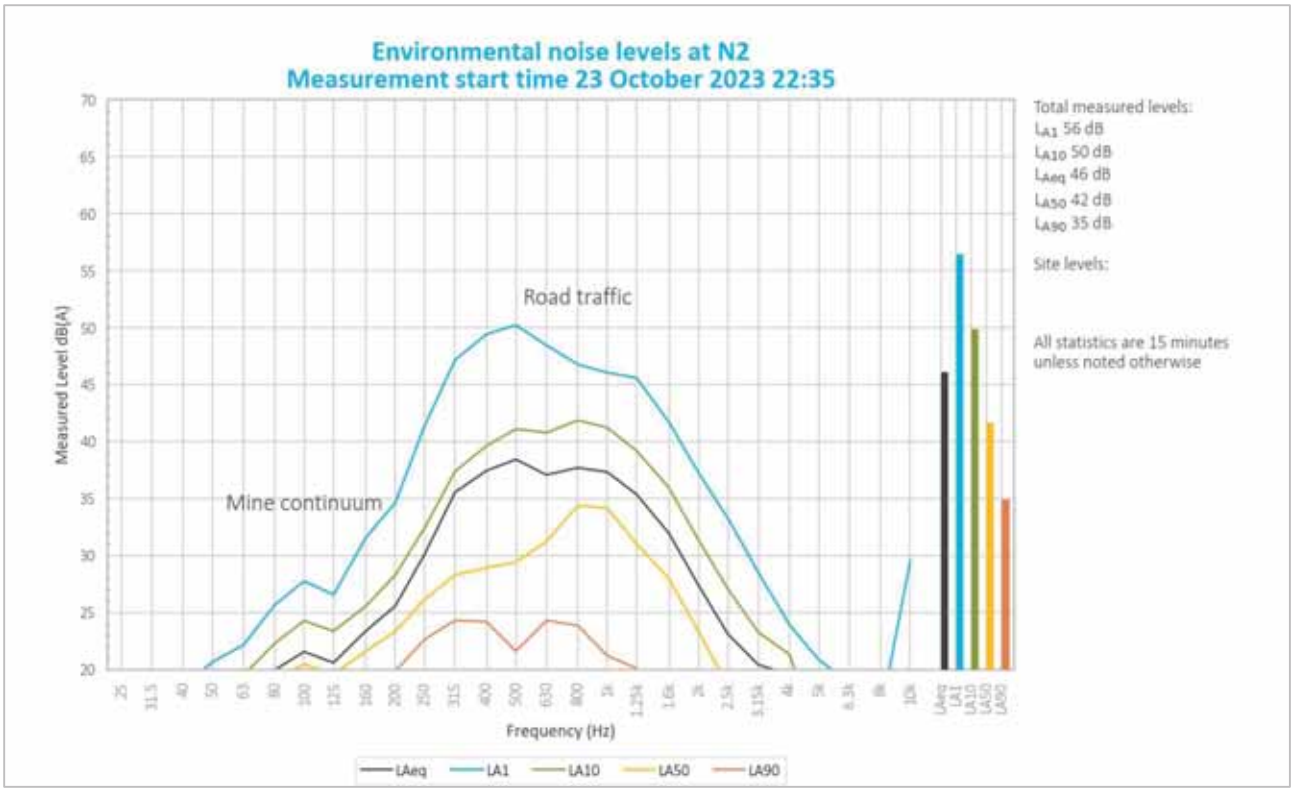

Figure 5.2 Environmental noise levels - N2, Camberwell Village (West)

Ashton Coal was inaudible throughout the entire measurement.

Road traffic noise was primarily responsible for measured levels.

Noise from insects was also noted.

5.2.1 Cumulative mining noise at N2

Ashton Coal was inaudible and therefore no cumulative mining noise was associated with it.

5.3 N3 – Camberwell Village (north-east)

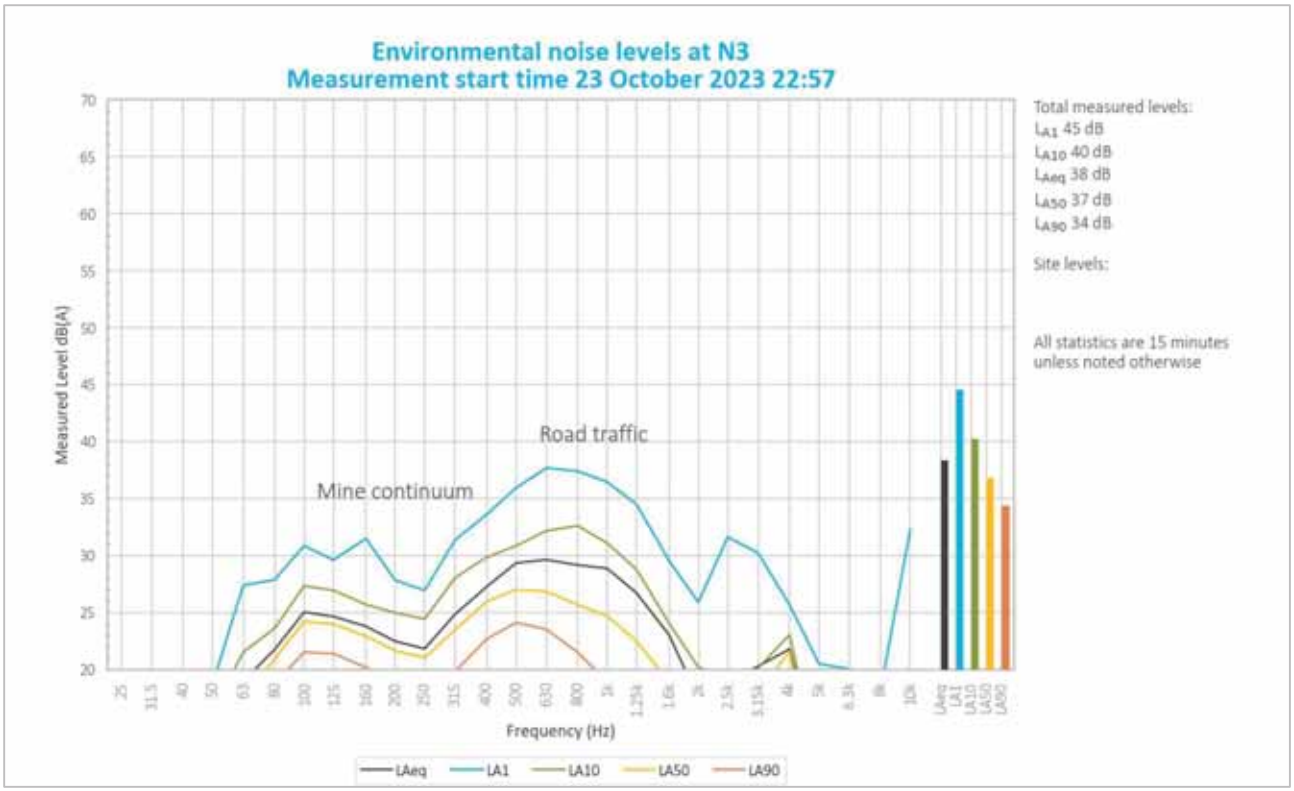

Figure 5.3 Environmental noise levels – N3, Camberwell Village (North-East)

Ashton Coal was inaudible throughout the entire measurement.

Road traffic and other mines in the vicinity (unrelated to Ashton Coal) were responsible for measured noise levels.

Noise from livestock, roosters, dogs barking and a train on the main line (unrelated to Ashton Coal) was also noted.

5.3.1 Cumulative mining noise at N3

Ashton Coal was inaudible and therefore no cumulative mining noise was associated with it.

5.4 N4 – South of New England Highway

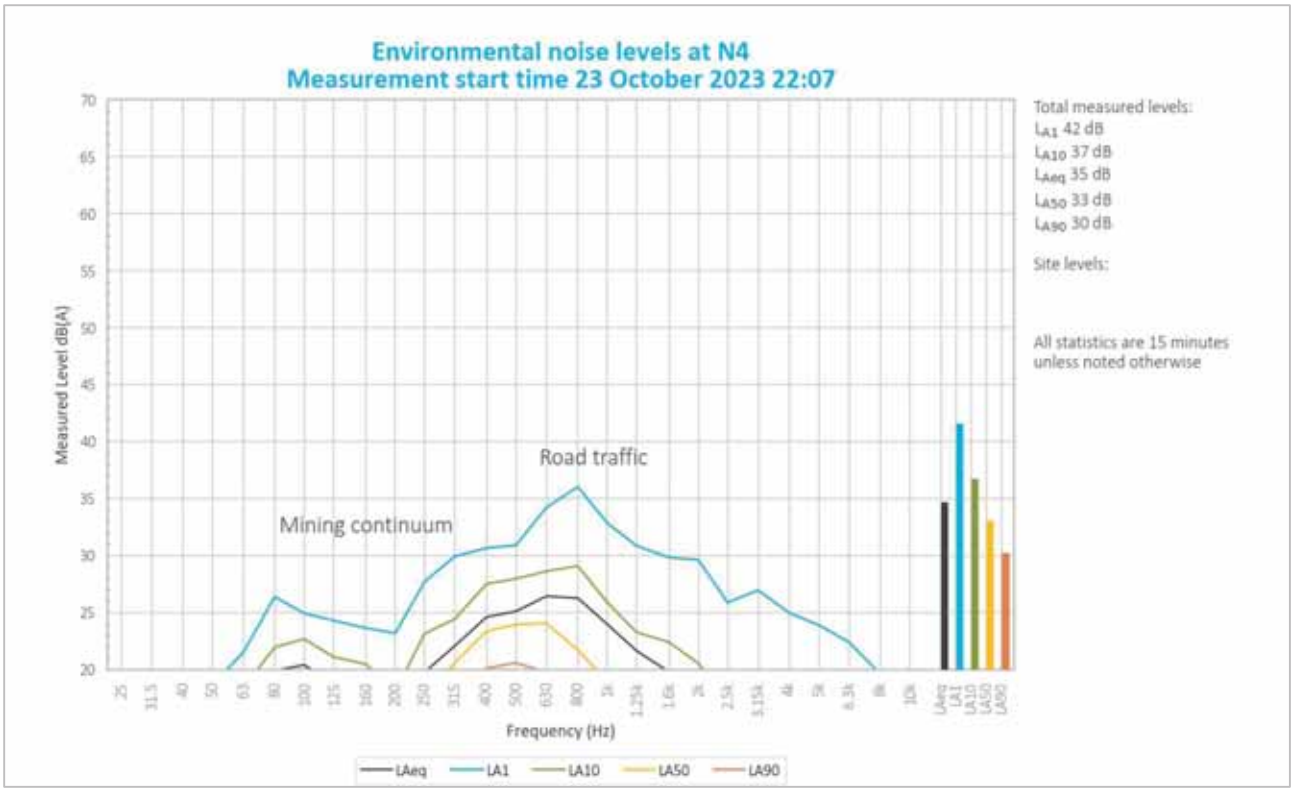

Figure 5.4 Environmental noise levels – N4, South of New England Highway

Ashton Coal was inaudible throughout the entire measurement.

Road traffic and other mines in the vicinity (unrelated to Ashton Coal) were responsible for measured noise levels.

Noise from insects, livestock and birds was also noted.

5.4.1 Cumulative mining noise at N4

Ashton Coal was inaudible and therefore no cumulative mining noise was associated with it.

6 Summary

EMM Consulting Pty Ltd (EMM) was engaged by Ashton Coal Operations Pty Ltd to conduct a monthly noise survey of operations at Ashton Coal. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified noise limits.

Attended environmental noise monitoring described in this report was done during the night period on Monday 23 October 2023 at three monitoring locations.

Noise levels from the site complied with relevant limits at all monitoring locations during the October 2023 survey.

Appendix A

Noise perception and examples

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A.1 Noise levels

Table A.1 gives an indication as to how an average person perceives changes in noise level. Examples of common noise levels are provided in Figure A.1.

Table A.1 Perceived change in noise

Change in sound pressure level (dB)	Perceived change in noise
up to 2	Not perceptible
3	Just perceptible
5	Noticeable difference
10	Twice (or half) as loud
15	Large change
20	Four times (or a quarter) as loud

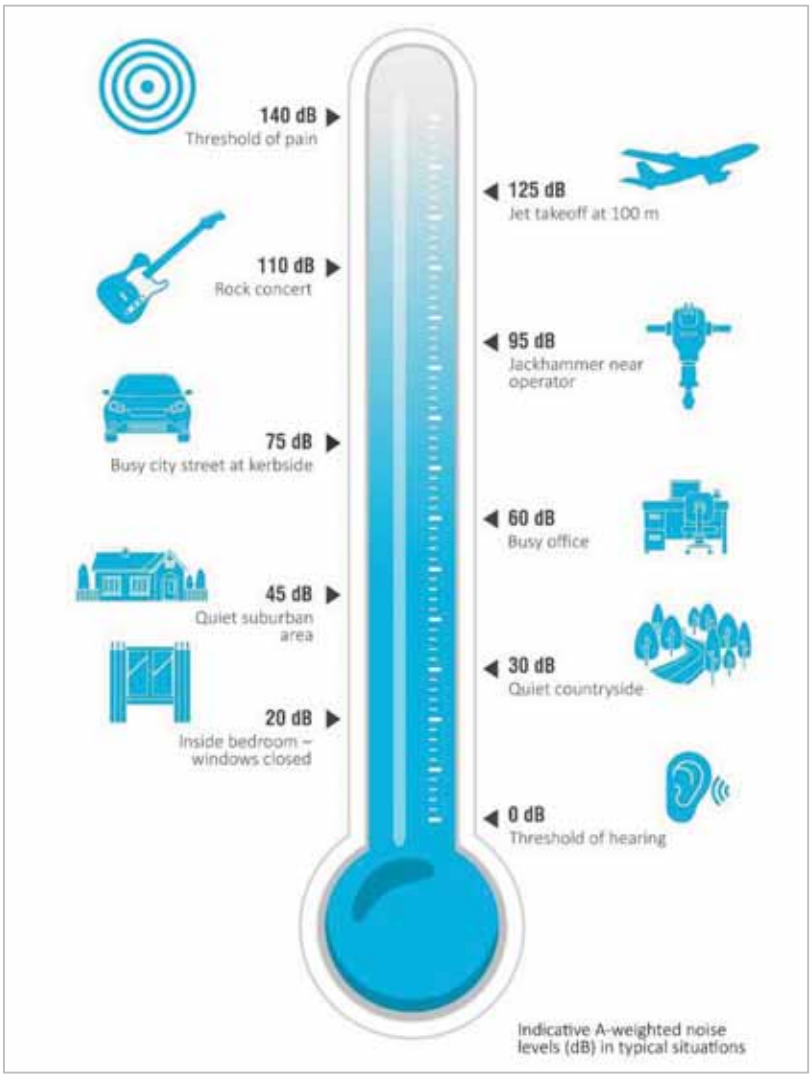

Figure A.1 Common noise levels

Appendix B
Regulator documents

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B.1 Project approval

APPENDIX 6

ALTERNATE NOISE CONDITIONS

NOISE

Application

1. Conditions 2 to 3 below have effect during times when open cut mining operations are not being undertaken at the Ashton Mine Complex, in the opinion of the Planning Secretary.

Noise Criteria

2. Except for the noise-affected land in Table 1 of Schedule 3, the Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 1 at any residence on privately-owned land or on more than 25 per cent of any privately-owned land.

Table 1: Noise Criteria dB(A)

Receiver No.	***Receiver***	***Day*** ($L_{Aeq\ (15min)}$)	***Evening*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{A1\ (1\ min)}$)
-	All privately-owned land	38	38	36	46

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy*. Appendix 8 sets out the requirements for evaluating compliance with these criteria.

However, these noise criteria do not apply if the Applicant has an agreement with the relevant owner/s of the residence/land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Additional Noise Mitigation Measures

3. Upon receiving a written request from the owner of any residence on any privately-owned land where subsequent operational noise monitoring shows the noise generated by the development exceeds the noise limits in Table 2, the Applicant must implement additional reasonable and feasible noise mitigation measures (such as double glazing, insulation, and/or air conditioning) at the residence in consultation with the owner.

If within 3 months of receiving this request from the landowner, the Applicant and the landowner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Planning Secretary for resolution.

Table 2: Additional Noise Mitigation Criteria dB(A) $L_{Aeq\ (15min)}$

Receiver No.	***Receiver***	***Day*** ($L_{Aeq\ (15min)}$)	***Evening*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{Aeq\ (15min)}$)
-	All privately-owned land	38	38	38

Notes:

- *Noise generated by the development is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 8 sets out the requirements for evaluating compliance with these criteria.*
- *For this condition to apply, the exceedance of the criteria must be systemic.*

APPENDIX 8

NOISE COMPLIANCE ASSESSMENT

Compliance Monitoring

1. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this approval.

2. Data collected for the purposes of determining compliance with the relevant conditions of this approval is to be excluded under the following meteorological conditions:
   a) during periods of rain or hail;
   b) average wind speed at microphone height exceeds 5 m/s;
   c) wind speeds greater than 3 m/s measures at 10 m above ground level; and
   d) temperature inversion conditions greater than 3°C/100m.

3. Unless otherwise agreed with the Planning Secretary, this monitoring is to be carried out in accordance with the relevant requirements relating for reviewing performance set out in the NSW Industrial Noise Policy (as amended from time to time), in particular the requirements relating to:
   a) monitoring locations for the collection of representative noise data;
   b) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
   c) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

4. To the extent that there is any inconsistency between the Industrial Noise Policy and the requirements set out in this Appendix, the Appendix prevails to the extent of the inconsistency.

Determination of Meteorological Conditions

5. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located in the vicinity of the site (as required by condition 18 of Schedule 3).

B.2 Environmental protection licence

Environment Protection Licence

24	Groundwater monitoring	Monitoring up-gradient of Glennies Creek alluvium at coordinates 319294, 6404588 (Easting, Northing), identified as WML120B in Figure 1.
25	Groundwater monitoring	Monitoring mid-gradient of Glennies Creek alluvium at coordinates 319468, 6403528 (Easting, Northing), identified as WML129 in Figure 1.
26	Groundwater monitoring	Monitoring down-gradient of Glennies Creek alluvium at coordinates 318965, 6402842 (Easting, Northing), identified as WMLP336 in Figure 1.
27	Groundwater monitoring	Monitoring up-gradient of Barrett coal seam at coordinates 318431, 6407214 (Easting, Northing), identified as GM1 in Figure 1.
28	Groundwater monitoring	Monitoring up-gradient of Pikes Gully coal seam at coordinates 319292, 6404580 (Easting, Northing), identified as WML120A in Figure 1.
29	Groundwater monitoring	Monitoring mid-gradient of Pikes Gully coal seam at coordinates 319220, 6403928 (Easting, Northing), identified as WML262 in Figure 1.
30	Groundwater monitoring	Monitoring up-gradient of Upper Liddell coal seam at coordinates 319215, 6403958 (Easting, Northing), identified as WML181 in Figure 1.
31	Groundwater monitoring	Monitoring mid-gradient of Upper Liddell coal seam at coordinates 319188, 6404325 (Easting, Northing), identified as WML183 in Figure 1.

P1.4 The following points referred to in the table below are identified in this licence for the purposes of weather and/or noise monitoring and/or setting limits for the emission of noise from the premises.

Noise/Weather

EPA identification no.	Type of monitoring point	Location description
12	Meteorological Station – to determine meteorological conditions for noise monitoring	Meteorological monitoring at coordinates 320522, 6406815 (Easting, Northing), identified as Repeater on Figure 2.
13	Noise monitoring	Monitoring at coordinates 320554, 6405839 (Easting, Northing), identified as N3 on Figure 2 and representative of Noise Assessment Group 2.

14	Noise monitoring	Monitoring at coordinates 320297, 6405670 (Easting, Northing), identified as N2 on Figure 2 and representative of Noise Assessment Group 1.
15	Noise monitoring	Monitoring at coordinates 319776, 6404101 (Easting, Northing), identified as N4 on Figure 2 and representative of Noise Assessment Group 3.
32	Meteorological Station – to determine meteorological conditions for noise monitoring	Monitoring of temperature at 'M1' at coordinates 320259, 6405971 (Easting, Northing).

P1.5 For the purposes of Condition P1.1, P1.2 and P1.3, Figure 1 refers to the plan titled "Ashton Underground Mine Environment Protection licence 11879 Premises Boundary, Surface Infrastructure" dated 30/08/19 (EPA reference DOC19/761196).

P1.6 For the purpose of Condition P1.4, Figure 2 refers to the plan titled "Ashton Underground Mine Environment Protection licence 11879 Premises Boundary, Monitoring" dated 30/08/19 (EPA reference DOC19/761196).

P1.7 The datum for grid references in this Licence is the Geodetic Datum of Australia 1994 (GDA94), Zone 56.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

L2.1 Flares must be operated by the licensee such that there is no visible emission other than for a total period of no more than 5 minutes in any 2 hours, except for heat haze.

L3 Waste

L3.1 The licensee must not cause, permit or allow any waste to be received at the premises unless specified in this licence.

L3.2 The Licensee must not dispose of waste on the premises unless authorised by a condition of this Licence.

L4 Noise limits

L4.1 Noise from the premises must not exceed the noise limits specified in the table below.

Residences referenced in this table are from the consent DA 309-11-2001-i and summarised in the EPA

reference DOC19/761196.

Location	Day LAeq(15 minute)	Evening LAeq(15 minute)	Night LAeq(15 minute)	Night LAeq(1 minute)
EPA Point 13	38	38	36	46
EPA Point 14	38	38	36	46
EPA Point 15	38	38	36	46
All other privately owned residences	38	38	36	46

L4.2 For the purpose of Condition L4.1:
a) Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays,
b) Evening is defined as the period from 6pm to 10pm, and
c) Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays

L4.3 The noise emission limits identified in condition L4.1 apply under the following meteorological conditions:

a) wind speeds up to 3m/s at 10m above ground level; and
b) temperature inversion conditions up to 3 degrees C/100m.

L4.4 For the purposes of condition L4.1:

a) Data recorded by the closest and most representative meteorological station installed on the premises at EPA Identification Point 12 must be used to determine meteorological conditions; and
b) Temperature inversion conditions (stability category) are to be determined by the methods referred to in Fact Sheet D of the Noise Policy for Industry (2017) using EPA Identification Points 12 and 32.

4 Operating Conditions

O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.
This includes:
a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
a) must be maintained in a proper and efficient condition; and
b) must be operated in a proper and efficient manner.

B.3 Noise management plan

Relevant parts of the DA have been reproduced in Appendix A along with reference to where they have been addressed in this document.

4.2 Applicable Criteria

Noise criteria for the ACP are divided into three categories:

- Impact assessment criteria;
- Additional noise mitigation criteria; and
- Cumulative noise acquisition criteria.

The RUM must adhere to a single set of noise criteria relating to noise generated by the RUM development.

4.2.1 Impact Assessment Criteria

In accordance with Condition 2, Appendix 6 of the Ashton DA and Condition L4.1 of EPL 11879, noise generated by the development within the ACP must not exceed the limits specified in **Table 3** at any privately-owned land or on more than 25 per cent of any privately-owned land. The noise limits are provided in decibels (dB).

Table 3: Ashton Noise Impact Criteria dB(A)

Location	Day	Evening	Night	
	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{A1} (1 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	38	38	36	46

In accordance with Condition 12, Schedule 3 of the RUM DA, noise generated by development in the ACOL-operated RUM must not exceed the limits specified in **Table 4** at any residence on privately-owned land or on more than 25 per cent of any privately-owned land.

Table 4 RUM Noise Impact Criteria dB(A)

Location	Day	Evening	Night	
	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{A1} (1 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	35	35	35	45

4.2.2 Additional Noise Mitigation Criteria

If noise emissions generated by the ACP exceed the criteria displayed in **Table 5** at any residence on privately-owned land, then, upon receiving a written request from the landowner, ACOL will implement additional reasonable and feasible noise mitigation measures (such as double glazing, insulation and/or air conditioning) at the residence in consultation with the owner.

Table 5 Additional Noise Mitigation Criteria dB(A)#

Location	Day	Evening	Night
	LAeq (15 minute)	LAeq (15 minute)	LAeq (15 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	38	38	38

* Exceedance of the criteria must be systemic.

4.2.3 Cumulative Noise Acquisition Criteria

If noise emissions generated by the ACP, and other mines exceed the criteria in **Table 6** at any residence on privately-owned land or on more than 25 per cent of any privately-owned land (except for noise affected residential receivers in Condition 1, Schedule 3 of the Ashton DA) then, upon receiving a written request for acquisition from the landowner, ACOL together with the relevant mines, will acquire the land in accordance with the Acquisition Process (as defined in Conditions 7 and 8, Schedule 4 of the Ashton DA).

Table 6 Cumulative Noise Acquisition Criteria dB(A)

Location	Day	Evening	Night
	LAeq (period)	LAeq (period)	LAeq (period)
Camberwell Village	60	50	45
All other privately-owned land	55	50	45

4.3 Existing Environment

The ACP is located in the Hunter Valley region of New South Wales and is bound by the Main Northern Railway to the north, Hunter River to the south and Glennies Creek to the east with the New England Highway dividing the open cut from the underground mining areas.

Other mining operations in the area include the Ravensworth Complex, the Mount Owen Complex, Rix's Creek Open Cut, Integra Underground and Hunter Valley Operations.

The closest sensitive receivers are located in Camberwell. There are currently 13 private landholdings in the local area, 11 of these have an occupied residence.

Ambient noise levels within the village of Camberwell are influenced by the New England Highway to the south, the railway line to the northeast and surrounding mining operations. Attended noise monitoring has confirmed that the major contributing noise source is usually the New England Highway. Noise from ACP has been noted at times in Camberwell Village, historical reports show this has been infrequent and at relatively low levels.

Based on the historical meteorological data collected by ACOL's M2 (repeater) weather station the most common winds in winter are from the west-northwest and the east-southeast in summer. Prevailing winds act to enhance noise from surrounding noise sources (road, rail and mining).

Appendix C
Calibration certificates

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C37508

EQUIPMENT TESTED : Sound Level Calibrator

Manufacturer: Svantek
Type No: SV 36 **Serial No:** 79952
Class: 1
Owner: EMM Consulting Pty Ltd
L3, 175 Scott Street
Newcastle, NSW 2300
Tests Performed: Measured Output Pressure level, Frequency & Distortion
Comments: See Details and Class Tolerance overleaf.

CONDITION OF TEST:

Ambient Pressure	1005	hPa ±1 hPa	**Date of Receipt :**	26/09/2023
Temperature	23	°C ±1° C	**Date of Calibration :**	27/09/2023
Relative Humidity	47	% ±5%	**Date of Issue :**	28/09/2023

Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2017

CHECKED BY: .....

AUTHORISED SIGNATURE: .....

Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

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Acu-Vib Electronics
CALIBRATIONS SALES RENTALS REPAIRS

Head Office & Calibration Laboratory
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
(02) 9680 8133
www.acu-vib.com.au

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM34169

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	B & K		
Type No:	2250	**Serial No:**	3029363
Mic. Type:	4189	**Serial No:**	3260501
Pre-Amp. Type:	ZC0032	**Serial No:**	30109
Filter Type:	1/3 Octave	**Test No:**	F034175

Owner: EMM Consulting
Suite 01, 20 Chandos St
St Leonards NSW 2065

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	1002	hPa ±1 hPa	**Date of Receipt :**	02/11/2022
Temperature	24	°C ±1° C	**Date of Calibration :**	03/11/2022
Relative Humidity	35	% ±5%	**Date of Issue :**	04/11/2022

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

Jack Kielt

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Appendix K

Monthly attended noise monitoring report – November 2023

EMM
creating opportunities

Ashton Coal

Monthly attended noise monitoring - November 2023

Prepared for Ashton Coal Operations Pty Ltd

November 2023

Ashton Coal

Monthly attended noise monitoring - November 2023

Ashton Coal Operations Pty Ltd

E221164 RP11

November 2023

Version	Date	Prepared by	Reviewed by	Comments
1	24 November 2023	Teanuanua Villierme	Tony Welbourne	Draft
2	27 November 2023	Teanuanua Villierme	Tony Welbourne	Final

Approved by

Tony Welbourne
Associate Director
27 November 2023
Level 3 175 Scott Street
Newcastle NSW 2300

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Tables

Figures

1 Introduction

1.1 Background

EMM Consulting Pty Ltd (EMM) was engaged by Ashton Coal Operations Pty Ltd to conduct a monthly noise survey of operations at Ashton Coal Operations (Ashton Coal, the site) located at Glennies Creek Road, Camberwell NSW. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified limits.

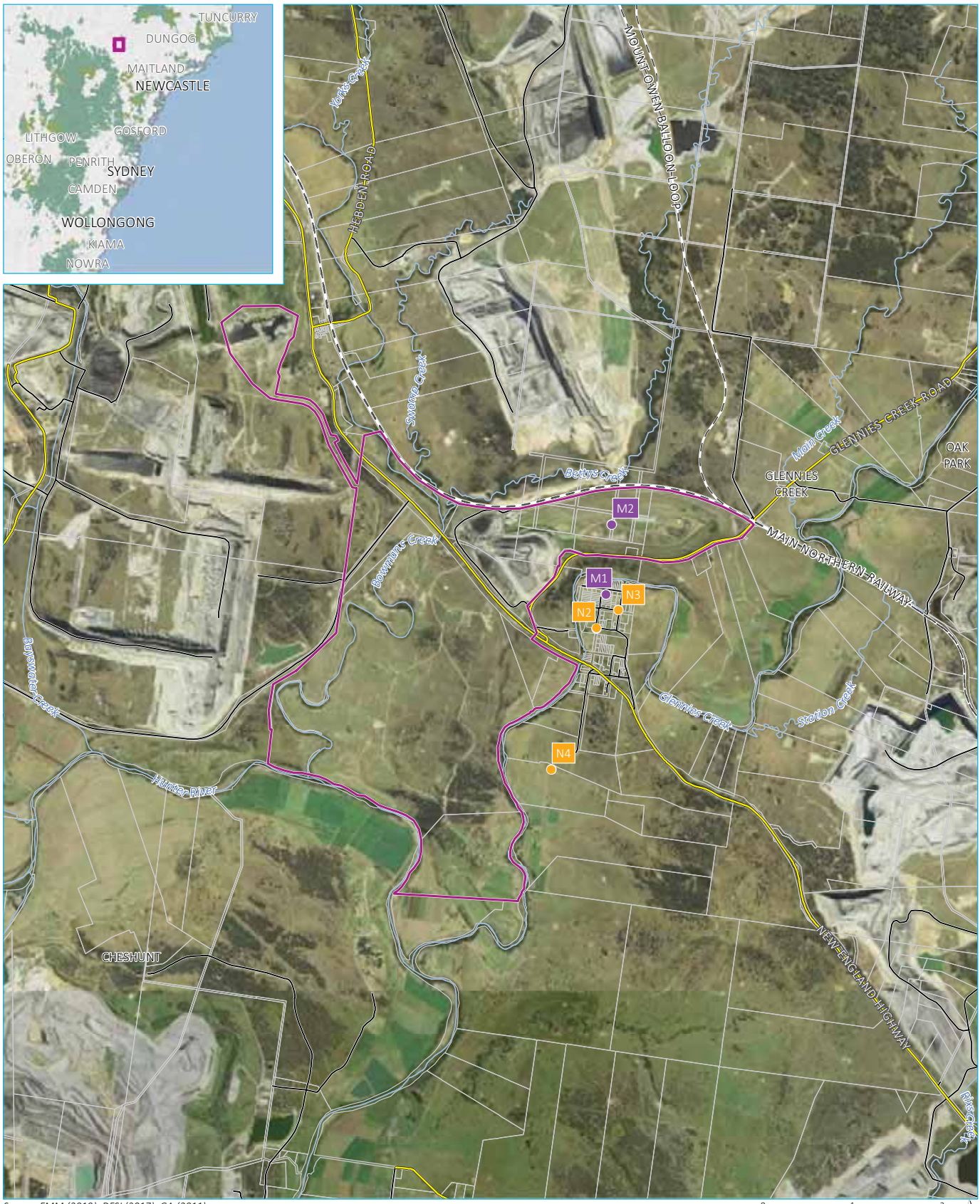
Attended environmental noise monitoring described in this report was done during the night period of Monday 13 November 2023 at three monitoring locations.

1.2 Attended monitoring locations

Site monitoring locations are detailed in Table 1.1 and shown on Figure 1.1. It should be noted that Figure 1.1 shows actual monitoring positions, not necessarily the location of residences.

Table 1.1 Attended noise monitoring locations

Location descriptor/ID	Description/address	Coordinates (MGA56)	
		Easting	Northing
N2	Camberwell Village (west)	320297	6405670
N3	Camberwell Village (north-east)	320554	6405839
N4	South of New England Highway	319776	6404101



Source: EMM (2019); DFSI (2017); GA (2011)

0 1 2 km

GDA 1994 MGA Zone 56

N

\\emmsvr1\EMM\Jobs\2019\H190081 - Ashton Coal Noise Monitoring\8 GIS\02_Maps\N001_NoiseMonitoring_20190312_02.mxd 12/03/2019

KEY

- Site boundary
- Noise monitoring location
- Meteorological station
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Cadastral boundary

Noise monitoring locations and Ashton colliery boundary

Ashton Coal
Monthly attended noise monitoring
Figure 1.1

EMM
creating opportunities

1.3 Terminology and abbreviations

Some definitions of terms and abbreviations which may be used in this report are provided in Table 1.2.

Table 1.2 Terminology and abbreviations

Term/descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to approximate how humans hear noise.
L_{Amax}	The maximum root mean squared A-weighted noise level over a time period.
L_{A1}	The A-weighted noise level which is exceeded for one per cent of the time.
$L_{A1,1minute}$	The A-weighted noise level which is exceeded for one per cent of the specified time period of one minute.
L_{A10}	The A-weighted noise level which is exceeded for 10 per cent of the time.
L_{Aeq}	The energy average A-weighted noise level.
L_{A50}	The A-weighted noise level which is exceeded for 50 per cent of the time, and is also the median noise level during a measurement period.
L_{A90}	The A-weighted noise level exceeded for 90 percent of the time, also referred to as the "background" noise level and commonly used to derive noise limits.
L_{Amin}	The minimum A-weighted noise level over a time period.
L_{Ceq}	The energy average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure are measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	The vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	Monday – Saturday: 7 am to 6 pm, on Sundays and Public Holidays: 8 am to 6 pm.
Evening	Monday – Saturday: 6 pm to 10 pm, on Sundays and Public Holidays: 6 pm to 10 pm.
Night	Monday – Saturday: 10 pm to 7 am, on Sundays and Public Holidays: 10 pm to 8 am.
Temperature inversion	A meteorological condition where the atmospheric temperature increases with altitude.

Appendix A provides further information that gives an indication as to how an average person perceives changes in noise level, and examples of common noise levels.

2 Noise limits

2.1 Development consent

Ashton Coal noise limits are provided in Table 1, Condition 2 of Appendix 6 of development consent 309-11-2001-I (DC). Relevant sections of the DC are reproduced in Appendix B.1.

2.2 Environment protection licence

Ashton Coal noise limits are provided in Condition L4.1 of EPL 11879 (EPL). Relevant sections of the EPL are reproduced in Appendix B.2.

2.3 Noise management plan

The approved NMP adopts three attended noise monitoring locations that are representative of residences outlined in the DC and EPL. Relevant sections of the NMP are reproduced in Appendix B.3.

2.4 Noise limits

Noise limits based on the NMP are as shown in Table 2.1.

Table 2.1 Noise impact limits, dB

Location	Day $L_{Aeq,15minute}$	Evening $L_{Aeq,15minute}$	Night $L_{Aeq,15minute}$	Night $L_{A1,1minute}$
N2	38	38	36	46
N3	38	38	36	46
N4	38	38	36	46

2.5 Meteorological conditions

The DC and EPL specify the following meteorological conditions under which noise limits do not apply:

- during periods of rain or hail
- average wind speed at microphone height exceeds 5 metres per second (m/s)
- wind speeds greater than 3 m/s at 10 metres above ground level
- temperature inversion conditions greater than 3°C/100 m.

2.6 Additional requirements

Monitoring and reporting have been done in accordance with the NSW EPA 'Noise Policy for Industry' (NPfI) issued in October 2017 and the 'Approved methods for the measurement and analysis of environmental noise in NSW' (Approved Methods) issued in January 2022.

3 Methodology

3.1 Overview

Attended environmental noise monitoring was done in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant EPA requirements. Meteorological data was obtained from the Ashton Coal on-site weather station (AWS) which allowed the correlation of atmospheric parameters with measured noise levels.

3.2 Attended noise monitoring

During this survey, attended noise monitoring was done during the night period at each location. The duration of each measurement was 15 minutes. Atmospheric conditions were measured at each monitoring location.

Measured sound levels from various sources were noted during each measurement, and particular attention was paid to the extent of site contribution (if any) to measured levels. At each monitoring location, the site-only $L_{Aeq,15minute}$ and L_{Amax} were measured directly or determined by other methods detailed in Section 7.1 of the NPfI.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, it was inaudible at the monitoring location. When site noise is noted as NM, this means it was audible but could not be quantified. All results noted as IA or NM in this report were due to one or more of the following:

- Site noise levels were very low, typically more than 10 dB below the measured background (L_{A90}), and unlikely to be noticed.
- Site noise levels were masked by more dominant sources that are characteristic of the environment (such as breeze in foliage or continuous road traffic noise) that cannot be eliminated by monitoring at an alternate or intermediate location.
- It was not feasible or reasonable to employ methods, such as to move closer and back calculate. Cases may include rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

If exact noise levels from site could not be established due to masking by other noise sources in a similar frequency range but were determined to be at least 5 dB lower than relevant limits, then a maximum estimate may be provided. This is expressed as a 'less than' quantity, such as <20 dB or <30 dB.

For this assessment, the measured L_{Amax} has been used as a conservative estimate of $L_{A1,1minute}$. The EPA accepts sleep disturbance analysis based on either the $L_{A1,1minute}$ or L_{Amax} metrics, with the L_{Amax} representing a more conservative assessment of site noise emissions.

3.3 Meteorological data

As per Condition L4.4, this assessment determined stability categories for the attended monitoring period using the direct measurement method as per Fact Sheet D of the Noise Policy for Industry (2017).

The temperature lapse rate was calculated using data from two weather stations; Sentinex Unit 40 weather station (M1) located in Camberwell Village and Ashton Coal 'repeater' weather station (M2 – the site AWS) located in the north-eastern open cut area). This was calculated for each 15-minute measurement using the following formula:

$$\text{Temperature lapse rate} = (\Delta T) \times (100/(\Delta H))$$

Where:

- ΔT = temperature measured at M2 (at 10 metres above ground level) minus temperature measured at M1 (at 10 metres above ground level); and
- ΔH = the vertical height difference between M2 and M1 (equal to 73 metres).

3.4 Modifying factors

All measurements were evaluated for potential modifying factors in accordance with the NPfI. If applicable, modifying factor penalties have been reported and added to the measured site only L_{Aeq} noise levels.

Low-frequency modifying factor penalties have only been applied to site-only L_{Aeq} if the site was the only contributing low-frequency noise source. Specific methodology for assessment of each modifying factor is outlined in Fact Sheet C of the NPfI.

3.5 Instrumentation

The equipment used to measure environmental noise levels is detailed in Table 3.1. Calibration certificates are provided in Appendix C.

Table 3.1 Attended noise monitoring equipment

Item	Serial number	Calibration due date	Relevant standard
Brüel & Kjær 2250 sound level meter	3029363	3/11/2024	IEC 61672-1:2013
Svantek SV-36 calibrator	79952	27/9/2025	IEC 60942:2017

4 Results

4.1 Total measured noise levels and atmospheric conditions

Overall noise levels measured at each location during attended measurements are provided in Table 4.1. Discussion as to the sources responsible for measured levels is provided in Section 5 of this report.

Table 4.1 Total measured noise levels, dB – November 2023[1]

Location	Start date	Time	L_{Amax}	L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	L_{Amin}
N2	13/11/2023	22:59	61	56	53	50	48	45	42
N3	13/11/2023	23:18	63	49	44	42	40	37	35
N4	13/11/2023	22:35	53	49	44	41	38	35	30

Notes: 1. Levels in this table are not necessarily the result of activity at the site.

Atmospheric condition data measured by the operator during each measurement using a hand-held weather meter is shown in Table 4.2. The wind speed, direction and temperature were measured at approximately 1.5 metres above ground. Attended noise monitoring is not done during rain, hail, or wind speeds above 5 m/s at microphone height.

Table 4.2 Atmospheric conditions measured at microphone height – November 2023

Location	Date	Time	Temperature °C	Wind speed m/s	Wind direction °Magnetic north	Cloud cover 1/8s
N2	13/11/2023	22:59	18	0.6	135	0
N3	13/11/2023	23:18	18	0.6	135	0
N4	13/11/2023	22:35	19	0.5	135	0

4.2 Site only noise levels

4.2.1 Modifying factors

There were no modifying factors, as defined in the NPfI, applicable during the survey.

4.2.2 Monitoring results

Table 4.3 provides site noise levels in the absence of other sources, where possible, and includes weather data from the site AWS. Limits are applicable if weather conditions were within specified parameters during each measurement.

Table 4.3 Site noise levels and limits – November 2023

Location	Start Date	Time	Wind		Stability Class	VTG °C/100m	Limits apply? [1]	Limit, dB		Site level, dB [2]		Exceedance, dB	
			Speed m/s	Direction° [4]				$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
N2	13/11/2023	22:59	2.2	132	D	-1.0	Yes	36	46	IA	IA	N/A	N/A
N3	13/11/2023	23:18	2.1	134	D	-0.7	Yes	36	46	IA	IA	N/A	N/A
N4	13/11/2023	22:35	2.7	128	D	-0.8	Yes	36	46	IA	IA	N/A	N/A

Notes:
1. Noise emission limits do not apply during periods of rainfall or winds greater than 3 metres per second (at a height of 10 metres).
2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties if applicable.
3. N/A in the exceedance columns means the criterion was not applicable due to atmospheric conditions outside those specified in project approval.
4. Degrees magnetic north, "-" indicates calm conditions.
5. IA in the site level column means that the site was deemed inaudible at that location.

5 Discussion

5.1 Noted noise sources

During attended monitoring, the time variations (temporal characteristics) of noise sources are considered in each measurement via statistical descriptors. From these observations, summaries have been derived for the location and provided in this chapter. Statistical 1/3 octave-band analysis of environmental noise was undertaken, and the following figures display frequency ranges of various noise sources at each location for L_{A1}, L_{A10}, L_{Aeq}, L_{A50}, and L_{A90} descriptors. These figures also provide, graphically, statistical information for these noise levels.

An example is provided as Figure 5.1, where frogs and insects are seen to be generating noise at frequencies above 1000 Hz, while industrial noise is observed at frequencies less than 1000 Hz.

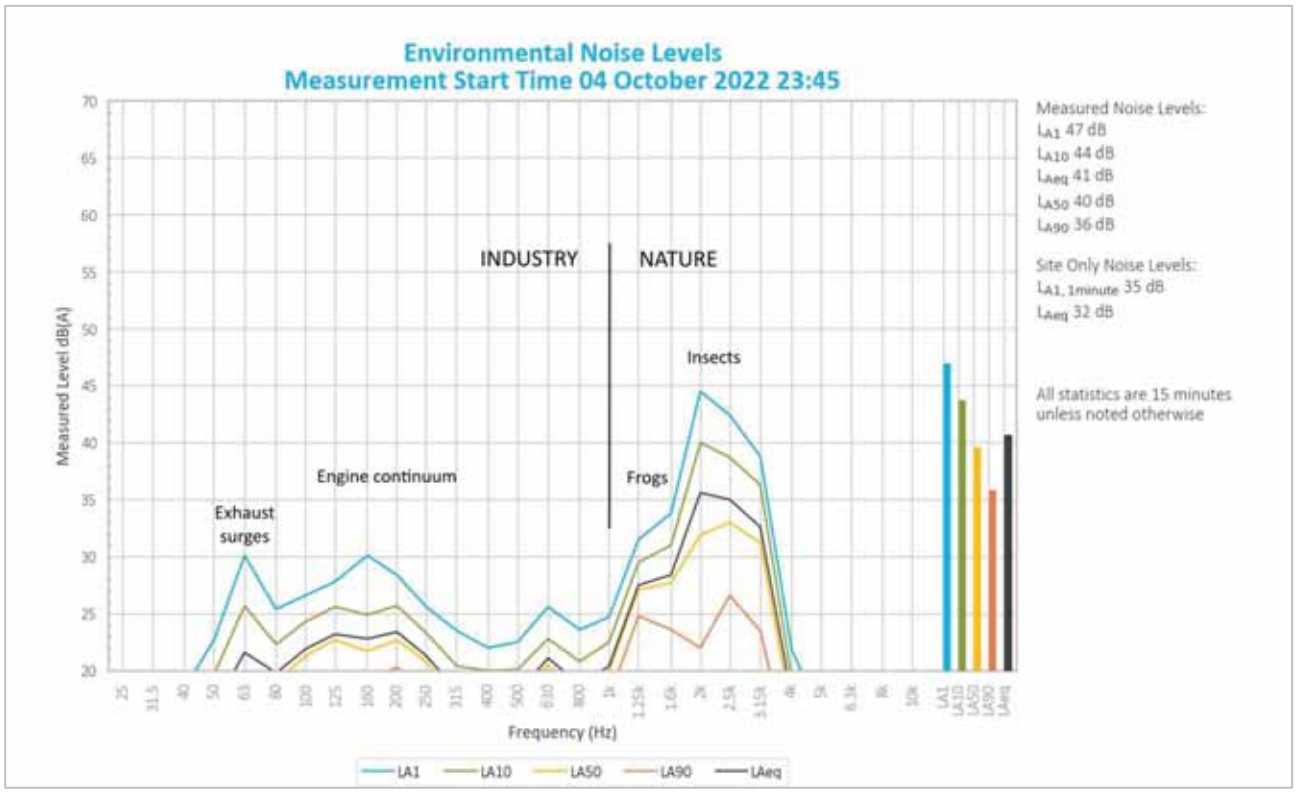


Figure 5.1 Example graph

5.2 N2 – Camberwell Village (west)

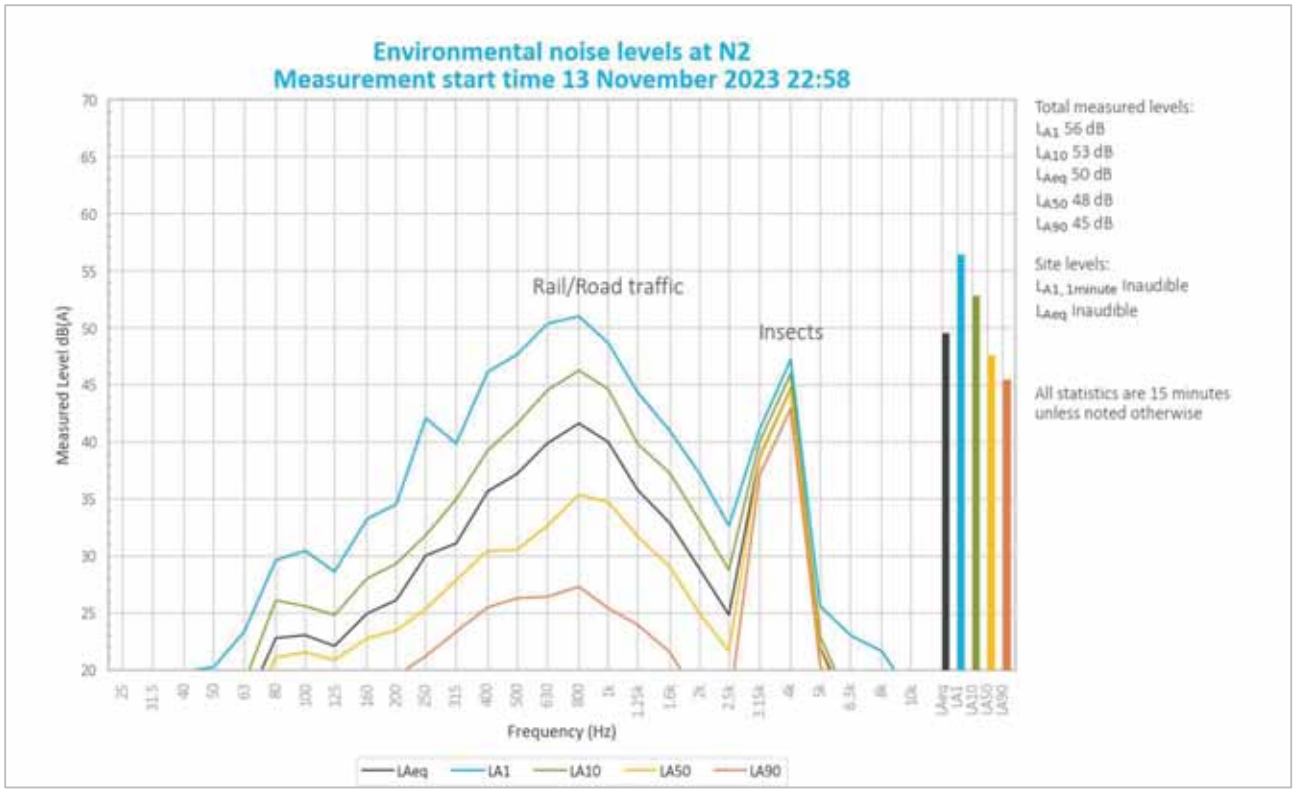


Figure 5.2 Environmental noise levels - N2, Camberwell Village (West)

Ashton Coal was inaudible throughout the entire measurement.

Road traffic noise and insects were responsible for measured levels.

5.2.1 Cumulative mining noise at N2

Ashton Coal was inaudible and therefore no cumulative mining noise was associated with it.

5.3 N3 – Camberwell Village (north-east)

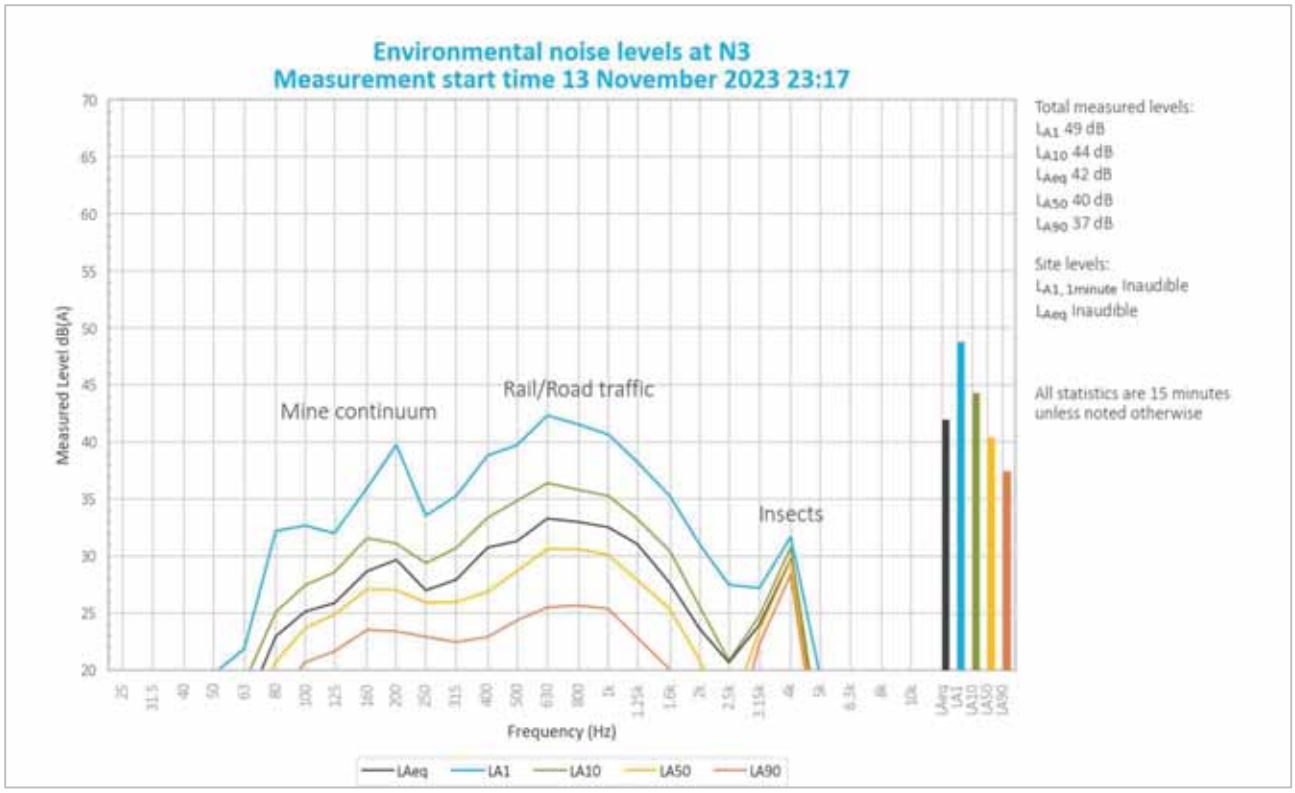


Figure 5.3 Environmental noise levels – N3, Camberwell Village (North-East)

Ashton Coal was inaudible throughout the entire measurement.

Rail and road traffic and other mines in the vicinity (unrelated to Ashton Coal) were responsible for measured noise levels.

5.3.1 Cumulative mining noise at N3

Ashton Coal was inaudible and therefore no cumulative mining noise was associated with it.

5.4 N4 – South of New England Highway

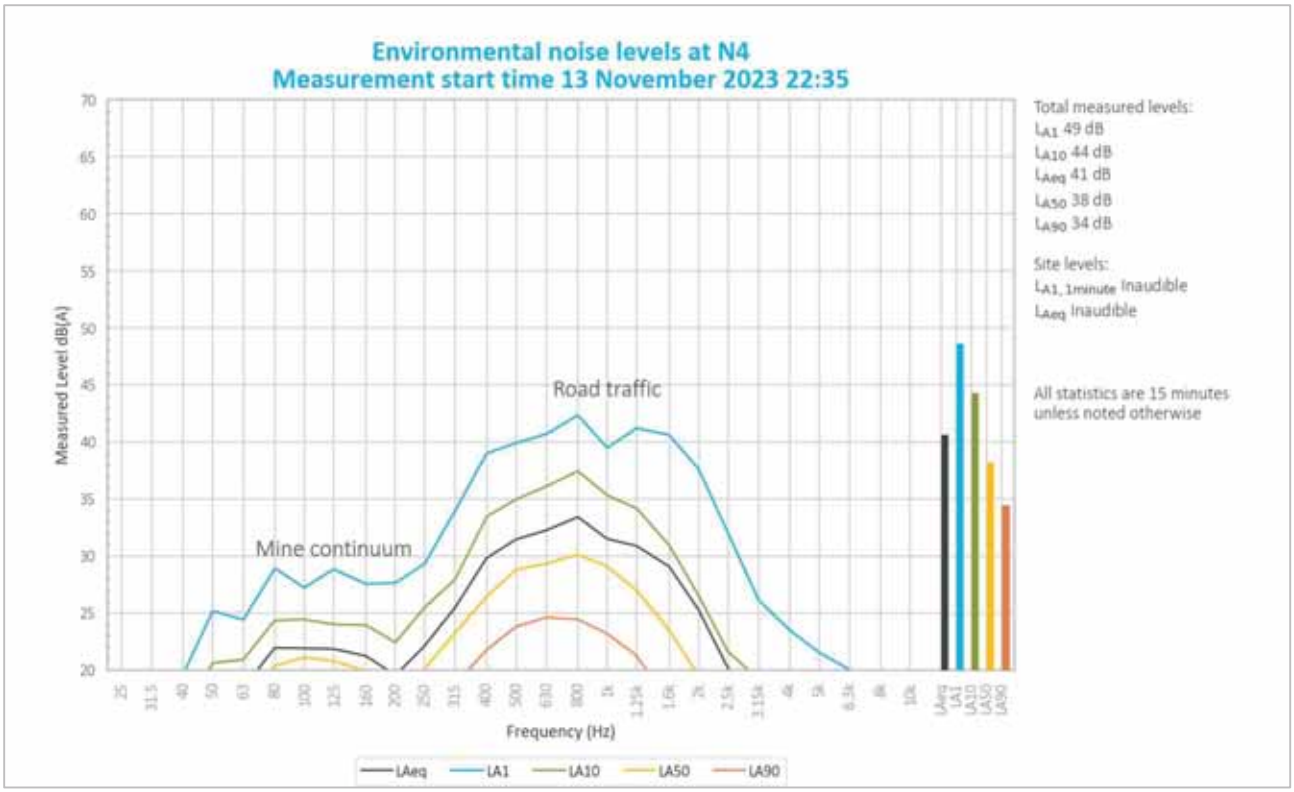


Figure 5.4 Environmental noise levels – N4, South of New England Highway

Ashton Coal was inaudible throughout the entire measurement.

Road traffic (primarily) and other mines in the vicinity (unrelated to Ashton Coal) were responsible for measured noise levels.

Noise from livestock was also noted.

5.4.1 Cumulative mining noise at N4

Ashton Coal was inaudible and therefore no cumulative mining noise was associated with it.

6 Summary

EMM Consulting Pty Ltd (EMM) was engaged by Ashton Coal Operations Pty Ltd to conduct a monthly noise survey of operations at Ashton Coal. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified noise limits.

Attended environmental noise monitoring described in this report was done during the night period on Monday 13 November 2023 at three monitoring locations.

Noise levels from the site complied with relevant limits at all monitoring locations during the November 2023 survey.

Appendix A
Noise perception and examples

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A.1 Noise levels

Table A.1 gives an indication as to how an average person perceives changes in noise level. Examples of common noise levels are provided in Figure A.1.

Table A.1 Perceived change in noise

Change in sound pressure level (dB)	Perceived change in noise
up to 2	Not perceptible
3	Just perceptible
5	Noticeable difference
10	Twice (or half) as loud
15	Large change
20	Four times (or a quarter) as loud

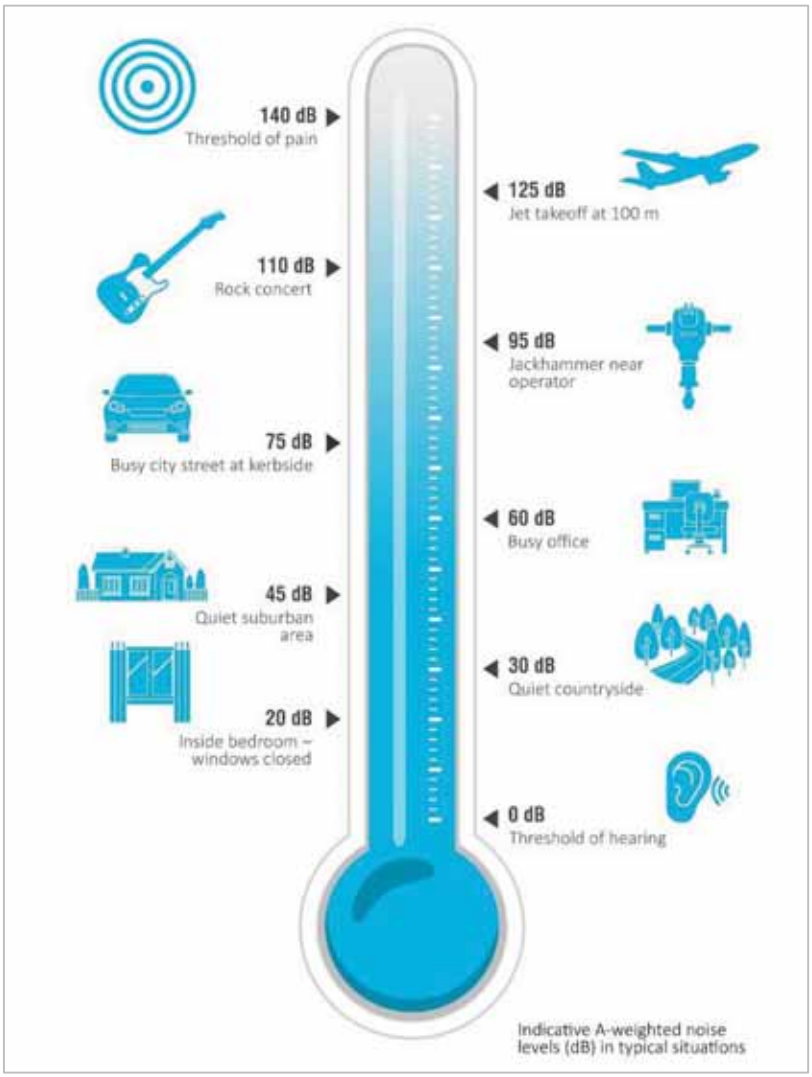

Figure A.1 Common noise levels

Appendix B
Regulator documents

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B.1 Project approval

APPENDIX 6

ALTERNATE NOISE CONDITIONS

NOISE

Application

1. Conditions 2 to 3 below have effect during times when open cut mining operations are not being undertaken at the Ashton Mine Complex, in the opinion of the Planning Secretary.

Noise Criteria

2. Except for the noise-affected land in Table 1 of Schedule 3, the Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 1 at any residence on privately-owned land or on more than 25 per cent of any privately-owned land.

Table 1: Noise Criteria dB(A)

Receiver No.	***Receiver***	***Day*** ($L_{Aeq\ (15min)}$)	***Evening*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{A1\ (1\ min)}$)
-	All privately-owned land	38	38	36	46

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy*. Appendix 8 sets out the requirements for evaluating compliance with these criteria.

However, these noise criteria do not apply if the Applicant has an agreement with the relevant owner/s of the residence/land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Additional Noise Mitigation Measures

3. Upon receiving a written request from the owner of any residence on any privately-owned land where subsequent operational noise monitoring shows the noise generated by the development exceeds the noise limits in Table 2, the Applicant must implement additional reasonable and feasible noise mitigation measures (such as double glazing, insulation, and/or air conditioning) at the residence in consultation with the owner.

If within 3 months of receiving this request from the landowner, the Applicant and the landowner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Planning Secretary for resolution.

Table 2: Additional Noise Mitigation Criteria dB(A) $L_{Aeq\ (15min)}$

Receiver No.	***Receiver***	***Day*** ($L_{Aeq\ (15min)}$)	***Evening*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{Aeq\ (15min)}$)
-	All privately-owned land	38	38	38

Notes:

- *Noise generated by the development is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 8 sets out the requirements for evaluating compliance with these criteria.*
- *For this condition to apply, the exceedance of the criteria must be systemic.*

APPENDIX 8

NOISE COMPLIANCE ASSESSMENT

Compliance Monitoring

1. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this approval.

2. Data collected for the purposes of determining compliance with the relevant conditions of this approval is to be excluded under the following meteorological conditions:
   a) during periods of rain or hail;
   b) average wind speed at microphone height exceeds 5 m/s;
   c) wind speeds greater than 3 m/s measures at 10 m above ground level; and
   d) temperature inversion conditions greater than 3°C/100m.

3. Unless otherwise agreed with the Planning Secretary, this monitoring is to be carried out in accordance with the relevant requirements relating for reviewing performance set out in the NSW Industrial Noise Policy (as amended from time to time), in particular the requirements relating to:
   a) monitoring locations for the collection of representative noise data;
   b) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
   c) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

4. To the extent that there is any inconsistency between the Industrial Noise Policy and the requirements set out in this Appendix, the Appendix prevails to the extent of the inconsistency.

Determination of Meteorological Conditions

5. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located in the vicinity of the site (as required by condition 18 of Schedule 3).

B.2 Environmental protection licence

Environment Protection Licence

24	Groundwater monitoring	Monitoring up-gradient of Glennies Creek alluvium at coordinates 319294, 6404588 (Easting, Northing), identified as WML120B in Figure 1.
25	Groundwater monitoring	Monitoring mid-gradient of Glennies Creek alluvium at coordinates 319468, 6403528 (Easting, Northing), identified as WML129 in Figure 1.
26	Groundwater monitoring	Monitoring down-gradient of Glennies Creek alluvium at coordinates 318965, 6402842 (Easting, Northing), identified as WMLP336 in Figure 1.
27	Groundwater monitoring	Monitoring up-gradient of Barrett coal seam at coordinates 318431, 6407214 (Easting, Northing), identified as GM1 in Figure 1.
28	Groundwater monitoring	Monitoring up-gradient of Pikes Gully coal seam at coordinates 319292, 6404580 (Easting, Northing), identified as WML120A in Figure 1.
29	Groundwater monitoring	Monitoring mid-gradient of Pikes Gully coal seam at coordinates 319220, 6403928 (Easting, Northing), identified as WML262 in Figure 1.
30	Groundwater monitoring	Monitoring up-gradient of Upper Liddell coal seam at coordinates 319215, 6403958 (Easting, Northing), identified as WML181 in Figure 1.
31	Groundwater monitoring	Monitoring mid-gradient of Upper Liddell coal seam at coordinates 319188, 6404325 (Easting, Northing), identified as WML183 in Figure 1.

P1.4 The following points referred to in the table below are identified in this licence for the purposes of weather and/or noise monitoring and/or setting limits for the emission of noise from the premises.

Noise/Weather

EPA identification no.	Type of monitoring point	Location description
12	Meteorological Station – to determine meteorological conditions for noise monitoring	Meteorological monitoring at coordinates 320522, 6406815 (Easting, Northing), identified as Repeater on Figure 2.
13	Noise monitoring	Monitoring at coordinates 320554, 6405839 (Easting, Northing), identified as N3 on Figure 2 and representative of Noise Assessment Group 2.

14	Noise monitoring	Monitoring at coordinates 320297, 6405670 (Easting, Northing), identified as N2 on Figure 2 and representative of Noise Assessment Group 1.
15	Noise monitoring	Monitoring at coordinates 319776, 6404101 (Easting, Northing), identified as N4 on Figure 2 and representative of Noise Assessment Group 3.
32	Meteorological Station – to determine meteorological conditions for noise monitoring	Monitoring of temperature at 'M1' at coordinates 320259, 6405971 (Easting, Northing).

P1.5 For the purposes of Condition P1.1, P1.2 and P1.3, Figure 1 refers to the plan titled "Ashton Underground Mine Environment Protection licence 11879 Premises Boundary, Surface Infrastructure" dated 30/08/19 (EPA reference DOC19/761196).

P1.6 For the purpose of Condition P1.4, Figure 2 refers to the plan titled "Ashton Underground Mine Environment Protection licence 11879 Premises Boundary, Monitoring" dated 30/08/19 (EPA reference DOC19/761196).

P1.7 The datum for grid references in this Licence is the Geodetic Datum of Australia 1994 (GDA94), Zone 56.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

L2.1 Flares must be operated by the licensee such that there is no visible emission other than for a total period of no more than 5 minutes in any 2 hours, except for heat haze.

L3 Waste

L3.1 The licensee must not cause, permit or allow any waste to be received at the premises unless specified in this licence.

L3.2 The Licensee must not dispose of waste on the premises unless authorised by a condition of this Licence.

L4 Noise limits

L4.1 Noise from the premises must not exceed the noise limits specified in the table below.

Residences referenced in this table are from the consent DA 309-11-2001-i and summarised in the EPA

reference DOC19/761196.

Location	Day LAeq(15 minute)	Evening LAeq(15 minute)	Night LAeq(15 minute)	Night LAeq(1 minute)
EPA Point 13	38	38	36	46
EPA Point 14	38	38	36	46
EPA Point 15	38	38	36	46
All other privately owned residences	38	38	36	46

L4.2 For the purpose of Condition L4.1:
a) Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays,
b) Evening is defined as the period from 6pm to 10pm, and
c) Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays

L4.3 The noise emission limits identified in condition L4.1 apply under the following meteorological conditions:

a) wind speeds up to 3m/s at 10m above ground level; and
b) temperature inversion conditions up to 3 degrees C/100m.

L4.4 For the purposes of condition L4.1:

a) Data recorded by the closest and most representative meteorological station installed on the premises at EPA Identification Point 12 must be used to determine meteorological conditions; and
b) Temperature inversion conditions (stability category) are to be determined by the methods referred to in Fact Sheet D of the Noise Policy for Industry (2017) using EPA Identification Points 12 and 32.

4 Operating Conditions

O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.
This includes:
a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
a) must be maintained in a proper and efficient condition; and
b) must be operated in a proper and efficient manner.

B.3 Noise management plan

Relevant parts of the DA have been reproduced in Appendix A along with reference to where they have been addressed in this document.

4.2 Applicable Criteria

Noise criteria for the ACP are divided into three categories:

- Impact assessment criteria;
- Additional noise mitigation criteria; and
- Cumulative noise acquisition criteria.

The RUM must adhere to a single set of noise criteria relating to noise generated by the RUM development.

4.2.1 Impact Assessment Criteria

In accordance with Condition 2, Appendix 6 of the Ashton DA and Condition L4.1 of EPL 11879, noise generated by the development within the ACP must not exceed the limits specified in **Table 3** at any privately-owned land or on more than 25 per cent of any privately-owned land. The noise limits are provided in decibels (dB).

Table 3: Ashton Noise Impact Criteria dB(A)

Location	Day	Evening	Night	
	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{A1} (1 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	38	38	36	46

In accordance with Condition 12, Schedule 3 of the RUM DA, noise generated by development in the ACOL-operated RUM must not exceed the limits specified in **Table 4** at any residence on privately-owned land or on more than 25 per cent of any privately-owned land.

Table 4 RUM Noise Impact Criteria dB(A)

Location	Day	Evening	Night	
	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{A1} (1 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	35	35	35	45

4.2.2 Additional Noise Mitigation Criteria

If noise emissions generated by the ACP exceed the criteria displayed in **Table 5** at any residence on privately-owned land, then, upon receiving a written request from the landowner, ACOL will implement additional reasonable and feasible noise mitigation measures (such as double glazing, insulation and/or air conditioning) at the residence in consultation with the owner.

Table 5 Additional Noise Mitigation Criteria dB(A)#

Location	Day	Evening	Night
	LAeq (15 minute)	LAeq (15 minute)	LAeq (15 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	38	38	38

* Exceedance of the criteria must be systemic.

4.2.3 Cumulative Noise Acquisition Criteria

If noise emissions generated by the ACP, and other mines exceed the criteria in **Table 6** at any residence on privately-owned land or on more than 25 per cent of any privately-owned land (except for noise affected residential receivers in Condition 1, Schedule 3 of the Ashton DA) then, upon receiving a written request for acquisition from the landowner, ACOL together with the relevant mines, will acquire the land in accordance with the Acquisition Process (as defined in Conditions 7 and 8, Schedule 4 of the Ashton DA).

Table 6 Cumulative Noise Acquisition Criteria dB(A)

Location	Day	Evening	Night
	LAeq (period)	LAeq (period)	LAeq (period)
Camberwell Village	60	50	45
All other privately-owned land	55	50	45

4.3 Existing Environment

The ACP is located in the Hunter Valley region of New South Wales and is bound by the Main Northern Railway to the north, Hunter River to the south and Glennies Creek to the east with the New England Highway dividing the open cut from the underground mining areas.

Other mining operations in the area include the Ravensworth Complex, the Mount Owen Complex, Rix's Creek Open Cut, Integra Underground and Hunter Valley Operations.

The closest sensitive receivers are located in Camberwell. There are currently 13 private landholdings in the local area, 11 of these have an occupied residence.

Ambient noise levels within the village of Camberwell are influenced by the New England Highway to the south, the railway line to the northeast and surrounding mining operations. Attended noise monitoring has confirmed that the major contributing noise source is usually the New England Highway. Noise from ACP has been noted at times in Camberwell Village, historical reports show this has been infrequent and at relatively low levels.

Based on the historical meteorological data collected by ACOL's M2 (repeater) weather station the most common winds in winter are from the west-northwest and the east-southeast in summer. Prevailing winds act to enhance noise from surrounding noise sources (road, rail and mining).

Appendix C
Calibration certificates

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C37508

EQUIPMENT TESTED : Sound Level Calibrator

Manufacturer: Svantek
Type No: SV 36 **Serial No:** 79952
Class: 1
Owner: EMM Consulting Pty Ltd
L3, 175 Scott Street
Newcastle, NSW 2300
Tests Performed: Measured Output Pressure level, Frequency & Distortion
Comments: See Details and Class Tolerance overleaf.

CONDITION OF TEST:

Ambient Pressure	1005	hPa ±1 hPa	**Date of Receipt :**	26/09/2023
Temperature	23	°C ±1° C	**Date of Calibration :**	27/09/2023
Relative Humidity	47	% ±5%	**Date of Issue :**	28/09/2023

Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2017

CHECKED BY: .....

AUTHORISED SIGNATURE: .....

Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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CALIBRATIONS SALES RENTALS REPAIRS

Head Office & Calibration Laboratory
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
(02) 9680 8133
www.acu-vib.com.au

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM34169

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	B & K		
Type No:	2250	**Serial No:**	3029363
Mic. Type:	4189	**Serial No:**	3260501
Pre-Amp. Type:	ZC0032	**Serial No:**	30109
Filter Type:	1/3 Octave	**Test No:**	F034175

Owner: EMM Consulting
Suite 01, 20 Chandos St
St Leonards NSW 2065

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	1002	hPa ±1 hPa	**Date of Receipt :**	02/11/2022
Temperature	24	°C ±1° C	**Date of Calibration :**	03/11/2022
Relative Humidity	35	% ±5%	**Date of Issue :**	04/11/2022

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

Jack Kielt

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Appendix L

Monthly attended noise monitoring report – December 2023

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Ashton Coal

Monthly attended noise monitoring - December 2023

Prepared for Ashton Coal Operations Pty Ltd

December 2023

Ashton Coal

Monthly attended noise monitoring - December 2023

Ashton Coal Operations Pty Ltd

E221164 RP12

December 2023

Version	Date	Prepared by	Reviewed by	Comments
1	8 December 2023	Lucas Adamson	Najah Ishac	Draft
2	18 December 2023	Lucas Adamson	Najah Ishac	Final

Approved by

Najah Ishac
Director
18 December 2023

Level 3 175 Scott Street
Newcastle NSW 2300

TABLE OF CONTENTS

Appendices

Tables

Figures

1 Introduction

1.1 Background

EMM Consulting Pty Ltd (EMM) was engaged by Ashton Coal Operations Pty Ltd to conduct a monthly noise survey of operations at Ashton Coal Operations (Ashton Coal, the site) located at Glennies Creek Road, Camberwell NSW. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified limits.

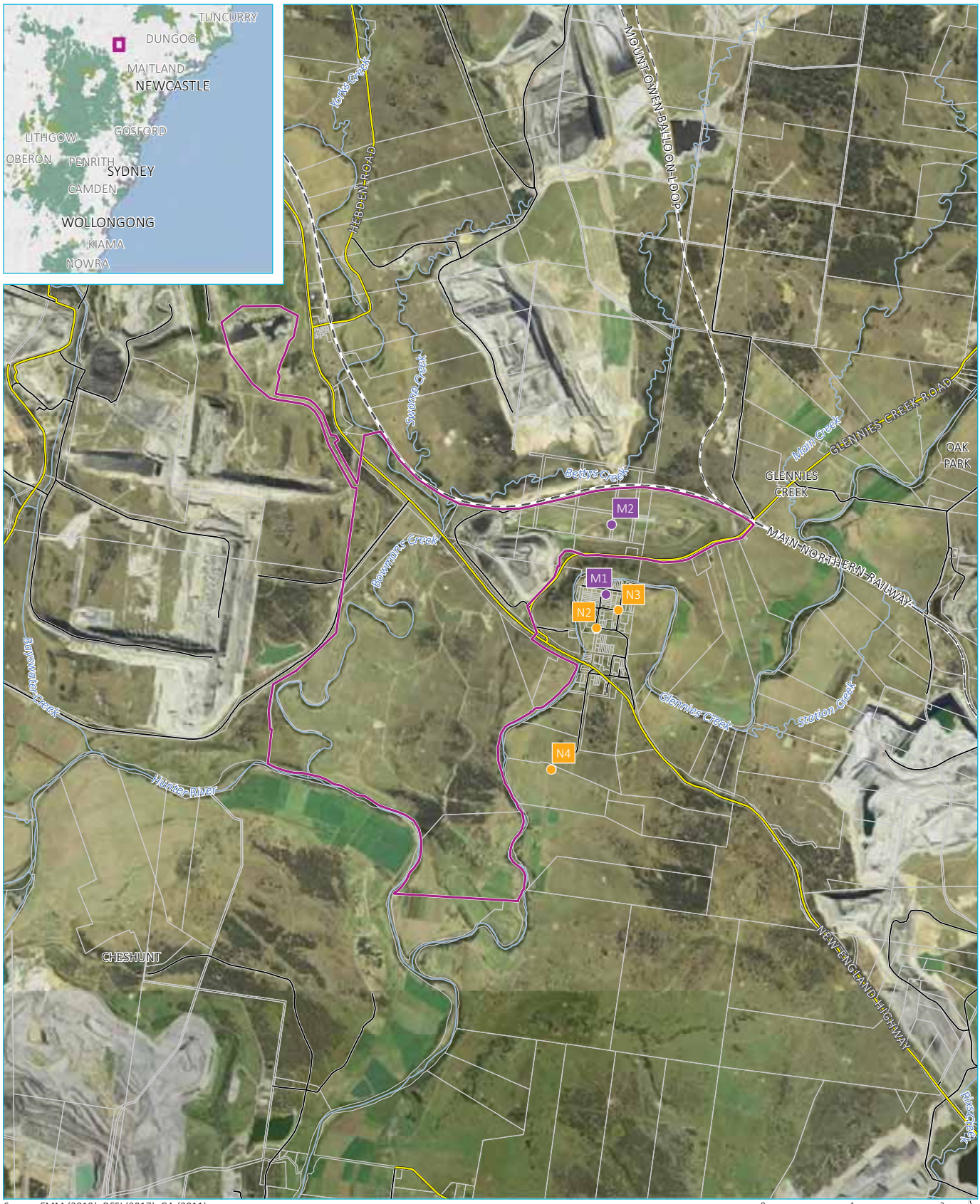
Attended environmental noise monitoring described in this report was done during the night period of Thursday 7 December 2023 at three monitoring locations.

1.2 Attended monitoring locations

Site monitoring locations are detailed in Table 1.1 and shown on Figure 1.1. It should be noted that Figure 1.1 shows actual monitoring positions, not necessarily the location of residences.

Table 1.1 Attended noise monitoring locations

Location descriptor/ID	Description/address	Coordinates (MGA56)	
		Easting	Northing
N2	Camberwell Village (west)	320297	6405670
N3	Camberwell Village (north-east)	320554	6405839
N4	South of New England Highway	319776	6404101



Source: EMM (2019); DFSI (2017); GA (2011)

0 1 2 km

GDA 1994 MGA Zone 56

N

\\emmsvr1\EMM\Jobs\2019\H190081 - Ashton Coal Noise Monitoring\8 GIS\02_Maps\N001_NoiseMonitoring_20190312_02.mxd 12/03/2019

KEY

- Site boundary
- Noise monitoring location
- Meteorological station
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Cadastral boundary

Noise monitoring locations and Ashton colliery boundary

Ashton Coal
Monthly attended noise monitoring
Figure 1.1

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1.3 Terminology and abbreviations

Some definitions of terms and abbreviations which may be used in this report are provided in Table 1.2.

Table 1.2 Terminology and abbreviations

Term/descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to approximate how humans hear noise.
L_{Amax}	The maximum root mean squared A-weighted noise level over a time period.
L_{A1}	The A-weighted noise level which is exceeded for one per cent of the time.
$L_{A1,1minute}$	The A-weighted noise level which is exceeded for one per cent of the specified time period of one minute.
L_{A10}	The A-weighted noise level which is exceeded for 10 per cent of the time.
L_{Aeq}	The energy average A-weighted noise level.
L_{A50}	The A-weighted noise level which is exceeded for 50 per cent of the time, and is also the median noise level during a measurement period.
L_{A90}	The A-weighted noise level exceeded for 90 percent of the time, also referred to as the "background" noise level and commonly used to derive noise limits.
L_{Amin}	The minimum A-weighted noise level over a time period.
L_{Ceq}	The energy average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure are measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	The vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	Monday – Saturday: 7 am to 6 pm, on Sundays and Public Holidays: 8 am to 6 pm.
Evening	Monday – Saturday: 6 pm to 10 pm, on Sundays and Public Holidays: 6 pm to 10 pm.
Night	Monday – Saturday: 10 pm to 7 am, on Sundays and Public Holidays: 10 pm to 8 am.
Temperature inversion	A meteorological condition where the atmospheric temperature increases with altitude.

Appendix A provides further information that gives an indication as to how an average person perceives changes in noise level, and examples of common noise levels.

2 Noise limits

2.1 Development consent

Ashton Coal noise limits are provided in Table 1, Condition 2 of Appendix 6 of development consent 309-11-2001-I (DC). Relevant sections of the DC are reproduced in Appendix B.1.

2.2 Environment protection licence

Ashton Coal noise limits are provided in Condition L4.1 of EPL 11879 (EPL). Relevant sections of the EPL are reproduced in Appendix B.2.

2.3 Noise management plan

The approved NMP adopts three attended noise monitoring locations that are representative of residences outlined in the DC and EPL. Relevant sections of the NMP are reproduced in Appendix B.3.

2.4 Noise limits

Noise limits based on the NMP are as shown in Table 2.1.

Table 2.1 Noise impact limits, dB

Location	Day $L_{Aeq,15minute}$	Evening $L_{Aeq,15minute}$	Night $L_{Aeq,15minute}$	Night $L_{A1,1minute}$
N2	38	38	36	46
N3	38	38	36	46
N4	38	38	36	46

2.5 Meteorological conditions

The DC and EPL specify the following meteorological conditions under which noise limits do not apply:

- during periods of rain or hail
- average wind speed at microphone height exceeds 5 metres per second (m/s)
- wind speeds greater than 3 m/s at 10 metres above ground level
- temperature inversion conditions greater than 3°C/100 m.

2.6 Additional requirements

Monitoring and reporting have been done in accordance with the NSW EPA 'Noise Policy for Industry' (NPfI) issued in October 2017 and the 'Approved methods for the measurement and analysis of environmental noise in NSW' (Approved Methods) issued in January 2022.

3 Methodology

3.1 Overview

Attended environmental noise monitoring was done in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant EPA requirements. Meteorological data was obtained from the Ashton Coal on-site weather station (AWS) which allowed the correlation of atmospheric parameters with measured noise levels.

3.2 Attended noise monitoring

During this survey, attended noise monitoring was done during the night period at each location. The duration of each measurement was 15 minutes. Atmospheric conditions were measured at each monitoring location.

Measured sound levels from various sources were noted during each measurement, and particular attention was paid to the extent of site contribution (if any) to measured levels. At each monitoring location, the site-only $L_{Aeq,15minute}$ and L_{Amax} were measured directly or determined by other methods detailed in Section 7.1 of the NPfI.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, it was inaudible at the monitoring location. When site noise is noted as NM, this means it was audible but could not be quantified. All results noted as IA or NM in this report were due to one or more of the following:

- Site noise levels were very low, typically more than 10 dB below the measured background (L_{A90}), and unlikely to be noticed.
- Site noise levels were masked by more dominant sources that are characteristic of the environment (such as breeze in foliage or continuous road traffic noise) that cannot be eliminated by monitoring at an alternate or intermediate location.
- It was not feasible or reasonable to employ methods, such as to move closer and back calculate. Cases may include rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

If exact noise levels from site could not be established due to masking by other noise sources in a similar frequency range but were determined to be at least 5 dB lower than relevant limits, then a maximum estimate may be provided. This is expressed as a 'less than' quantity, such as <20 dB or <30 dB.

For this assessment, the measured L_{Amax} has been used as a conservative estimate of $L_{A1,1minute}$. The EPA accepts sleep disturbance analysis based on either the $L_{A1,1minute}$ or L_{Amax} metrics, with the L_{Amax} representing a more conservative assessment of site noise emissions.

3.3 Meteorological data

As per Condition L4.4, this assessment determined stability categories for the attended monitoring period using the direct measurement method as per Fact Sheet D of the Noise Policy for Industry (2017).

The temperature lapse rate was calculated using data from two weather stations; Sentinex Unit 40 weather station (M1) located in Camberwell Village and Ashton Coal 'repeater' weather station (M2 – the site AWS) located in the north-eastern open cut area as shown in Figure 1.1). This was calculated for each 15-minute measurement using the following formula:

$$\text{Temperature lapse rate} = (\Delta T) \times (100/(\Delta H))$$

Where:

- ΔT = temperature measured at M2 (at 10 metres above ground level) minus temperature measured at M1 (at 10 metres above ground level); and
- ΔH = the vertical height difference between M2 and M1 (equal to 73 metres).

3.4 Modifying factors

All measurements were evaluated for potential modifying factors in accordance with the NPfI. If applicable, modifying factor penalties have been reported and added to the measured site only L_{Aeq} noise levels.

Low-frequency modifying factor penalties have only been applied to site-only L_{Aeq} if the site was the only contributing low-frequency noise source. Specific methodology for assessment of each modifying factor is outlined in Fact Sheet C of the NPfI.

3.5 Instrumentation

The equipment used to measure environmental noise levels is detailed in Table 3.1. Calibration certificates are provided in Appendix C.

Table 3.1 Attended noise monitoring equipment

Item	Serial number	Calibration due date	Relevant standard
Brüel & Kjær 2250 sound level meter	3029363	3/11/2024	IEC 61672-1:2013
Svantek SV-36 calibrator	79952	27/9/2025	IEC 60942:2017

4 Results

4.1 Total measured noise levels and atmospheric conditions

Overall noise levels measured at each location during attended measurements are provided in Table 4.1. Discussion as to the sources responsible for measured levels is provided in Section 5 of this report.

Table 4.1 Total measured noise levels, dB – December 2023[1]

Location	Start date	Time	L_{Amax}	L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	L_{Amin}
N2	7/12/2023	22:18	59	53	47	44	40	36	33
N3	7/12/2023	22:36	58	47	43	42	41	39	36
N4	7/12/2023	22:58	60	49	39	38	36	32	30

Notes: 1. Levels in this table are not necessarily the result of activity at the site.

Atmospheric condition data measured by the operator during each measurement using a hand-held weather meter is shown in Table 4.2. The wind speed, direction and temperature were measured at approximately 1.5 metres above ground. Attended noise monitoring is not done during rain, hail, or wind speeds above 5 m/s at microphone height.

Table 4.2 Atmospheric conditions measured at microphone height – December 2023

Location	Date	Time	Temperature °C	Wind speed m/s	Wind direction °Magnetic north	Cloud cover 1/8s
N2	7/12/2023	22:18	21.3	1.6	90	7
N3	7/12/2023	22:36	21.0	1.3	90	7
N4	7/12/2023	22:58	20.8	1.4	90	7

4.2 Site only noise levels

4.2.1 Modifying factors

There were no modifying factors, as defined in the NPfI, applicable during the survey.

4.2.2 Monitoring results

Table 4.3 provides site noise levels in the absence of other sources, where possible, and includes weather data from the site AWS. Limits are applicable if weather conditions were within specified parameters during each measurement.

Table 4.3 Site noise levels and limits – December 2023

Location	Start Date	Time	Wind		Stability Class	VTG °C/100m	Limits apply? [1]	Limit, dB		Site level, dB [2]		Exceedance, dB	
			Speed m/s	Direction° [4]				$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
N2	7/12/2023	22:18	3.2	133	D	-0.8	No	36	46	IA	IA	N/A	N/A
N3	7/12/2023	22:36	2.6	142	D	-0.8	Yes	36	46	IA	IA	N/A	N/A
N4	7/12/2023	22:58	2.2	141	D	-0.7	Yes	36	46	IA	IA	N/A	N/A

Notes:
1. Noise emission limits do not apply during periods of rainfall or winds greater than 3 metres per second (at a height of 10 metres).
2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties if applicable.
3. N/A in the exceedance columns means the criterion was not applicable due to atmospheric conditions outside those specified in project approval.
4. Degrees magnetic north, "-" indicates calm conditions.
5. IA in the site level column means that the site was deemed inaudible at that location.

5 Discussion

5.1 Noted noise sources

During attended monitoring, the time variations (temporal characteristics) of noise sources are considered in each measurement via statistical descriptors. From these observations, summaries have been derived for the location and provided in this chapter. Statistical 1/3 octave-band analysis of environmental noise was undertaken, and the following figures display frequency ranges of various noise sources at each location for L_{A1}, L_{A10}, L_{Aeq}, L_{A50}, and L_{A90} descriptors. These figures also provide, graphically, statistical information for these noise levels.

An example is provided as Figure 5.1, where frogs and insects are seen to be generating noise at frequencies above 1000 Hz, while industrial noise is observed at frequencies less than 1000 Hz.

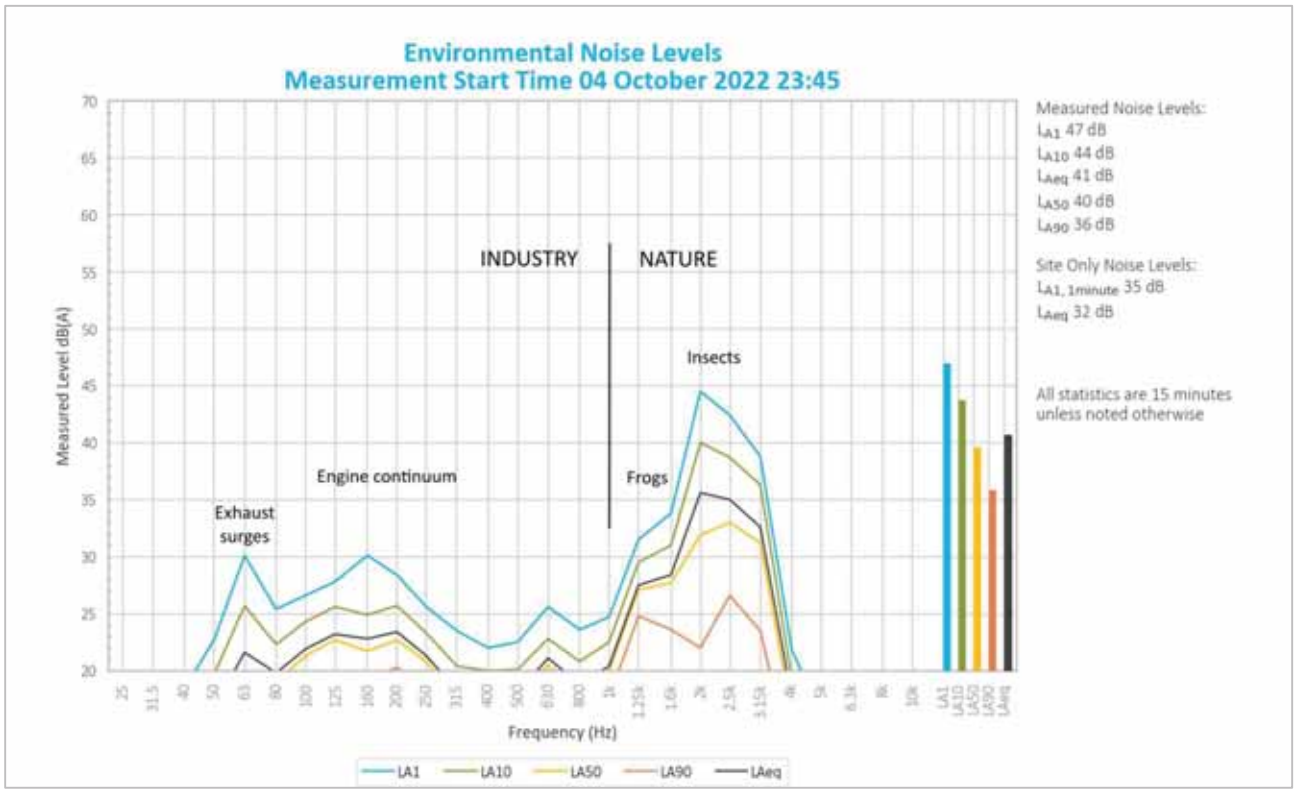

Figure 5.1 Example graph

5.2 N2 – Camberwell Village (west)

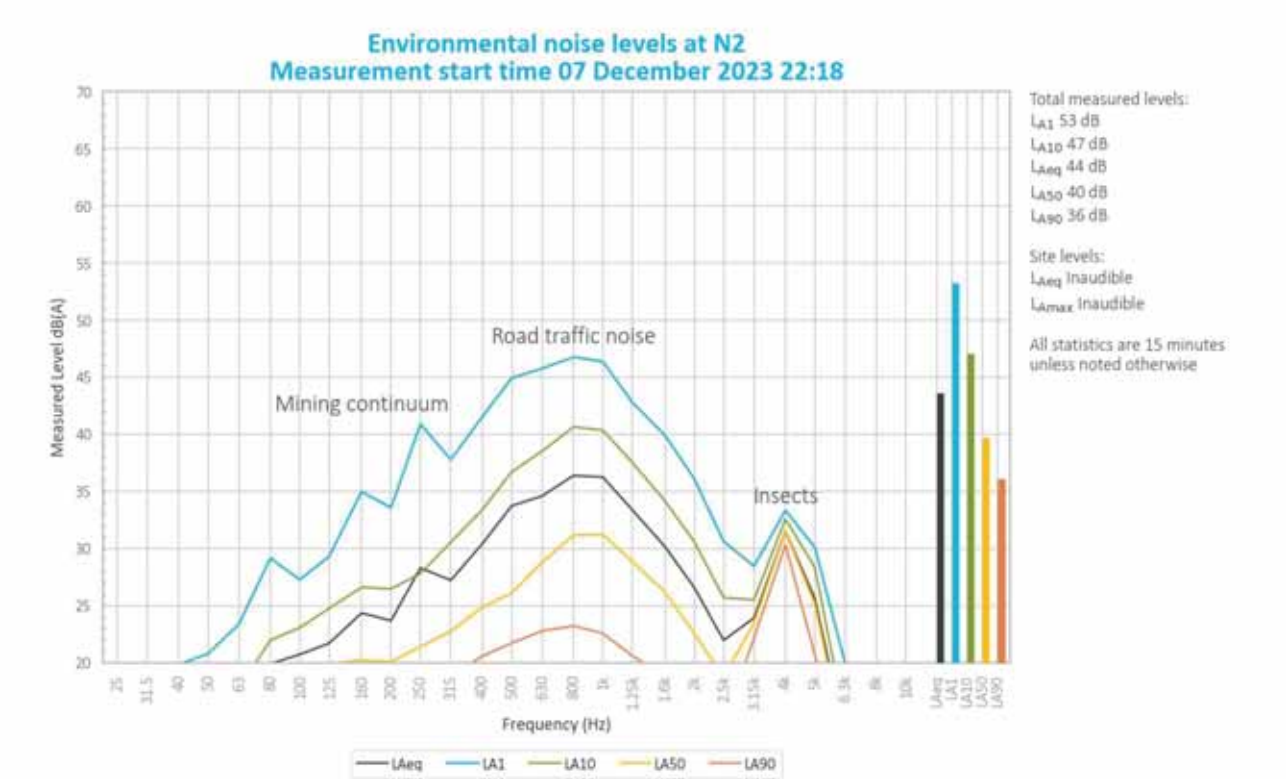

Figure 5.2 Environmental noise levels - N2, Camberwell Village (West)

Ashton Coal was inaudible throughout the entire measurement.

Road traffic noise and insects were the main contributors of measured levels.

Noise from other mines in the vicinity (unrelated to Ashton Coal), wind in foliage, dogs barking and a train on the main line was also noted.

5.2.1 Cumulative mining noise at N2

Ashton Coal was inaudible and therefore no cumulative mining noise was associated with it.

5.3 N3 – Camberwell Village (north-east)

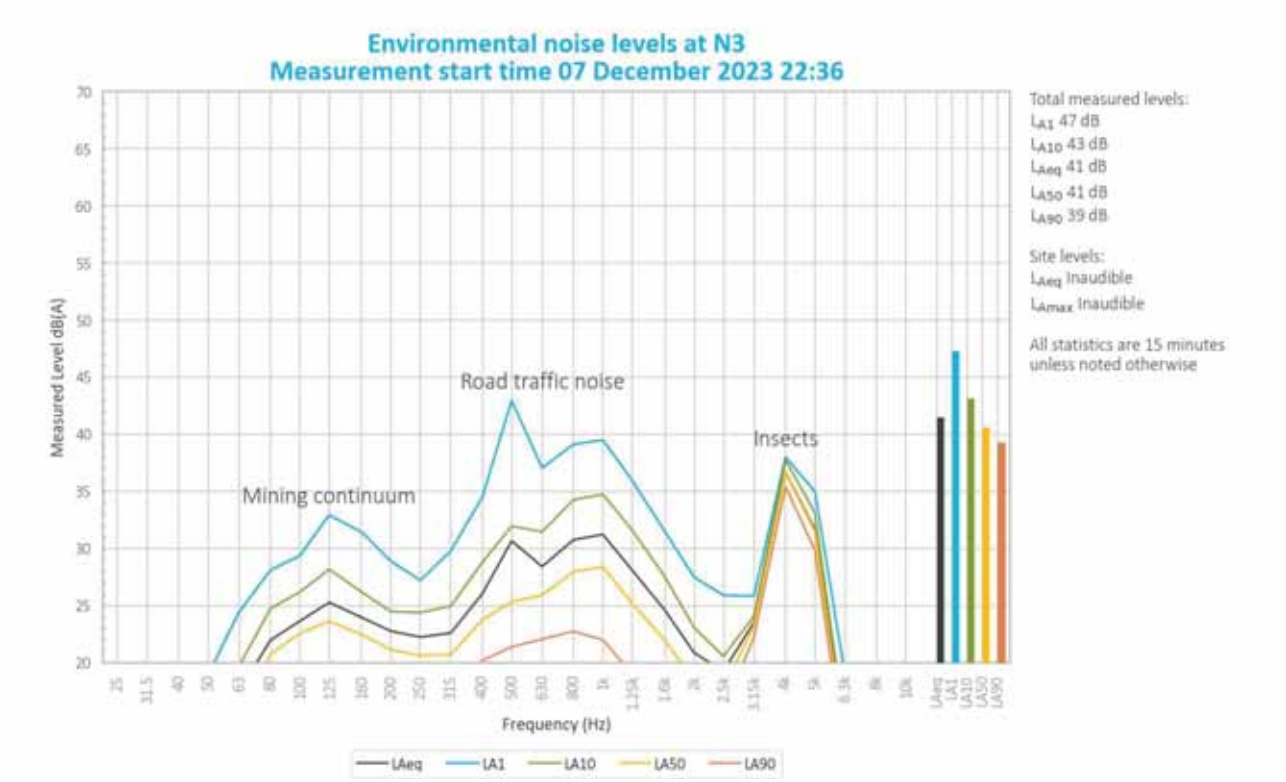

Figure 5.3 Environmental noise levels – N3, Camberwell Village (North-East)

Ashton Coal was inaudible throughout the entire measurement.

Road traffic noise and insects were the main contributors of measured levels.

Noise from other mines in the vicinity (unrelated to Ashton Coal) and distant dogs barking was also noted.

5.3.1 Cumulative mining noise at N3

Ashton Coal was inaudible and therefore no cumulative mining noise was associated with it.

5.4 N4 – South of New England Highway

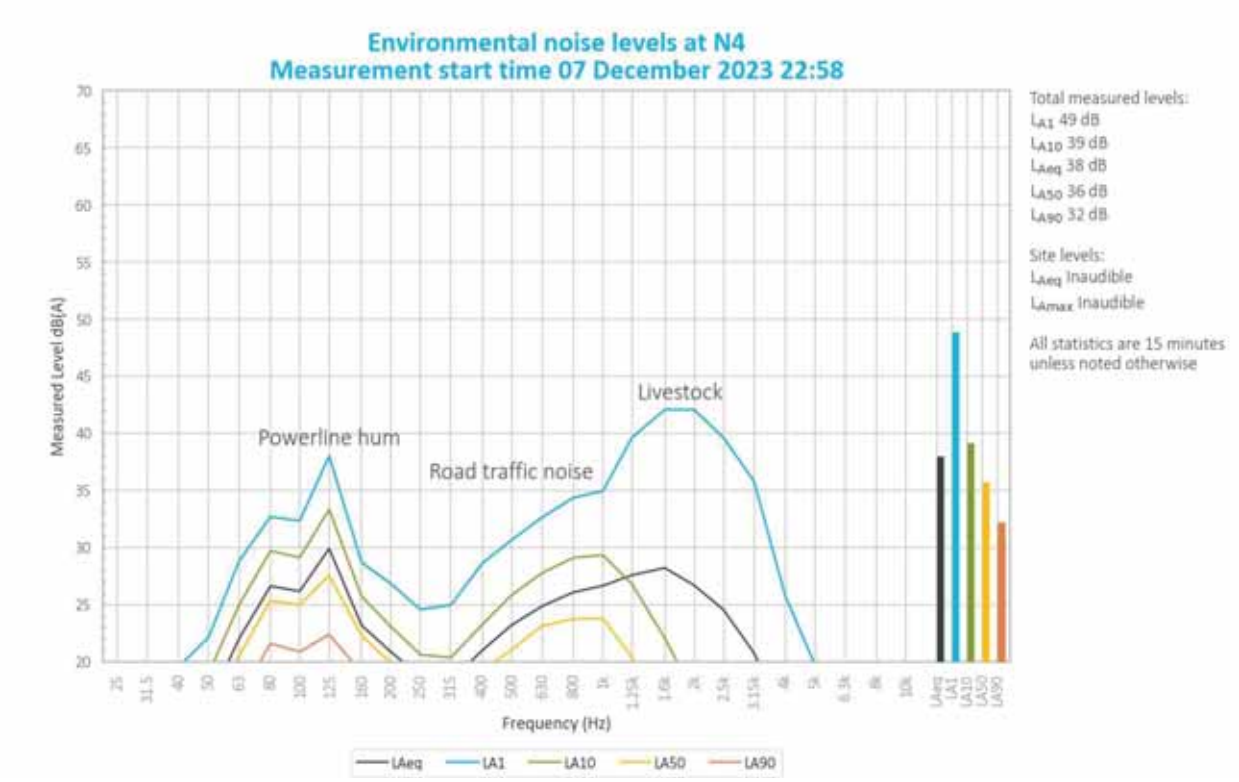

Figure 5.4 Environmental noise levels – N4, South of New England Highway

Ashton Coal was inaudible throughout the entire measurement.

Road traffic noise, powerline hum and livestock were the main contributors of measured levels.

Noise from other mines in the vicinity (unrelated to Ashton Coal) and insects was also noted.

5.4.1 Cumulative mining noise at N4

Ashton Coal was inaudible and therefore no cumulative mining noise was associated with it.

6 Summary

EMM Consulting Pty Ltd (EMM) was engaged by Ashton Coal Operations Pty Ltd to conduct a monthly noise survey of operations at Ashton Coal. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified noise limits.

Attended environmental noise monitoring described in this report was done during the night period on Thursday 7 December 2023 at three monitoring locations as per the NMP.

Noise levels from the site complied with relevant limits at all monitoring locations during the December 2023 survey.

Appendix A

Noise perception and examples

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A.1 Noise levels

Table A.1 gives an indication as to how an average person perceives changes in noise level. Examples of common noise levels are provided in Figure A.1.

Table A.1 Perceived change in noise

Change in sound pressure level (dB)	Perceived change in noise
up to 2	Not perceptible
3	Just perceptible
5	Noticeable difference
10	Twice (or half) as loud
15	Large change
20	Four times (or a quarter) as loud

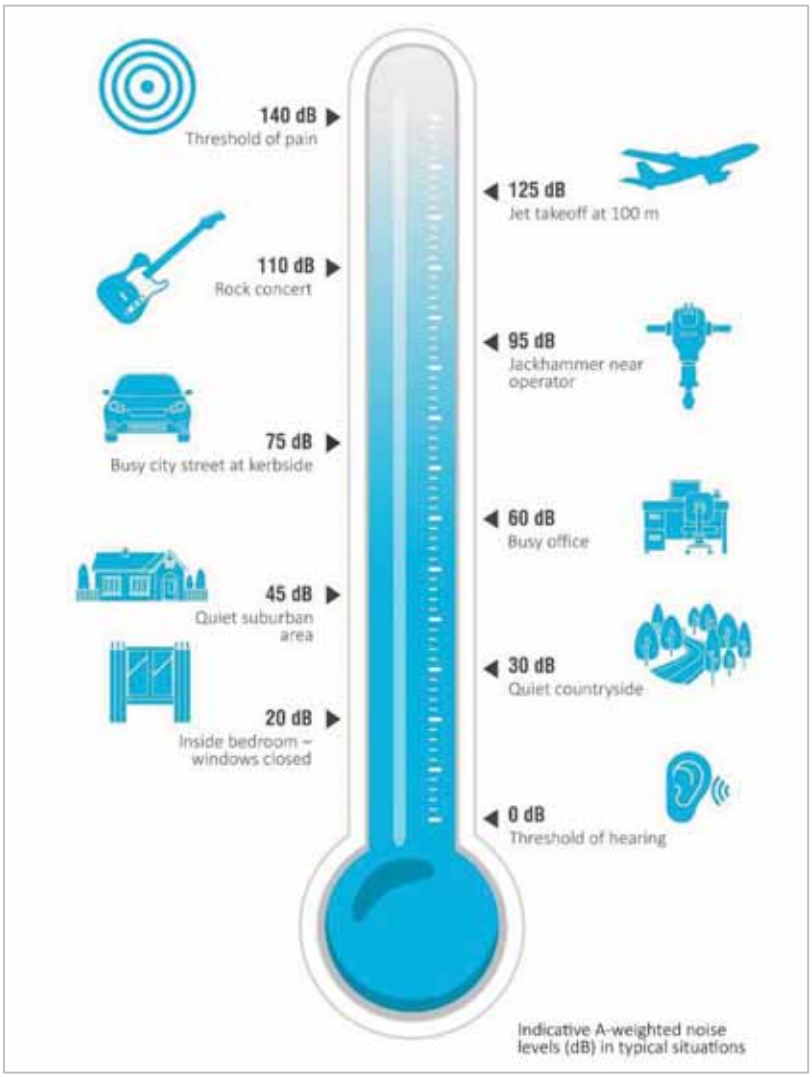

Figure A.1 Common noise levels

Appendix B
Regulator documents

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B.1 Project approval

APPENDIX 6

ALTERNATE NOISE CONDITIONS

NOISE

Application

1. Conditions 2 to 3 below have effect during times when open cut mining operations are not being undertaken at the Ashton Mine Complex, in the opinion of the Planning Secretary.

Noise Criteria

2. Except for the noise-affected land in Table 1 of Schedule 3, the Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 1 at any residence on privately-owned land or on more than 25 per cent of any privately-owned land.

Table 1: Noise Criteria dB(A)

Receiver No.	***Receiver***	***Day*** ($L_{Aeq\ (15min)}$)	***Evening*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{A1\ (1\ min)}$)
-	All privately-owned land	38	38	36	46

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy*. Appendix 8 sets out the requirements for evaluating compliance with these criteria.

However, these noise criteria do not apply if the Applicant has an agreement with the relevant owner/s of the residence/land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Additional Noise Mitigation Measures

3. Upon receiving a written request from the owner of any residence on any privately-owned land where subsequent operational noise monitoring shows the noise generated by the development exceeds the noise limits in Table 2, the Applicant must implement additional reasonable and feasible noise mitigation measures (such as double glazing, insulation, and/or air conditioning) at the residence in consultation with the owner.

If within 3 months of receiving this request from the landowner, the Applicant and the landowner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Planning Secretary for resolution.

Table 2: Additional Noise Mitigation Criteria dB(A) $L_{Aeq\ (15min)}$

Receiver No.	***Receiver***	***Day*** ($L_{Aeq\ (15min)}$)	***Evening*** ($L_{Aeq\ (15min)}$)	***Night*** ($L_{Aeq\ (15min)}$)
-	All privately-owned land	38	38	38

Notes:

- *Noise generated by the development is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 8 sets out the requirements for evaluating compliance with these criteria.*
- *For this condition to apply, the exceedance of the criteria must be systemic.*

APPENDIX 8

NOISE COMPLIANCE ASSESSMENT

Compliance Monitoring

1. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this approval.

2. Data collected for the purposes of determining compliance with the relevant conditions of this approval is to be excluded under the following meteorological conditions:
   a) during periods of rain or hail;
   b) average wind speed at microphone height exceeds 5 m/s;
   c) wind speeds greater than 3 m/s measures at 10 m above ground level; and
   d) temperature inversion conditions greater than 3°C/100m.

3. Unless otherwise agreed with the Planning Secretary, this monitoring is to be carried out in accordance with the relevant requirements relating for reviewing performance set out in the NSW Industrial Noise Policy (as amended from time to time), in particular the requirements relating to:
   a) monitoring locations for the collection of representative noise data;
   b) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
   c) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

4. To the extent that there is any inconsistency between the Industrial Noise Policy and the requirements set out in this Appendix, the Appendix prevails to the extent of the inconsistency.

Determination of Meteorological Conditions

5. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located in the vicinity of the site (as required by condition 18 of Schedule 3).

B.2 Environmental protection licence

Environment Protection Licence

24	Groundwater monitoring	Monitoring up-gradient of Glennies Creek alluvium at coordinates 319294, 6404588 (Easting, Northing), identified as WML120B in Figure 1.
25	Groundwater monitoring	Monitoring mid-gradient of Glennies Creek alluvium at coordinates 319468, 6403528 (Easting, Northing), identified as WML129 in Figure 1.
26	Groundwater monitoring	Monitoring down-gradient of Glennies Creek alluvium at coordinates 318965, 6402842 (Easting, Northing), identified as WMLP336 in Figure 1.
27	Groundwater monitoring	Monitoring up-gradient of Barrett coal seam at coordinates 318431, 6407214 (Easting, Northing), identified as GM1 in Figure 1.
28	Groundwater monitoring	Monitoring up-gradient of Pikes Gully coal seam at coordinates 319292, 6404580 (Easting, Northing), identified as WML120A in Figure 1.
29	Groundwater monitoring	Monitoring mid-gradient of Pikes Gully coal seam at coordinates 319220, 6403928 (Easting, Northing), identified as WML262 in Figure 1.
30	Groundwater monitoring	Monitoring up-gradient of Upper Liddell coal seam at coordinates 319215, 6403958 (Easting, Northing), identified as WML181 in Figure 1.
31	Groundwater monitoring	Monitoring mid-gradient of Upper Liddell coal seam at coordinates 319188, 6404325 (Easting, Northing), identified as WML183 in Figure 1.

P1.4 The following points referred to in the table below are identified in this licence for the purposes of weather and/or noise monitoring and/or setting limits for the emission of noise from the premises.

Noise/Weather

EPA identification no.	Type of monitoring point	Location description
12	Meteorological Station – to determine meteorological conditions for noise monitoring	Meteorological monitoring at coordinates 320522, 6406815 (Easting, Northing), identified as Repeater on Figure 2.
13	Noise monitoring	Monitoring at coordinates 320554, 6405839 (Easting, Northing), identified as N3 on Figure 2 and representative of Noise Assessment Group 2.

14	Noise monitoring	Monitoring at coordinates 320297, 6405670 (Easting, Northing), identified as N2 on Figure 2 and representative of Noise Assessment Group 1.
15	Noise monitoring	Monitoring at coordinates 319776, 6404101 (Easting, Northing), identified as N4 on Figure 2 and representative of Noise Assessment Group 3.
32	Meteorological Station – to determine meteorological conditions for noise monitoring	Monitoring of temperature at 'M1' at coordinates 320259, 6405971 (Easting, Northing).

P1.5 For the purposes of Condition P1.1, P1.2 and P1.3, Figure 1 refers to the plan titled "Ashton Underground Mine Environment Protection licence 11879 Premises Boundary, Surface Infrastructure" dated 30/08/19 (EPA reference DOC19/761196).

P1.6 For the purpose of Condition P1.4, Figure 2 refers to the plan titled "Ashton Underground Mine Environment Protection licence 11879 Premises Boundary, Monitoring" dated 30/08/19 (EPA reference DOC19/761196).

P1.7 The datum for grid references in this Licence is the Geodetic Datum of Australia 1994 (GDA94), Zone 56.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

L2.1 Flares must be operated by the licensee such that there is no visible emission other than for a total period of no more than 5 minutes in any 2 hours, except for heat haze.

L3 Waste

L3.1 The licensee must not cause, permit or allow any waste to be received at the premises unless specified in this licence.

L3.2 The Licensee must not dispose of waste on the premises unless authorised by a condition of this Licence.

L4 Noise limits

L4.1 Noise from the premises must not exceed the noise limits specified in the table below.

Residences referenced in this table are from the consent DA 309-11-2001-i and summarised in the EPA

reference DOC19/761196.

Location	Day LAeq(15 minute)	Evening LAeq(15 minute)	Night LAeq(15 minute)	Night LAeq(1 minute)
EPA Point 13	38	38	36	46
EPA Point 14	38	38	36	46
EPA Point 15	38	38	36	46
All other privately owned residences	38	38	36	46

L4.2 For the purpose of Condition L4.1:
a) Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays,
b) Evening is defined as the period from 6pm to 10pm, and
c) Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays

L4.3 The noise emission limits identified in condition L4.1 apply under the following meteorological conditions:

a) wind speeds up to 3m/s at 10m above ground level; and
b) temperature inversion conditions up to 3 degrees C/100m.

L4.4 For the purposes of condition L4.1:

a) Data recorded by the closest and most representative meteorological station installed on the premises at EPA Identification Point 12 must be used to determine meteorological conditions; and
b) Temperature inversion conditions (stability category) are to be determined by the methods referred to in Fact Sheet D of the Noise Policy for Industry (2017) using EPA Identification Points 12 and 32.

4 Operating Conditions

O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.
This includes:
a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
a) must be maintained in a proper and efficient condition; and
b) must be operated in a proper and efficient manner.

B.3 Noise management plan

Relevant parts of the DA have been reproduced in Appendix A along with reference to where they have been addressed in this document.

4.2 Applicable Criteria

Noise criteria for the ACP are divided into three categories:

- Impact assessment criteria;
- Additional noise mitigation criteria; and
- Cumulative noise acquisition criteria.

The RUM must adhere to a single set of noise criteria relating to noise generated by the RUM development.

4.2.1 Impact Assessment Criteria

In accordance with Condition 2, Appendix 6 of the Ashton DA and Condition L4.1 of EPL 11879, noise generated by the development within the ACP must not exceed the limits specified in **Table 3** at any privately-owned land or on more than 25 per cent of any privately-owned land. The noise limits are provided in decibels (dB).

Table 3: Ashton Noise Impact Criteria dB(A)

Location	Day	Evening	Night	
	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{A1} (1 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	38	38	36	46

In accordance with Condition 12, Schedule 3 of the RUM DA, noise generated by development in the ACOL-operated RUM must not exceed the limits specified in **Table 4** at any residence on privately-owned land or on more than 25 per cent of any privately-owned land.

Table 4 RUM Noise Impact Criteria dB(A)

Location	Day	Evening	Night	
	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{Aeq} (15 minute)	L_{A1} (1 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	35	35	35	45

4.2.2 Additional Noise Mitigation Criteria

If noise emissions generated by the ACP exceed the criteria displayed in **Table 5** at any residence on privately-owned land, then, upon receiving a written request from the landowner, ACOL will implement additional reasonable and feasible noise mitigation measures (such as double glazing, insulation and/or air conditioning) at the residence in consultation with the owner.

Table 5 Additional Noise Mitigation Criteria dB(A)#

Location	Day	Evening	Night
	LAeq (15 minute)	LAeq (15 minute)	LAeq (15 minute)
Any residence not owned by the Applicant or not subject to an agreement between the Applicant and the residence owner as to an alternate noise limit.	38	38	38

* Exceedance of the criteria must be systemic.

4.2.3 Cumulative Noise Acquisition Criteria

If noise emissions generated by the ACP, and other mines exceed the criteria in **Table 6** at any residence on privately-owned land or on more than 25 per cent of any privately-owned land (except for noise affected residential receivers in Condition 1, Schedule 3 of the Ashton DA) then, upon receiving a written request for acquisition from the landowner, ACOL together with the relevant mines, will acquire the land in accordance with the Acquisition Process (as defined in Conditions 7 and 8, Schedule 4 of the Ashton DA).

Table 6 Cumulative Noise Acquisition Criteria dB(A)

Location	Day	Evening	Night
	LAeq (period)	LAeq (period)	LAeq (period)
Camberwell Village	60	50	45
All other privately-owned land	55	50	45

4.3 Existing Environment

The ACP is located in the Hunter Valley region of New South Wales and is bound by the Main Northern Railway to the north, Hunter River to the south and Glennies Creek to the east with the New England Highway dividing the open cut from the underground mining areas.

Other mining operations in the area include the Ravensworth Complex, the Mount Owen Complex, Rix's Creek Open Cut, Integra Underground and Hunter Valley Operations.

The closest sensitive receivers are located in Camberwell. There are currently 13 private landholdings in the local area, 11 of these have an occupied residence.

Ambient noise levels within the village of Camberwell are influenced by the New England Highway to the south, the railway line to the northeast and surrounding mining operations. Attended noise monitoring has confirmed that the major contributing noise source is usually the New England Highway. Noise from ACP has been noted at times in Camberwell Village, historical reports show this has been infrequent and at relatively low levels.

Based on the historical meteorological data collected by ACOL's M2 (repeater) weather station the most common winds in winter are from the west-northwest and the east-southeast in summer. Prevailing winds act to enhance noise from surrounding noise sources (road, rail and mining).

Appendix C
Calibration certificates

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C37508

EQUIPMENT TESTED : Sound Level Calibrator

Manufacturer: Svantek
Type No: SV 36 **Serial No:** 79952
Class: 1
Owner: EMM Consulting Pty Ltd
L3, 175 Scott Street
Newcastle, NSW 2300
Tests Performed: Measured Output Pressure level, Frequency & Distortion
Comments: See Details and Class Tolerance overleaf.

CONDITION OF TEST:

Ambient Pressure	1005	hPa ±1 hPa	**Date of Receipt :**	26/09/2023
Temperature	23	°C ±1° C	**Date of Calibration :**	27/09/2023
Relative Humidity	47	% ±5%	**Date of Issue :**	28/09/2023

Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2017

CHECKED BY: .....

AUTHORISED SIGNATURE: .....

Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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Head Office & Calibration Laboratory
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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM34169

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	B & K		
Type No:	2250	**Serial No:**	3029363
Mic. Type:	4189	**Serial No:**	3260501
Pre-Amp. Type:	ZC0032	**Serial No:**	30109
Filter Type:	1/3 Octave	**Test No:**	F034175

Owner: EMM Consulting
Suite 01, 20 Chandos St
St Leonards NSW 2065

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	1002	hPa ±1 hPa	**Date of Receipt :**	02/11/2022
Temperature	24	°C ±1° C	**Date of Calibration :**	03/11/2022
Relative Humidity	35	% ±5%	**Date of Issue :**	04/11/2022

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

Jack Kielt

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Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

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Appendix 2

Annual Groundwater Monitoring Review 2023

(No. of pages including blank pages = 104)

Australasian Groundwater & Environmental Consultants

Report on

Yancoal – Ashton Coal Annual Groundwater Monitoring Review 2023

Prepared for
Ashton Coal Operations Pty Ltd

Project No. ASH5010.001
February 2024

ageconsultants.com.au

ABN 64 080 238 642

Document details and history

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Yancoal – Ashton Coal
Annual Groundwater Monitoring Review 2023

1 Introduction

The Ashton Coal Project (ACP) is located 14 km north-west of Singleton in the Hunter Valley region of New South Wales (NSW) (Figure 1.1). The ACP consists of decommissioned open cut and active underground mining to access a series of coal seams within the Permian Foybrook Formation. Ashton Coal Operations Ltd (ACOL) is wholly owned and operated by Yancoal Australia Limited (Yancoal).

Between 2003 and 2011, coal was recovered from eleven seams of varying thickness, down to and including the Lower Barrett Seam (LB), from an open cut mine known as the North-East Open Cut (NEOC). Between 2007 and 2016 underground longwall (LW) mining extracted coal from the Pikes Gully Seam (PG) and underlying Upper Liddell (ULD). Mining of the Upper Lower Liddell Seam (ULLD) commenced July 2017. Extraction of longwall panel LW206B (within the ULLD) commenced in mid-November 2022 and was completed in mid-March 2023. Mining in LW207A commenced in mid-June 2023.

The underground mine is located south of the New England Highway and includes a diversion of Bowmans Creek via two excavated and lined channels. The channels have re-routed Bowmans Creek to areas located above abandoned longwall panels.

1.1 Objective

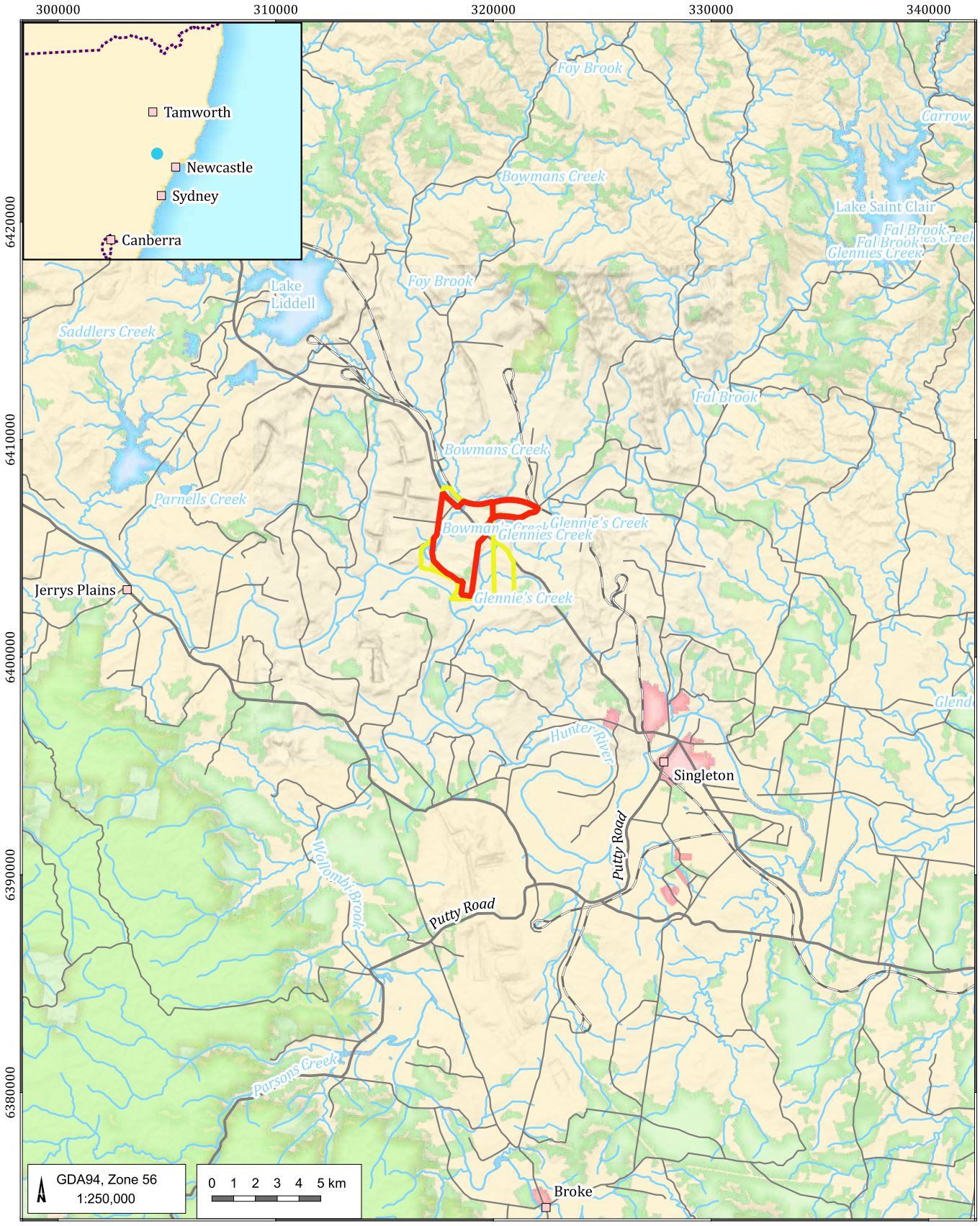
The ACOL development consent (DA 309-11-2001-i) last modified July 2022 requires that groundwater be monitored for potential impacts from mining. In 2018, the Department of Planning and Environment (DPE) approved the current Water Management Plan (WMP; Ashton document HSEC Management System Plan Doc. No. 3.4.1.8 version 11, dated 15 September 2020). The WMP outlines the groundwater monitoring program and establishes trigger values for groundwater levels and quality in the various groundwater systems located within the ACP site.

This report summarises the monthly data collected by Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) from January 2023 to December 2023. The aim of this report is to provide a consolidated summary of groundwater conditions at ACP throughout 2023.

1.2 Scope

The scope undertaken to achieve the objectives includes:

- review and assess rainfall, groundwater levels, pH, electrical conductivity (EC) and water chemistry data from groundwater monitoring campaigns;
- comparison of groundwater monitoring results against WMP triggers;
- notify ACOL of exceedances which require the enactment of the WMP groundwater response plan; and
- make recommendations regarding the groundwater monitoring network and program, where necessary, to ensure ongoing quality control/assurance of groundwater monitoring.



LEGEND

- Ashton mining lease
- Ashton exploration lease
- Study area location
- Populated place
- Built up area
- Major road
- Minor road
- Rail
- Watercourse
- Water area
- Reserve
- Vegetation
- Land

Yancoal Ashton - Monthly Reporting (ASH5010.001)

Study area location

AGE

DATE 08/01/2024

FIGURE No: **1.1**

N:\GroundwaterJobs\G1922L.Yancoal Ashton compliance reporting 2020\3_GIS\G1922L_Ashton_site_location.qgs

2 Physical setting

The Ashton underground mine is located south of the New England Highway, bounded by the Hunter River to the south and two Hunter River tributaries, Glennies Creek and Bowmans Creek, to the east and west, respectively (Figure 1.1). Underground operations intend extracting four coal seams; PG, ULD, ULLD and LB, via a longwall arrangement.

The underground workings (LW1 to LW8) extracted coal from the PG seam and underlying ULD seam (LW101 to LW108). Noteworthy, LW notation increases from east westward 1 to 8. Mining in LW206 began in January 2022 and ended in March 2023. Mining is currently in LW207A, which began in June 2023. LW207 is situated centrally within the mining lease (ML), with the Hunter River and the Hunter River alluvium to the south. The final LW panels within ULLD seams are located down dip of LW207, in the western portion of the ML.

2.1 Climate and rainfall

Climate monitoring data was collected by Ashton Weather Station and the Bureau of Meteorology (BOM) station at Bulga (South Wambo) (BOM station 061191), located about 19 km south-west of Ashton. The Ashton Weather station has 19 years of rainfall data for the period 1 July 2005 to present, while the Bulga (South Wambo) station has 65 years of rainfall data dating from 1959 to present. A summary of average monthly rainfall from the Bulga (South Wambo) station and the Ashton Weather station for 2023 is presented in Table 2.1. Rainfall at Ashton decreased in 2023 compared to the previous year, with above average rainfall recorded in January and February, whilst the rest of year experienced below average rainfall (Table 2.1). Rainfall at the Bulga (South Wambo) station was above average for three months of the year (March, April and December), whilst the rest of the year recorded below average rainfall.

Table 2.1 Average Monthly Rainfall 2023 – Ashton Coal and Bulga

Month	Ashton average monthly rainfall (mm)	% of long-term average	Bulga (South Wambo) average monthly rainfall (mm)	% of long-term average
Jan	63.8	107.0	86.4	72.2
Feb	87.0	126.7	85.7	88.0
Mar	115.5	84.2	75.7	147.7
Apr	54.8	97.4	45.4	103.3
May	32.0	21.9	39.1	10.7
Jun	62.8	17.2	43.3	33.9
Jul	40.0	26.0	33.0	29.7
Aug	43.1	68.2	34.7	64.6
Sep	49.9	0.4	38.4	31.3
Oct	54.0	76.7	55.9	56.2
Nov	81.9	27.1	64.8	72.2
Dec	69.8	83.9	73.2	119.1

An evapotranspiration (ET) rate of 945.9 mm/year was sourced from the Bureau of Meteorology (BOM) database for the Camberwell area.

Long-term rainfall trends can be characterised using the Cumulative Rainfall Departure (CRD) method (Bredenkamp et al., 1995). CRD shows trends in rainfall relative to the long-term monthly average and provides a historical record of wetter and drier periods. A rising gradient in the CRD plot indicates periods of above average rainfall, while a declining slope indicates periods of below average rainfall. CRD has been used in this study to provide context to variations in groundwater levels and chemistry.

The CRD for Ashton weather station and Bulga (South Wambo) (BOM station 061191) are shown on Figure 2.1. CRD trends for both stations show below average rainfall for 2023, as represented by an increasing CRD.

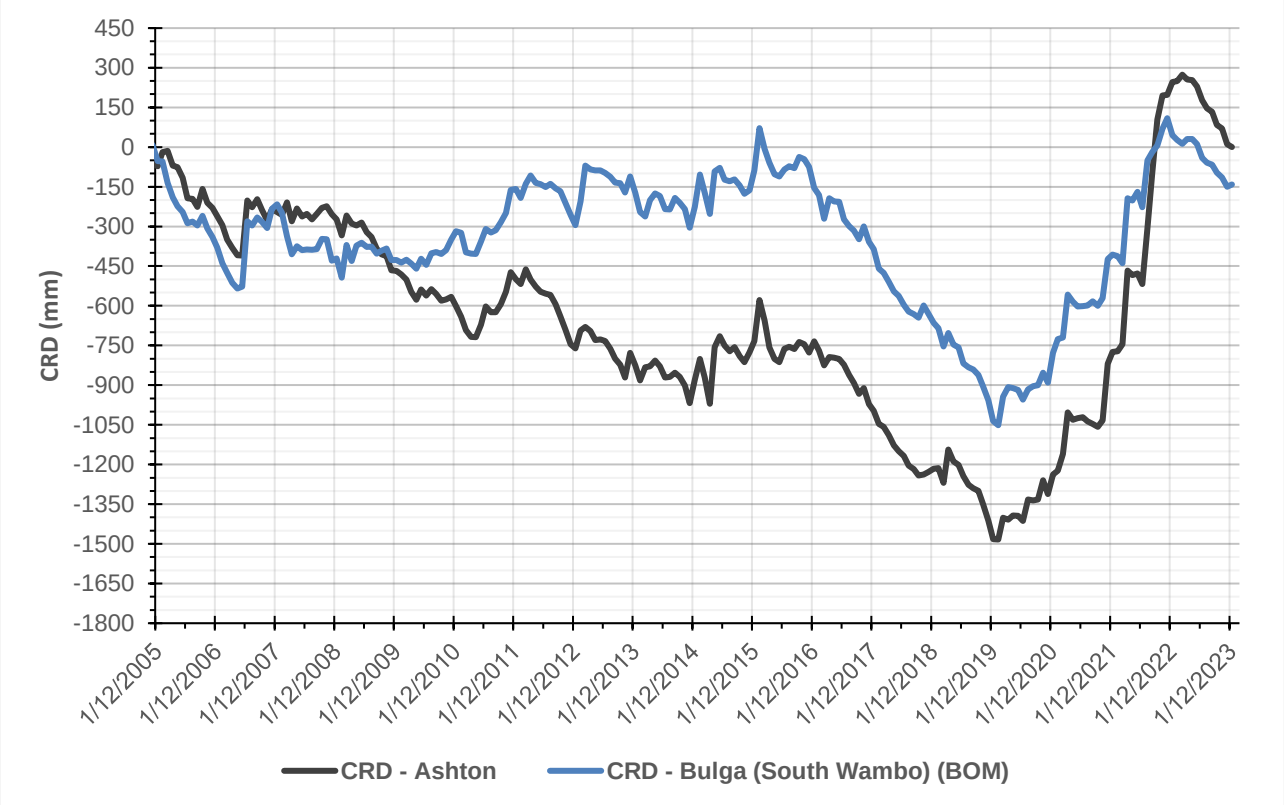


Figure 2.1 Cumulative Rainfall Departure – Ashton Coal and Bulga

2.2 Surface water

The Ashton mine lease is bounded by Bowmans Creek to the west, Bettys Creek (tributary of Bowmans Creek) to the north, Glennies Creek to the east side and Hunter River to the south. Both Bowmans and Glennies Creeks are tributaries of the Hunter River. The three main water courses are described below:

- Hunter River is the main surface water body with a catchment area at Bowmans Creek of 13,590 km^2. The flow is regulated by Glenbawn Dam and by other licensed extractions and releases.
- Glennies Creek and its associated alluvium are located to the east of the underground workings and the PG sub-crop area. The catchment area is approximately 600 km^2. Up to half of the Glennies Creek catchment feeds into Lake St. Clair, located within the far north-eastern section of the catchment. Water from Lake St. Clair discharges into Glennies Creek under controlled release.
- Bowmans Creek natural channel is above the longwall panel LW206/LW207 and its associated alluvium is over LW205 to LW208. It is the main water course over the underground workings area. Bowmans creek was diverted in two locations to minimise the impact of mining on both the creek and the potential inflows to the underground workings. The construction of the eastern diversion commenced in March 2011 and the western diversion commenced in February 2012. Both diversions were commissioned in November 2012 and are located within the Bowmans Creek Alluvium (BCA). The diversions were designed to replicate the natural creek setting in terms of channel cross-sectional variability in bed level and ecological features (i.e. resting pools). The diversions were lined with a geosynthetic clay liner to minimise leakage from the creek.
- Bowmans Creek flow is not regulated and is monitored according to the WMP. The streamflow gauging station (no. 210130 - regulated by WaterNSW), was installed in October 1993 and is used as a flow baseline for Bowmans creek with a catchment area of 240 km^2. This station is in the middle section of the creek on the ML, upstream to the western diversion.

2.3 Mining

The longwall panels accessing the ULLD are generally offset 24 m to the east and 10 m south from the overlying ULD longwall panels. This offset is designed to reduce the resulting subsidence and associated impacts to the surrounding environment. That said, the northern extent of PG, ULD, ULLD longwalls, and the main gate road are aligned resulting in a “stacked edge” where subsidence impacts are slightly more noticeable at the surface than elsewhere.

The start and end dates of longwall panel mining at ACP are summarised in Table 2.2.

Table 2.2 Longwall panel schedule

Longwall panel	Target seam	Start date	End date
LW1	PG	12/03/2007	15/10/2007
LW2	PG	10/11/2007	21/07/2008
LW3	PG	20/08/2008	03/03/2009
LW4	PG	02/04/2009	15/10/2009
LW5	PG	04/01/2010	07/06/2010
LW6A	PG	09/07/2010	22/11/2010
LW7A	PG	22/03/2011	08/08/2011
LW7B	PG	03/10/2011	17/01/2012
LW8	PG	27/02/2012	05/06/2012
LW101	ULD	31/07/2012	16/06/2013
LW6B	PG	14/07/2013	10/10/2013

Longwall panel	Target seam	Start date	End date
LW102	ULD	10/11/2013	24/07/2014
LW103	ULD	21/08/2014	21/06/2015
LW104A	ULD	23/07/2015	16/01/2016
LW104B	ULD	03/02/2016	11/04/2016
LW105	ULD	17/05/2016	26/09/2016
LW106A	ULD	18/10/2016	31/05/2017
LW201	ULLD	07/07/2017	04/05/2018
LW202	ULLD	07/06/2018	20/08/2019
LW203	ULLD	08/10/2019	25/05/2020
LW204	ULLD	02/07/2020	14/04/2021
LW205	ULLD	3/06/2021	5/12/2021
LW206A	ULLD	7/01/2022	28/10/2022
LW206B	ULLD	15/11/2022	15/03/2023
LW207A	ULLD	15/06/2023	Currently being mined

2.4 Conceptual hydrogeology

2.4.1 Hydrostratigraphy

Ashton is located in the central Hunter Valley of NSW where the lower sequences of the Wittingham Coal Measures (Singleton Supergroup) subcrop (Figure 2.2). Within the Ashton mining lease, the Hebden seam to the Bayswater seam (inclusive) subcrop. The underground operation targets the PG, ULD, ULLD and the LB seams.

The Wittingham Coal Measures dip west south-west in the Ashton area, an orientation locally controlled by the Camberwell Anticline to the east of the mine and the Bayswater Syncline to the west. The top target coal seam at Ashton, the PG seam, subcrops under the Glennies Creek Alluvium (GCA) approximately 150 m east of the mine, while the lowest target coal seam, the LB seam, subcrops under regolith approximately 2 km to the east of the mine. In the western portion of the mining area, the overburden above the PG seam ranges in thickness between 100 m (north end of LW7) and 190 m (south end of LW7).

The stratigraphic sequence in the region comprises two distinct units: Quaternary alluvium and Permian strata. The Permian strata comprise coal seams (typically 2 m to 2.5 m thick) with overburden and interburden (typically 30 m thick between successive seams) consisting of sandstone, siltstone, tuffaceous mudstone, and conglomerate. The Quaternary alluvium consists of unconsolidated silt, sand and gravel in the alluvial floodplains of the Hunter River (HR), Bowmans Creek (BC) and Glennies Creek (GC). The alluvium unconformably overlies the Permian within the floodplains of the HR, BC and GC. Elsewhere, the Permian is overlain by a regolith comprising colluvium, eluvium and completely weathered rock, which interfaces with the floodplain alluvium at the flanks of the valleys.

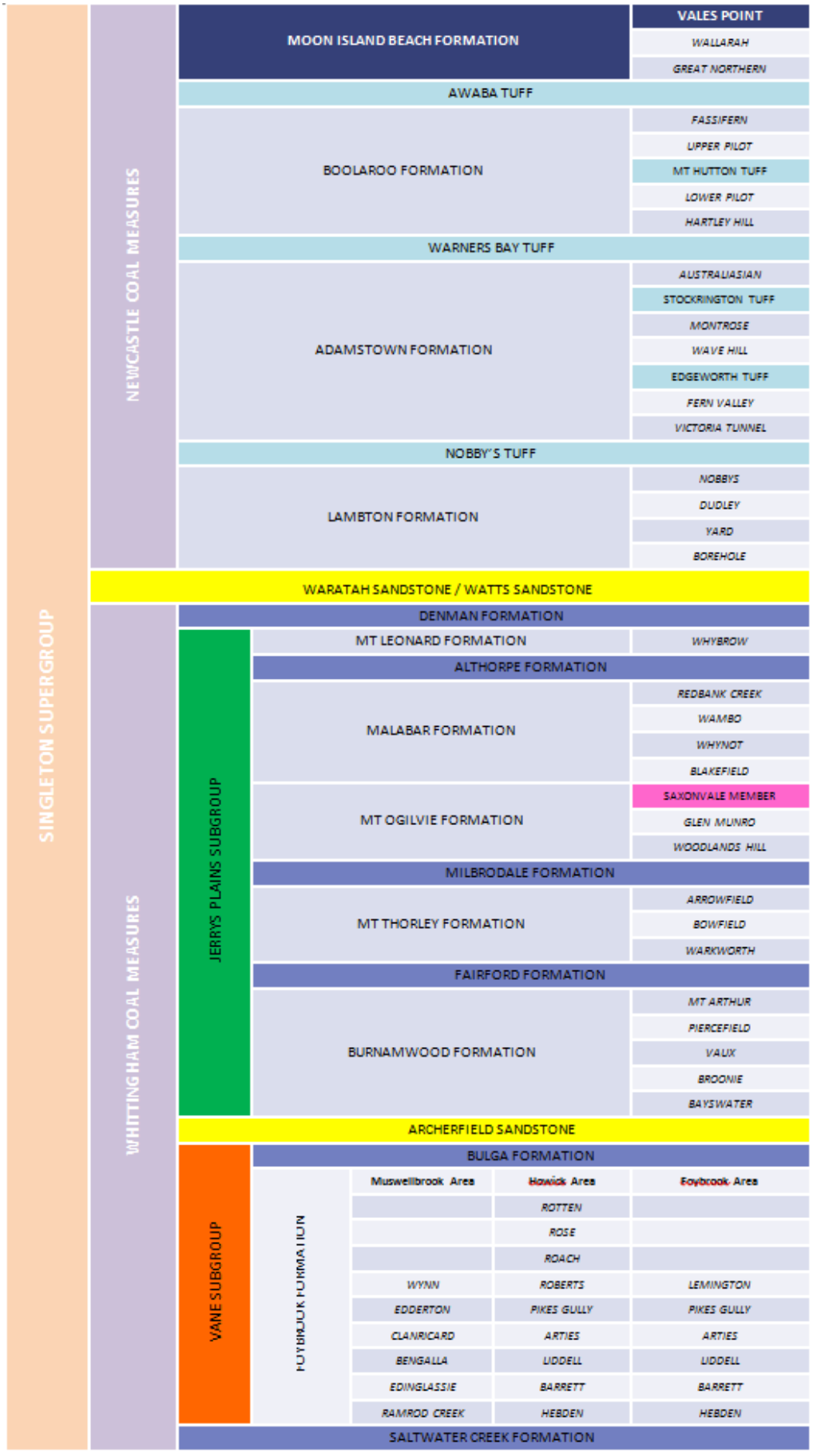


Figure 2.2 Singleton Super Group sequence stratigraphy (AGE, 2016)

2.4.1.1 Quaternary alluvium/Regolith

Ashton is overlain by Quaternary alluvium associated with the HR, BC and GC. The Bowmans Creek Alluvium (BCA) and Glennies Creek Alluvium (GCA) are in direct connection to the Hunter River Alluvium (HRA). The Quaternary/recent aged alluvium/colluvium along the HR, GC and BC flood plains comprises two distinct depositional units; a surficial fine-grained sediment and a coarser basal material. The surficial alluvium comprises shallow sequences of clay, silty sand and sands. Along the minor drainage lines, the surficial alluvium is typically constrained within 500 m of the creeks and is between 7 m to 15 m thick.

Away from the floodplain areas, the Permian coal measures sequence is overlain by a layer of regolith, comprising colluvium/eluvium, and completely weathered rock that collectively have soil rather than rock properties and interface with the alluvium at the flanks of the floodplain areas. The regolith layer varies in thickness, though is typically 15 m to 20 m thick above rock.

2.4.1.2 Permian strata

The Wittingham Coal Measures comprise Permian aged coal seams interbedded with siltstone, sandstone, shales and conglomerates. The Wittingham Coal Measures are up to 400 m thick at Ashton, but regionally they range from approximately 250 m to 600 m thickness. At Ashton, the lower portion of the Wittingham Coal Measures is present on site. The profile extends from above the Bayswater seam to the Hebden seam (Figure 2.2).

Locally, the Wittingham Coal Measures are further divided into (AGE, 2016):

- four main target coal seams – PG, ULD, ULLD and the LB;
- a large number of coal seams and plies of varying thickness, including the Bayswater seam, up to 20 Lemington seam plies, the Arties seam, and a number of Liddell seam and Barrett seam plies that are not proposed to be mined in the Ashton underground mine; and
- interburden sediments comprising siltstone, sandstone, conglomerate and claystone.

Over 20 plies of the Lemington seam profile and the overlying Bayswater seam are present within the PG seam overburden. The largest Lemington seam plies are of similar thickness as the four target seams and may have similar hydraulic properties.

2.4.2 Recharge

Recharge is interpreted to occur from direct rainfall to the ground surface, infiltrating into the formations through the thin soil cover and regolith. The coal measures also occur at subcrop in localised zones beneath the HRA, GCA, and the BCA. In these areas, the Permian coal measures are interpreted to be recharged by downward seepage and then downdip flow along the most permeable strata in the sequence, primarily the coal seams (Aquaterra, 2009 and AGE, 2016).

The combined surface water catchment area potentially providing recharge to the Ashton area is significantly greater in size than the mine area itself. Ashton is located immediately adjacent the confluences of the Hunter River with Bowmans and Glennies Creeks. The Ashton surface and underground infrastructure is located entirely within the Bowmans and Glennies Creek catchments, which extend approximately 30 km and 45 km to the north of Ashton, respectively.

Bowmans and Glennies Creek have up to fourth order tributaries up-stream of the site and rainfall falling within the respective catchments flows through the Ashton area. The Bowmans and Glennies Creeks catchments span approximately 300 km^2 and 600 km^2, respectively.

2.4.3 Groundwater flow

The Quaternary alluvium and regolith combined is interpreted (AGE, 2016) to be an unconfined groundwater system that is recharged by rainfall infiltration, streamflow and upward leakage from the underlying stratigraphy, particularly along GC and BC.

The water table in the alluvium/regolith is a subdued reflection of topography. Groundwater within the HRA flows generally in an easterly direction, while groundwater within GCA and the BCA flows generally in a southerly direction towards the HR, with local flow towards the respective river/creeks.

The direction of groundwater flow for the coal seams is influenced by the local geomorphology and structural geology as well as the long history of mining within the region. Groundwater flow within the Permian Coal Measures is understood to be to the south-west, consistent with the dip direction of the coal seams.

The mining of the PG seam and ULD seam has impacted the groundwater regime at Ashton. Mining has induced subsidence cracking that extends to the ground surface above parts of Ashton, and to a lesser height above the goaf in other areas where the cover depth above the PG seam is greater (i.e. near the western side of the mine area). It is likely that in areas of shallower cover depth, this cracking has penetrated both the overburden of the PG, along with the BCA. Surface cracking is also visible along and across the longwall panel areas immediately following subsidence. This surface cracking is expected to extend for only a limited depth below surface and may or may not intersect with the subsidence cracking emanating up from the goaf, depending on cover depth and subsidence magnitude.

There is also potential for recharge from the GCA through connectivity with the PG seam (AGE, 2016), which hydraulic testing showed was significantly more permeable close to outcrop than at depth (Peter Dundon and Associates, 2006). Inflows into the workings during mining of LW1 were not significantly greater than during mining of LW1 tailgate (TG1A). This would indicate that mining of LW1 did not increase the connectivity or flow from the PG seam in subcrop beneath the GCA. Although inflows were higher during mining of TG1A than subsequent inflows from subsided strata during extraction of LW1, the total inflows to the end of LW1 were below predicted inflows, and the observed impacts on GCA were less than predicted, confirming that the proximity to Glennies Creek has not resulted in an unexpected level of connectivity and inflows from the Glennies Creek floodplain.

The presence of subsidence cracking over parts of the underground mine increases the potential connectivity of the mine with the water within the creeks and associated alluvium. Planned LW panels within the underlying ULLD and LB seams may allow for reactivation of subsidence and subsidence related fracturing within these areas (AGE, 2016).

The conceptual hydrogeological model is depicted in Figure 2.3.

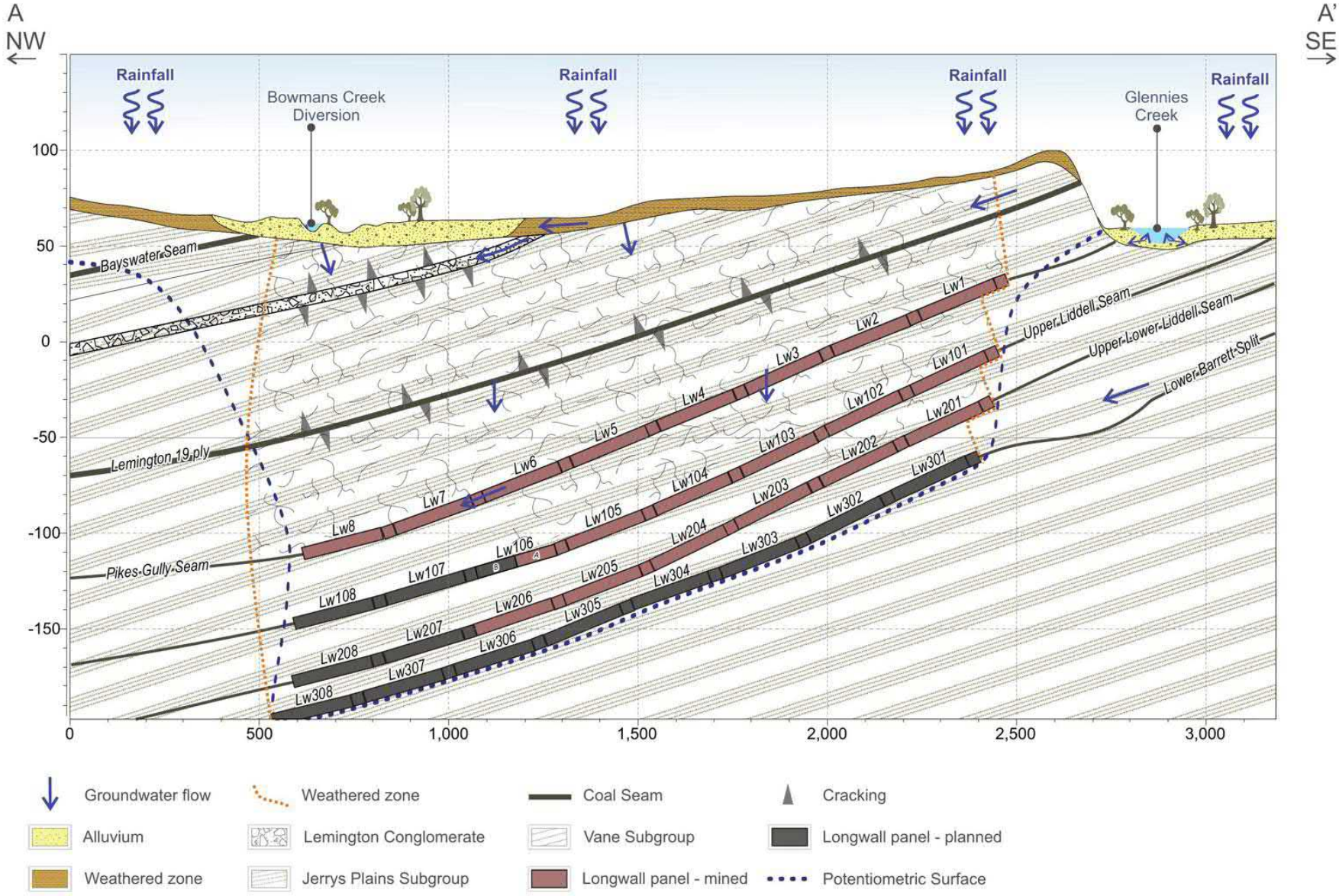


Figure 2.3 Conceptual hydrogeology – north-west to south-east – not to scale

3 Groundwater management plan

The previous WMP (2018) was updated and submitted to DPI Water for approval in March 2018. The updated WMP (2020) (herein referred to as WMP) includes an update to targeted water quality triggers. Details of the monitoring locations are summarised in Appendix A. The groundwater monitoring plan, including monitoring parameters and frequency, is summarised in Appendix B. The WMP received approval in September 2020, therefore, groundwater monitoring was conducted as per WMP version 11 (2020) following its approval.

3.1 Groundwater monitoring network

The ACOL groundwater monitoring network consists of more than 100 monitoring bores. Of these, 64 bores and ten vibrating wire piezometer (VWP) installations are monitored as part of the WMP throughout monthly, quarterly, and annual campaigns (Appendix A). The WMP outlines the monitoring plan and key monitoring locations in areas potentially sensitive to mining impacts.

Monitoring of groundwater levels, VWP pressure heads, and water quality parameters at these bores sufficiently captures the lateral groundwater system behaviour of the alluvial aquifers, the interburden and the coal seam aquifers at the site. The current groundwater monitoring network is considered suitable to detect changes to groundwater across the site.

The WMP monitoring locations and respective monitoring targets are presented in Figure 3.1. Details of these monitoring locations are summarised in Appendix A (Table A 1).

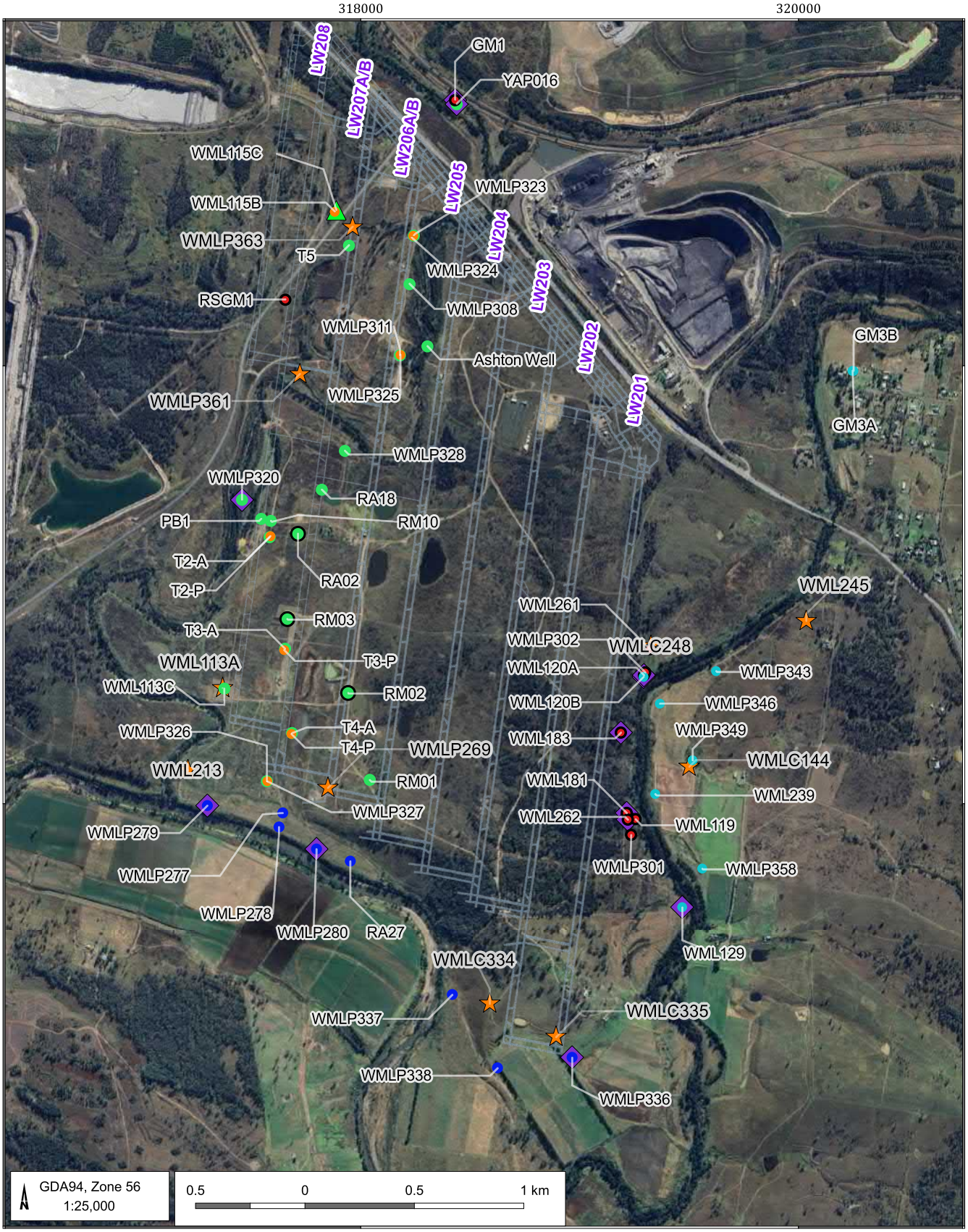
The groundwater monitoring program includes the monitoring of:

- groundwater levels;
- groundwater (piezometric) pressures;
- field water quality parameters – pH, EC, temperature and total dissolved solids (TDS);
- groundwater sampling for minor chemical lab analysis (including pH, EC, TDS, major ions (calcium, magnesium, sodium, potassium, chloride and sulfate as SO4) and alkalinity);
- groundwater sampling for comprehensive chemical lab analysis (including pH, EC, TDS, major ions, alkalinity, cations/anions, arsenic, cadmium, chromium, copper, iron, lead, manganese, nickel, selenium, zinc, turbidity, cyanide, nitrate, nitrite, Kjeldahl nitrogen, total nitrogen and total phosphorous); and
- monitoring of groundwater levels and EC as required by Environmental Protection Licence (EPL) 11879.

Monitoring frequency is as follows (Appendix B):

- monthly monitoring at selected alluvial piezometers for water level and field water quality;
- monthly monitoring of water level and piezometric pressure in longwall-specific piezometers during active extraction at relevant longwalls;
- quarterly monitoring at selected piezometers for water level, field water quality and minor chemical analysis;
- biannual monitoring for bores specified by EPL 11879; and
- annual sampling at selected piezometers for minor and comprehensive chemical analysis.

The groundwater monitoring plan, including monitoring parameters and frequencies, is summarised in Appendix B (Table B 1).



LEGEND

- Longwall panels (ULLD)
- Bowmans Creek Alluvium
- Bowmans Creek Alluvium and Coal Measure Overburden
- Bowmans Creek Colluvium
- Coal measure
- Coal measure overburden
- EPL Bores - Updated Nov 2022
- Glennies Creek Alluvium
- Hunter River Alluvium
- VWPs

Yancoal Ashton - Monthly Reporting (ASH5010.001)

WMP groundwater monitoring network

AGE

DATE 08/01/2024

FIGURE No: **3.1**

N:\GroundwaterJobs\G1922L.Yancoal Ashton compliance reporting 2020\3_GIS\G1922L_WMP_groundwater_monitoring_network_2020.qgs

3.2 Trigger values

The WMP outlines trigger values for groundwater level and quality for monitoring bores in the Bowmans Creek BCA, GCA and the HRA.

A recorded water level below the defined trigger level at a monitoring bore at any time between March 2018 and the end of mining of LW204 in the ULLD, sustained for three consecutive months, would trigger a response under the WMP. In late 2019, AGE was requested by ACOL to validate and subsequently update the AGE (2016) groundwater model as part of the NSW regulatory requirements requiring a model update at least every 3 years. We understand that ACOL are currently reviewing the updated model and that modelled drawdowns for longwall panels from LW205 onwards will be incorporated into a revised WMP with updated trigger criteria. In the interim, recorded water levels (and water quality) will continue to be assessed against the approved WMP. Groundwater elevation trigger levels are summarised in Table 3.1.

Groundwater quality trigger levels are summarised in Table 3.2. As for groundwater elevation, three consecutive measurements outside of these values trigger a response under the WMP. In addition, if a recorded value at a monitoring bore differs extremely from the preceding three readings at that location and there are no unusual events that could have caused the difference, a response would be triggered. The WMP groundwater response plan, for cases where trigger values are exceeded, is summarised in Appendix C.

Table 3.1 Groundwater elevation trigger levels for alluvial monitoring bores

Aquifer	Monitoring bore	Base of alluvium elevation (mAHD)	Assigned trigger value at end of mining in LW204 (Upper Lower Liddell Seam) (mAHD)
BCA*	WMLP311	55.64	57.50
	WMLP323	59.47	59.20
	WMLP328	49.42	55.15
	T2A	49.69	54.17
GCA	WML120B	51.12	51.45
	WML129	45.44	49.80
	WML239	50.82	49.78
	WMLP343	50	51.33
	WMLP346	49.18	51.35
	WMLP349	48.84	50.82
	WMLP358	50.16	50.79$
HRA	WMLP279	45.1	48.82
	WMLP280	44.92	48.63
	WMLP337	48.05	47.73
	WMLP336	47.87	48.15

Notes: * Bowmans Creek alluvium is approved to be dewatered in areas above the mine plan by end of mining of the Upper Liddell seam (Aquaterra, 2009). Trigger values are therefore intended as a guide representing updated, more conservative, impact predictions from the updated groundwater model (AGE, 2016).

$ This water level trigger is based on the second lowest water level measured, as the lowest measured water level is an outlier in the dataset.

Table 3.2 Groundwater quality trigger levels for alluvial monitoring bores

Aquifer	Monitoring bore	Groundwater pH trigger - Lower (5th percentile)	Groundwater pH trigger - Upper (95th percentile)	Groundwater EC trigger (µS/cm) (95th percentile)
BCA	WMLC113C	6.6	7.4	1445
	WMLP311	6.5	8.0	1289
	WMLP323	6.5	8.1	1241
	WMLP326	6.6	7.5	2078
	WMLP328	6.6	8.2	1175
	T2A	6.7	7.7	1422
GCA	WML120B	6.4	7.7	1387
	WML129	6.7	8.0	740
	WML239	6.3	7.4	984
	WMLP343	6.7	7.2	994
	WMLP346	6.5	7.1	750
	WMLP349	6.5	6.8	983
	WMLP358	6.2	6.9	401
HRA	WMLP279	6.3	7.5	1276
	WMLP280	6.6	7.9	2034
	WMLP337	6.8	7.8	3254
	WMLP336	6.2	8.2	1708

Note: Data reviewed for trigger derivation includes historical data to June 2017.

3.3 Sampling methods

Groundwater sampling at Ashton in 2023 adhered to the following standards and procedures:

- Australian Government – National Water Commission (2020). *"Minimum Construction Requirements for Water Bores in Australia".* Fourth edition ISBN 978-0-646-81881-8.
- Standards Australia (1998). *"Water Quality – Sampling. Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples".* Australian/New Zealand Standard 5667.1:1998.
- Sundaram, B. (2009). *"Groundwater Sampling and Analysis – A Field Guide",* Australian Government – Geoscience Australia. GeoCat 60901.

Groundwater levels/pressure heads at Ashton in 2023 were measured as follows:

- manual measurements using a water level dipper;
- download of VWP data;
- downloadable pressure transducer (PT); and
- telemetric PT.

Groundwater quality field parameters were measured using a calibrated water quality meter. Water quality laboratory analysis is conducted by National Association of Testing Authorities (NATA) accredited group Australian Laboratory Services (ALS).

Throughout 2023, groundwater sampling was conducted by AGE Hydrogeologists Edward Hunt, Jordan Reeds and Oliver Palmer.

4 Groundwater monitoring results

Groundwater monitoring and sampling was conducted at the locations and frequencies outlined in the WMP (Section 7.3). Groundwater levels and quality trends for alluvial bores are presented in Figure 4.1 through Figure 4.22. Groundwater levels and quality data for non-alluvial monitoring locations are presented in Figure 4.23 through Figure 4.28.

4.1 Alluvium monitoring

4.1.1 WMP compliance groundwater elevations

The groundwater elevation trends and trigger levels for the BCA, GCA and HRA compliance monitoring bores are presented in Figure 4.1, Figure 4.2, Figure 4.3 and Figure 4.4, respectively. Daily rainfall measurements and CRD have also been plotted and used to compare water level trends. The river and creek water levels (sourced from WaterNSW online database[1]) are presented graphically in Figure 4.5.

The following observations can be noted for 2023:

- Groundwater elevations in BCA monitoring bores decreased throughout 2023 (Figure 4.1). Groundwater elevations declined below established triggers in T2A (Sep and Oct 2023 – two consecutive exceedances) and WMLP328 (July 2023-onwards – six consecutive exceedances). Unlike the GCA and HRA, the BCA is not a regulated stream. It should be noted that ACP is approved to intercept the BCA groundwater resource under DA 309-11-2011-i MOD 5;
- GCA groundwater elevations were generally stable throughout the year (Figure 4.2 and Figure 4.3). WMLP343 was unable to sampled for most of 2023 due to sediment buildup in the screened interval. Airlift development is planned in 2024 to remove the sediment obstruction. All GCA groundwater elevations remained above established triggers in 2023;
- HRA regulatory bore groundwater elevations decreased throughout the year (Figure 4.4). The stability of HRA water elevations can be partly attributed to controlled releases upstream of the HR section that traverses ACP. All HRA groundwater elevations remained above established triggers in 2023; and
- Surface water elevation in Bowmans Creek declined from the beginning of the year, with the creek being dry from April 2023 onward with intermittent water present following rainfall events (Figure 4.5). The Hunter River and Glennies Creek water elevation was relatively stable throughout the year, with sharp increases in water elevation recorded after heavy rainfall.

The site area experienced average rainfall from January to April 2023, as indicated by a stable CRD. Decreasing CRD from April to December 2023 indicates periods of below-average rainfall in the region. Decreased groundwater elevation in BCA, GCA and HRA regulatory bores throughout 2023 is attributed to these periods of below average rainfall. No mining impacts outside of predictions are noted in the alluvium.

[1] WaterNSW (2021). Real-time water data. Available at: http://realtimedata.water.nsw.gov.au/water

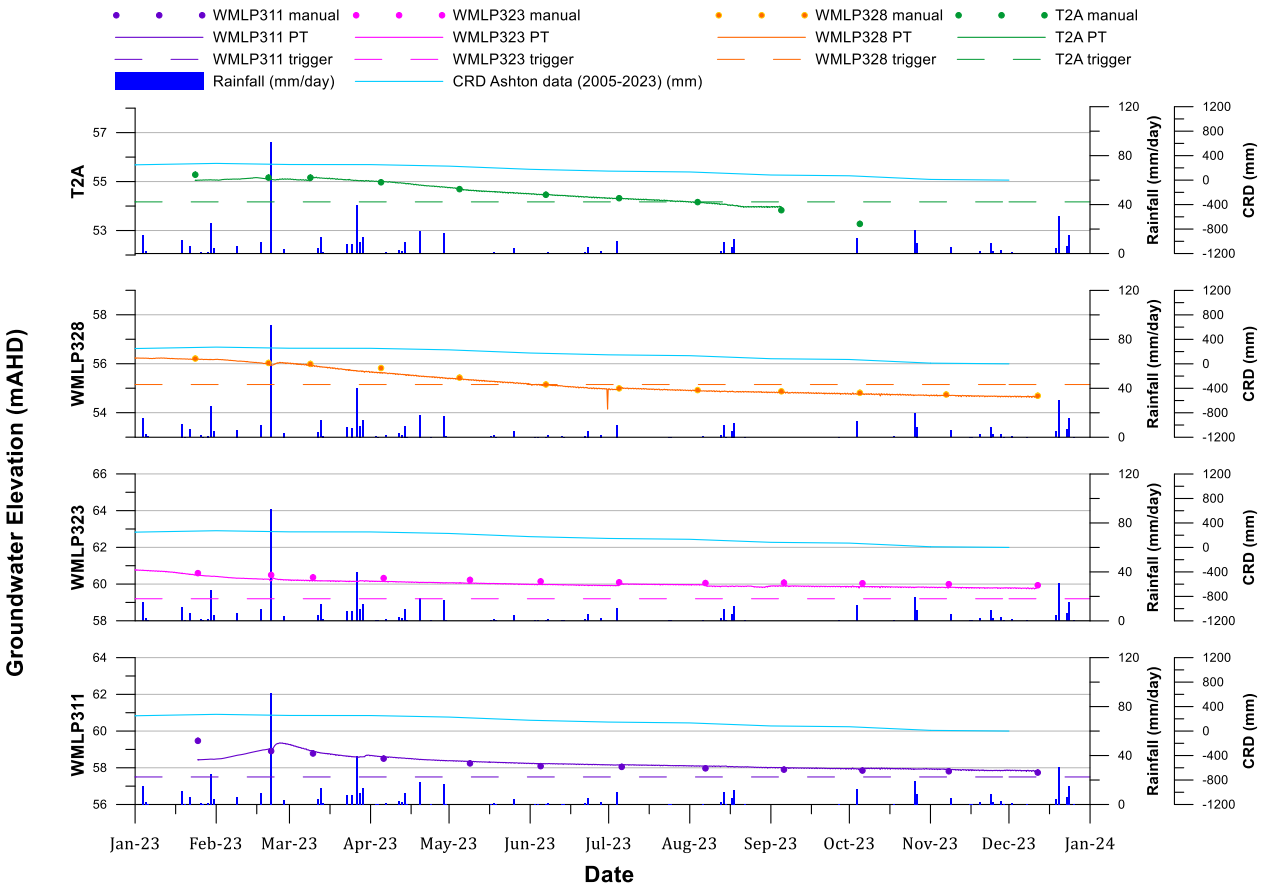


Figure 4.1 Bowmans Creek alluvium trigger bore hydrographs

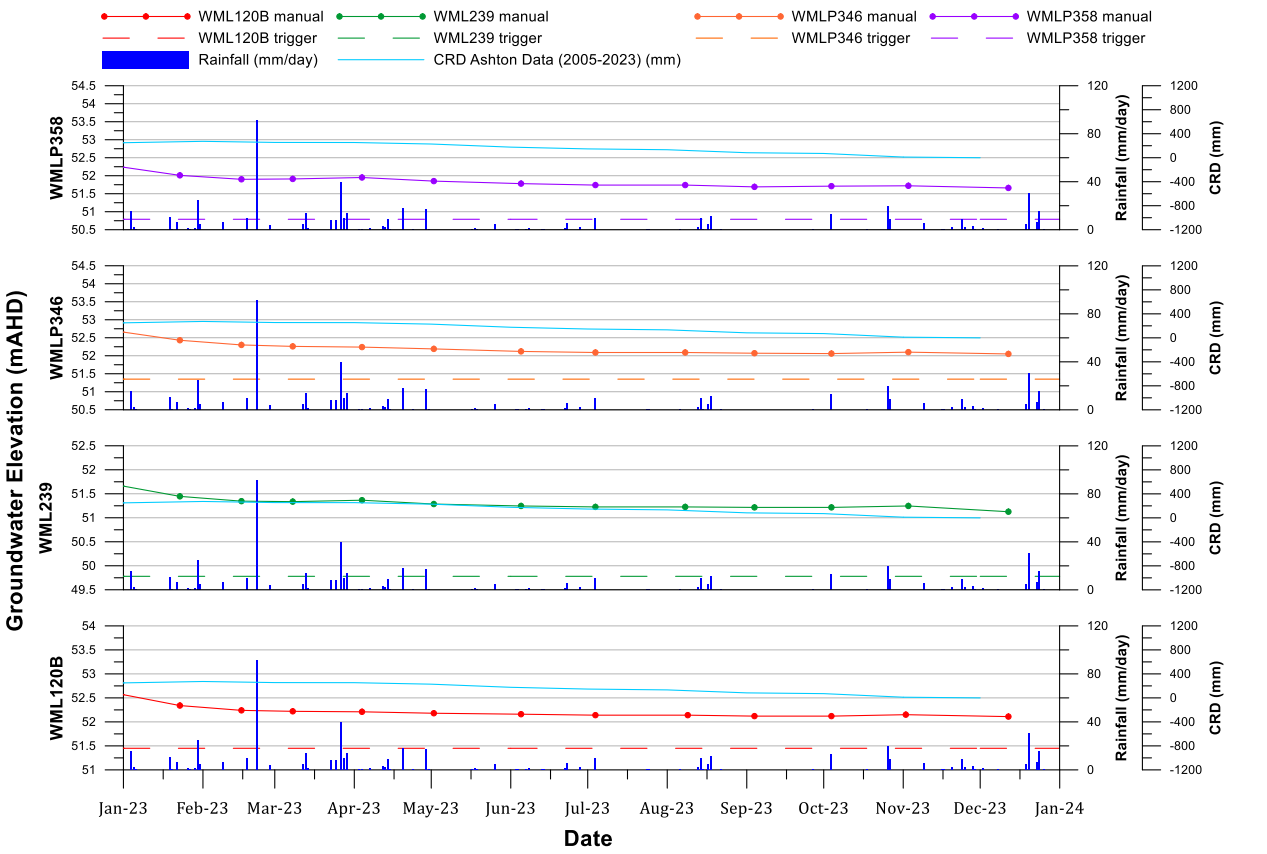


Figure 4.2 Glennies Creek alluvium trigger bore hydrographs (1)

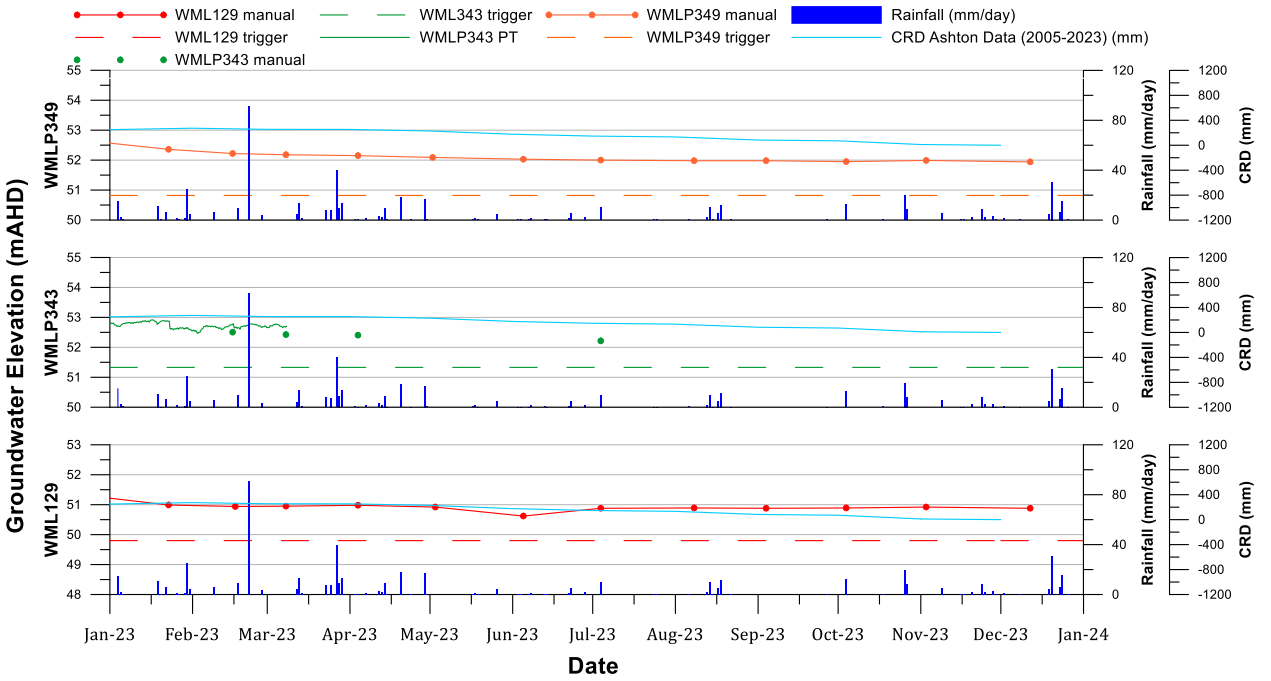


Figure 4.3 Glennies Creek alluvium trigger bore hydrographs (2)

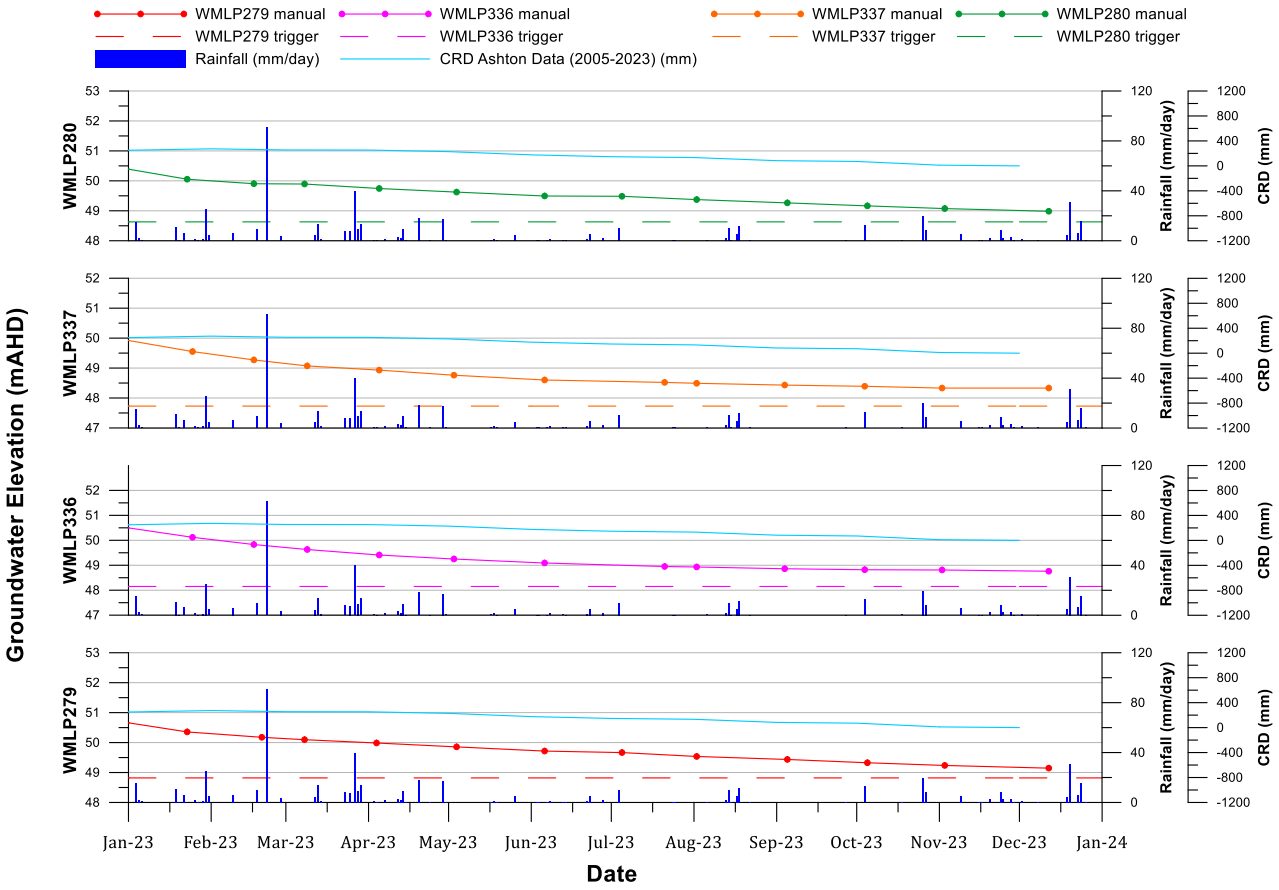


Figure 4.4 Hunter River alluvium trigger bore hydrographs

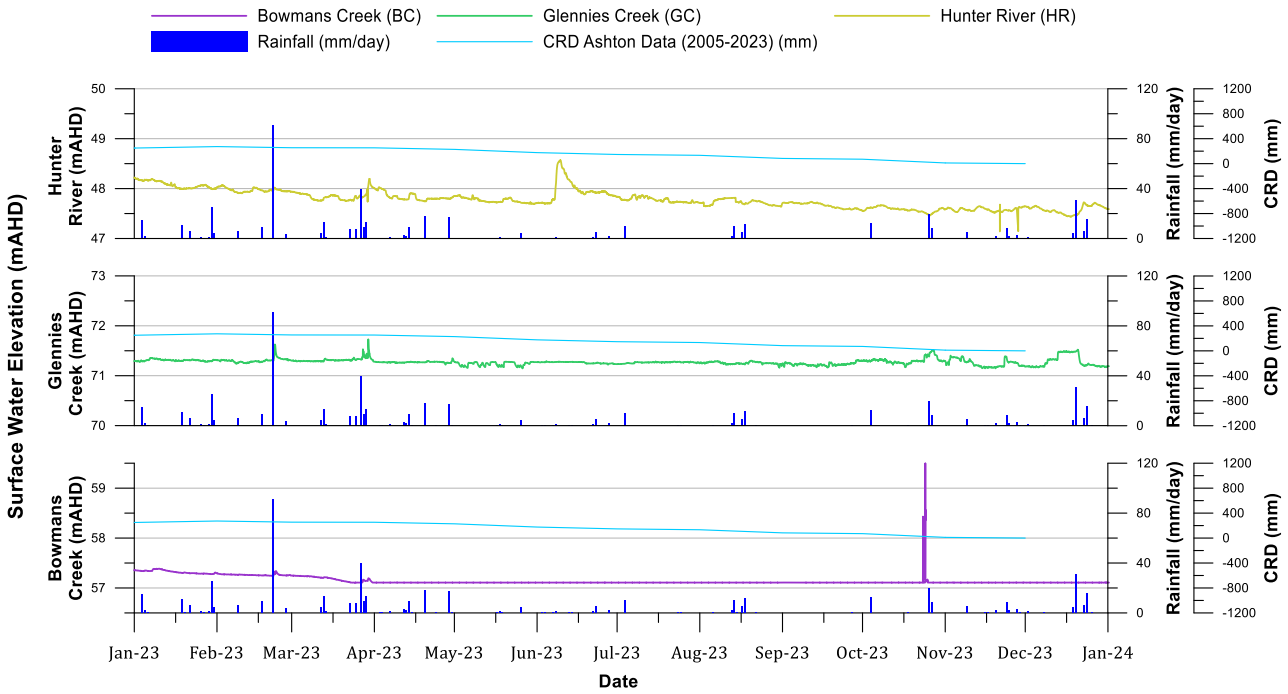


Figure 4.5 Surface water level hydrographs

4.1.2 Other alluvium groundwater levels

Groundwater elevation trends observed in 2023 for other BCA and HRA monitoring bores across the monitoring network are presented in Figure 4.6 and Figure 4.7, respectively. Daily rainfall measurements and CRD have been plotted and used to assess water elevation trends. Non-regulatory BCA alluvial bores recorded decreasing groundwater elevations, likely in response to below average rainfall throughout 2023. Non-regulatory bore T5 was found to be dry from June 2023 onward. Groundwater elevation in non-regulatory HRA bores decreased, likely in response to reduced rainfall throughout 2023. No mining impacts outside of predictions are noted.

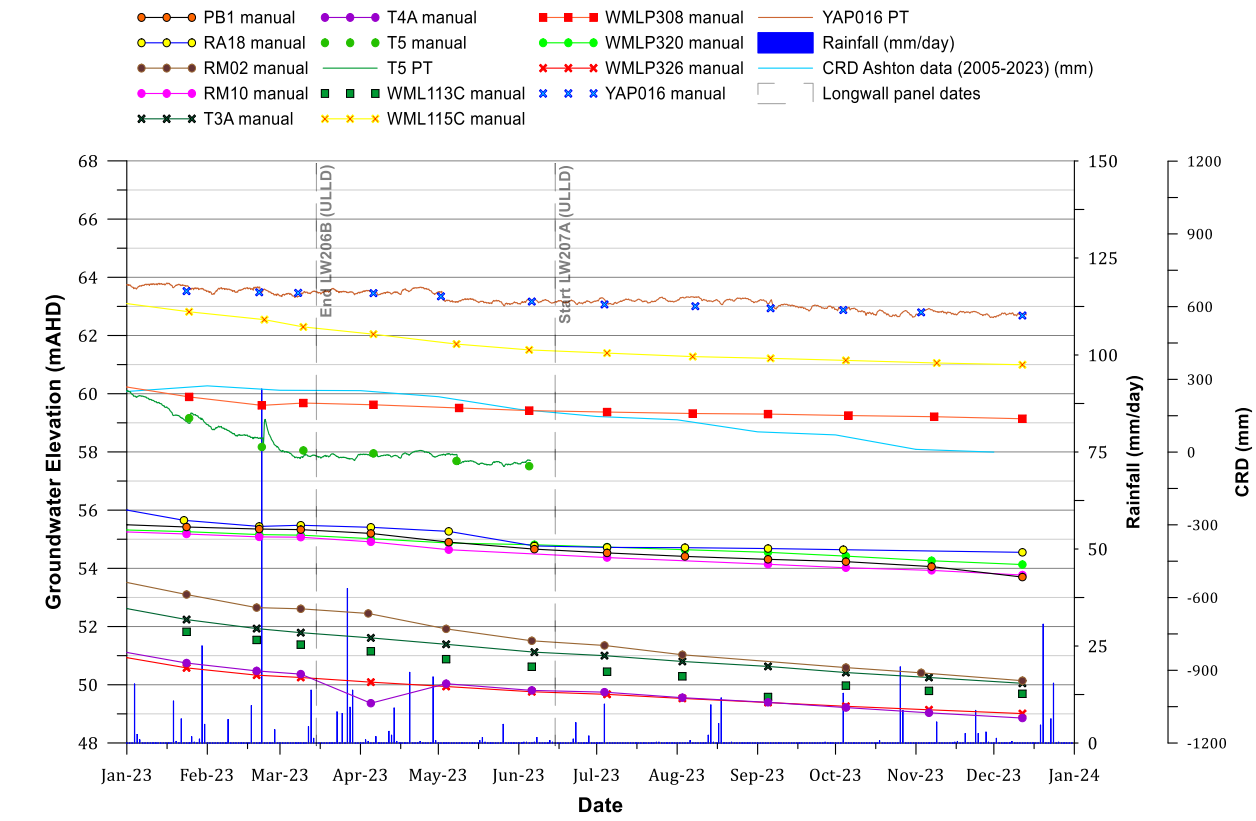


Figure 4.6 Other Bowmans Creek alluvium monitoring bore hydrographs

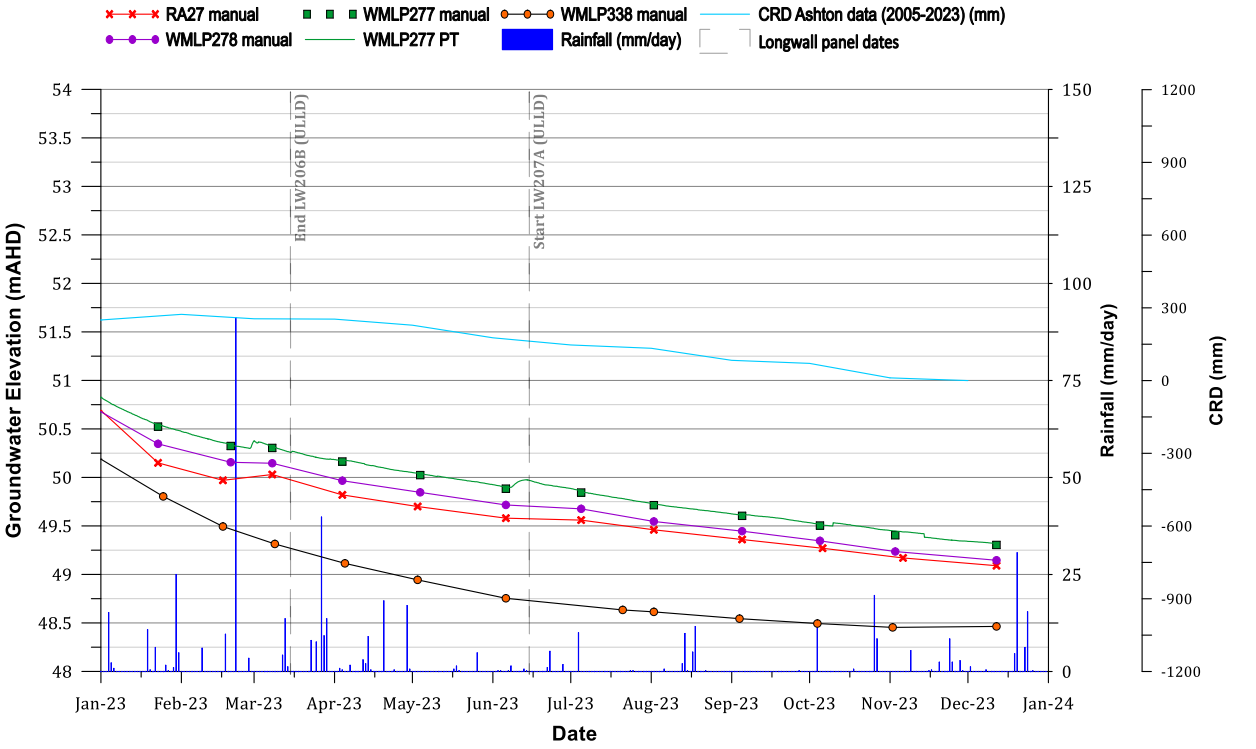


Figure 4.7 Other Hunter River alluvium monitoring bore hydrographs

4.1.3 pH, electrical conductivity and major ions

All alluvial bores across the ACP monitoring network were sampled for pH, EC and major ions throughout 2023, and the results are presented graphically in Figure 4.8 through to Figure 4.22. A complete table of results for the aforementioned parameters is presented in Table D1; together with comprehensive analysis measurements recorded during annual sampling in August 2023. All associated laboratory files can be found in Appendix F.

As has been the case in preceding years, groundwater pH in alluvial bores was slightly acidic to neutral in 2023. Multiple bores recorded an exceedance of pH trigger values throughout the year.

- WMLP311 in December;
- WML113C in November;
- WML129 in November to December;
- WML120B in December;
- WMLP358 in February, and September to November;
- WMLP349 in February, and August to October;
- WMLP336 in December; and
- WMLP337 in September to December.

WMLP349 and WMLP358 exceeded pH trigger criteria on three or more consecutive occasions and the cause of the exceedances were investigated (AGE, 2023). The investigation identified no potential environmental harm or likely impact from mining operations and found that derived pH triggers were representative of environmental conditions during a major drought between July 2017 and May 2020. Despite this, values for pH were relatively stable in 2023, generally ranging from pH 6.5 to 7.5, with only a few outliers outside this range. The recorded pH range is considered within natural variation for the area.

The specific pH ranges measured within the BCA, GCA and HRA in 2023 were:

- BCA – pH 6.20 (PB1 to pH 8.41 (WML115C);
- GCA – pH 5.97 (WMLP358) to pH 8.03 (WML129; and
- HRA – pH 5.93 (WMLP336) to pH 7.54 (RA27).

Groundwater EC was fresh to slightly brackish across the BCA, GCA and HRA regulatory monitoring network in 2023; mirroring the conditions in previous years. Multiple bores recorded an exceedance in groundwater EC values throughout the year:

- WMLP279 in February;
- WMLP311 from October to December;
- WMLP346 from April to September, and November;
- WMLP349 from January to December; and
- WMLP358 from January to November.

Investigations into EC (and pH) trigger levels and EC exceedances for WMLP349 and WMLP358 were conducted (AGE, 2022a. AGE, 2023). The investigations determined the dataset population size used for GCA bore trigger derivation was adequate and the percentile calculations were correct. Whilst the statistical methodology used for the trigger derivation was sound, the variability in rainfall recharge during the time period used to derive the triggers was not representative of average long-term rainfall variation at Ashton. This indicated that the derived triggers may not adequately capture natural environmental variation in this bore. It was recommended that revised triggers be developed to include the latest data collected, which better represents seasonal variability. An investigation into groundwater EC exceedances is underway to determine the cause for consistently elevated values.

BCA monitoring bores recorded overall stable EC values during 2023, with the exception of WMLP311. WMLP311 recorded steadily increasing EC throughout the year and began to exceed the derived trigger threshold from October 2023 onward. YAP016 recorded steadily increasing EC values throughout 2023 until August, where EC began to decrease.

Groundwater EC in GCA monitoring bores was relatively stable in 2023, the exception being WML120B, WML129, and WMLP349. Groundwater EC in WML120B decreased throughout the year, only slightly increasing between October 2023 and November 2023. EC values in WML120 increased overall throughout the year. Groundwater EC in WMLP349 increased from January to May 2023, then decreased for the rest of the year, recording an overall increase during the year.

HRA monitoring bores recorded varying trends in EC values throughout the year. Groundwater EC in WMLP277, WMLP278, WMLP280, WMLP336 and WMLP337 increased throughout the year, while EC values in RA27, WMLP279 and WMLP338 decreased overall in 2023. Aside from WMLP279 in which groundwater EC exceeded the derived trigger threshold in February 2023, no groundwater EC exceedances were detected in HRA bores during 2023.

For alluvial bores, the observed EC ranges in 2023 were:

- BCA – 453.1 µS/cm (Ashton Well) to 3,779 µS/cm (RM02);
- GCA – 333.9 µS/cm (WML129) to 5,831 µS/cm (GM3A); and
- HRA – 521.7µS/cm (WMLP280) to 2,860 µS/cm (WMLP337).

River and creek EC levels (sourced from the WaterNSW online database) were also examined during 2023. Glennies Creek and the Hunter River remained overall stable throughout the year, oscillating in response to changes in daily rainfall. Surface water EC periodically declined in response to significant rainfall events, recovering shortly afterward. EC values in Bowmans Creek remained stable from January to April 2023, followed by a period of brief but intense oscillation in mid-April. Bowmans Creek EC remained consistently low throughout the year, however these readings are considered inaccurate as this period of low EC directly correlates with Bowmans Creek being reported as dry.

The major ion content of each alluvial system was also assessed in 2023 as shown in the classification table and Piper diagram from August 2023 (Appendix E). The cation water type in all monitoring bores were Na or Ca dominant. With respect to anions, Cl dominates over HCO3 and SO4 ions in the alluvial monitoring bores. The BCA and HRA water types are similar and can be distinguished from the GCA water types due to the water source and the recharge/discharge mechanism associated with each body.

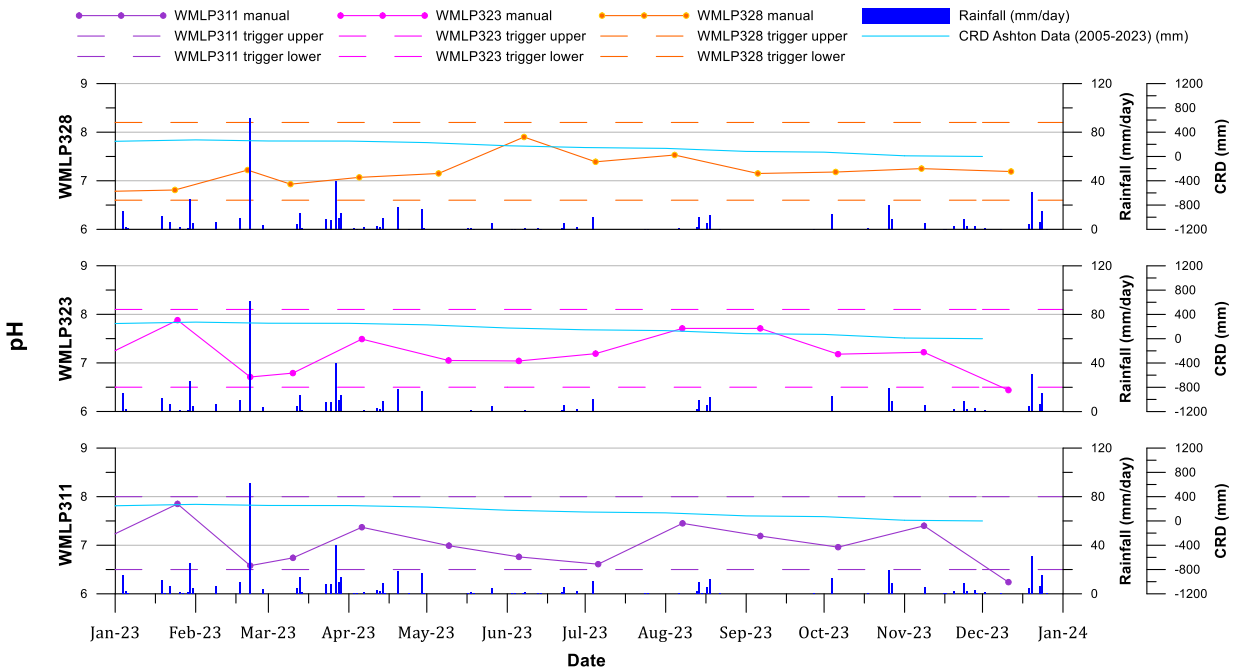


Figure 4.8 Bowmans Creek alluvium trigger bore pH trends (1)

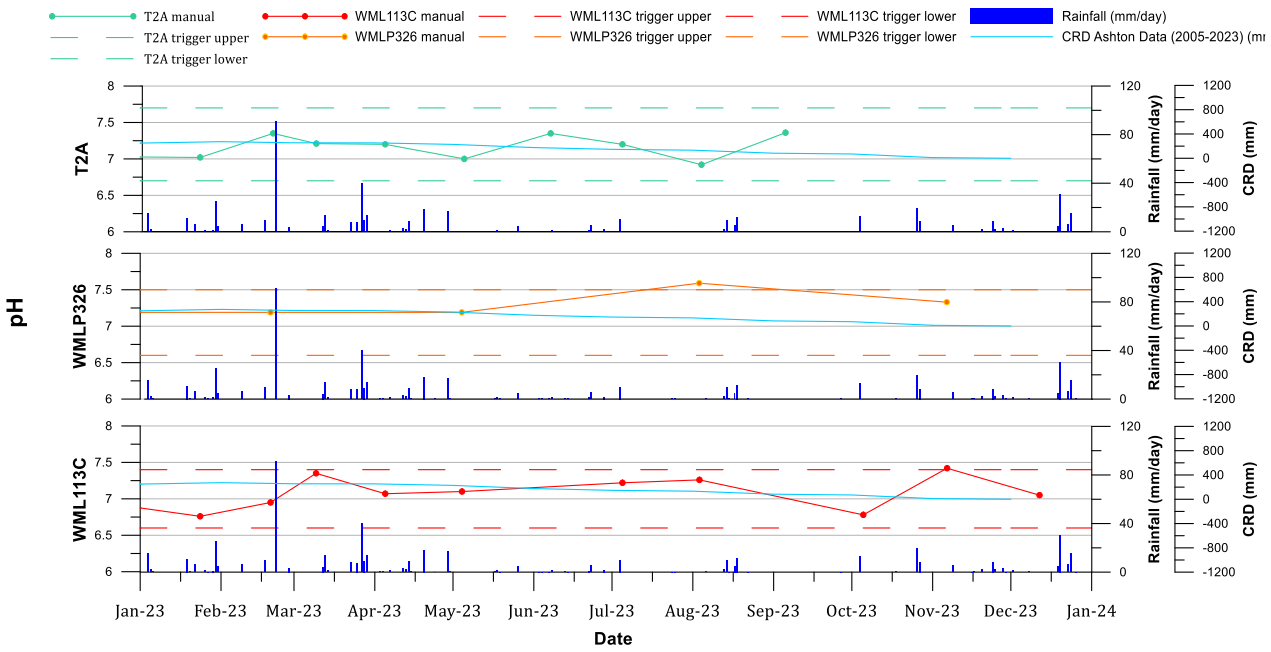


Figure 4.9 Bowmans Creek alluvium trigger bore pH trends (2)

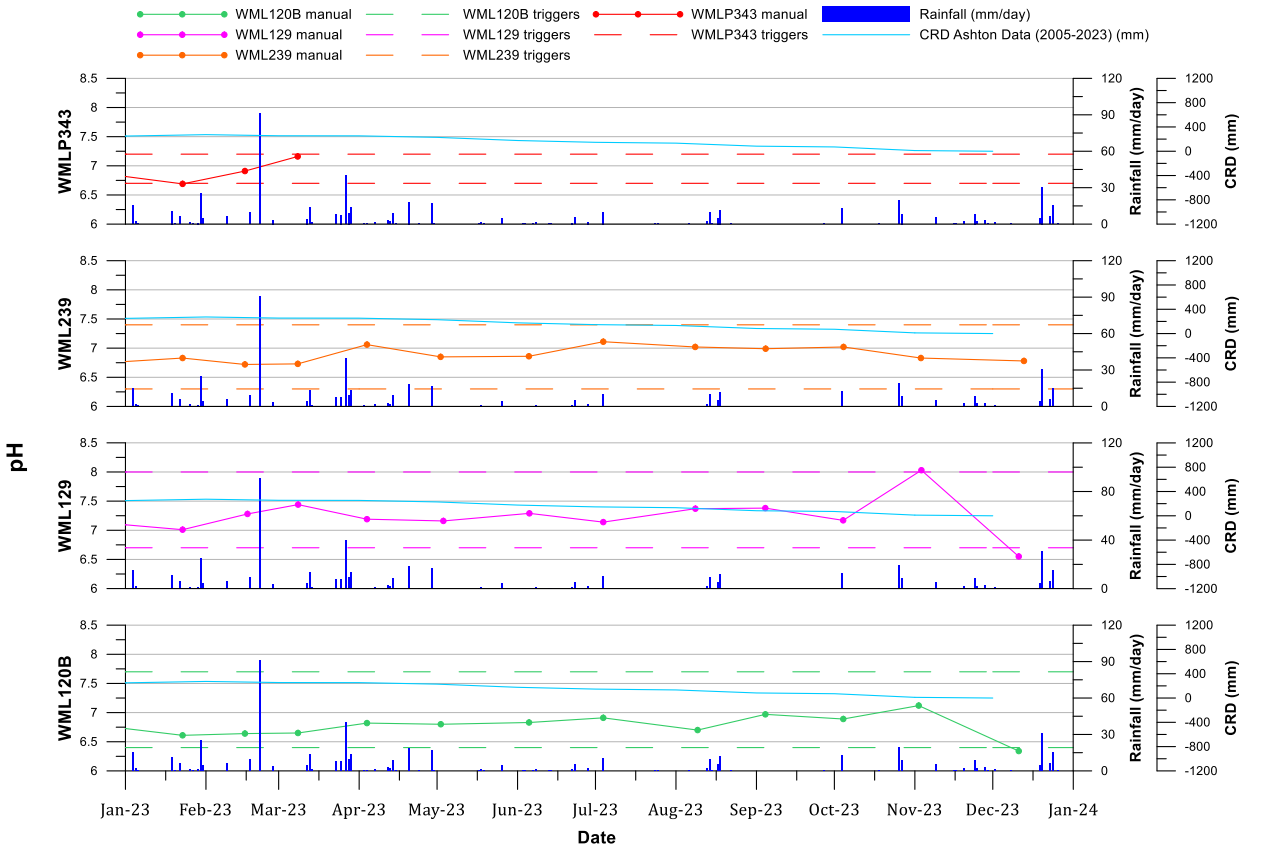


Figure 4.10 Glennies Creek alluvium trigger bore pH trends (1)

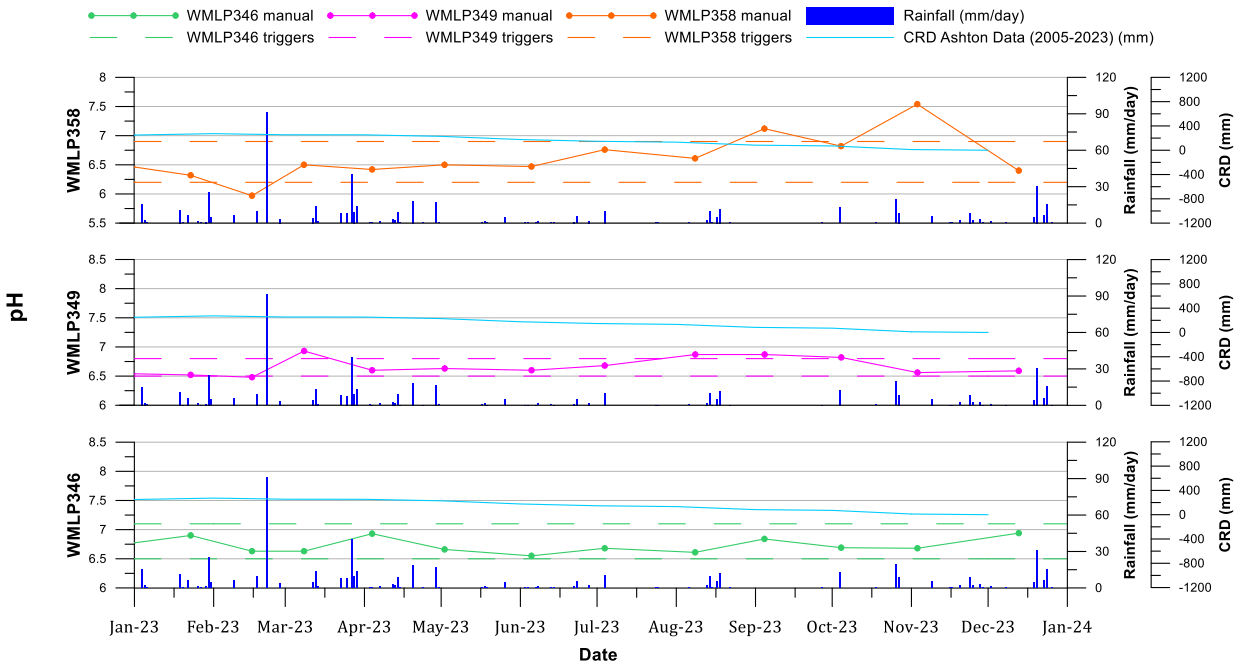


Figure 4.11 Glennies Creek alluvium trigger bore pH trends (2)

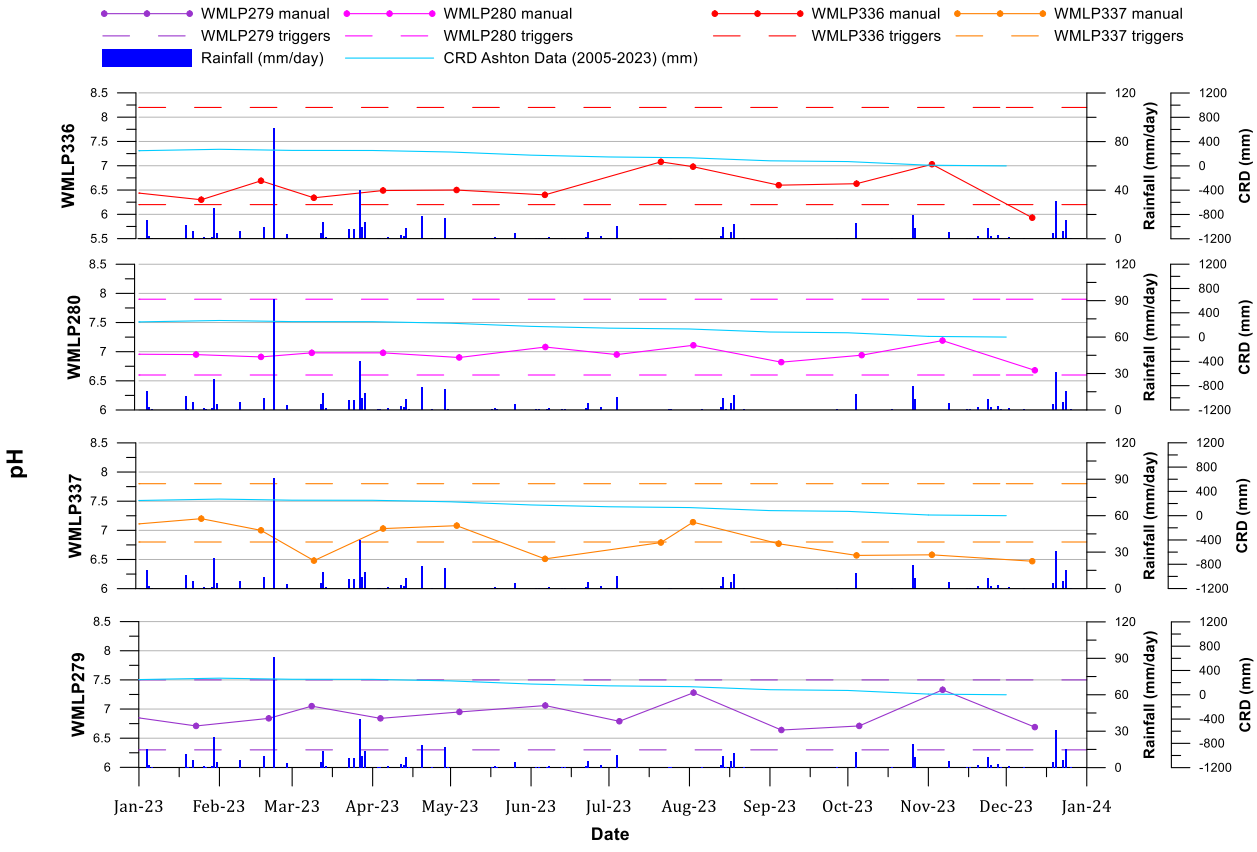


Figure 4.12 Hunter River alluvium trigger bore pH trends

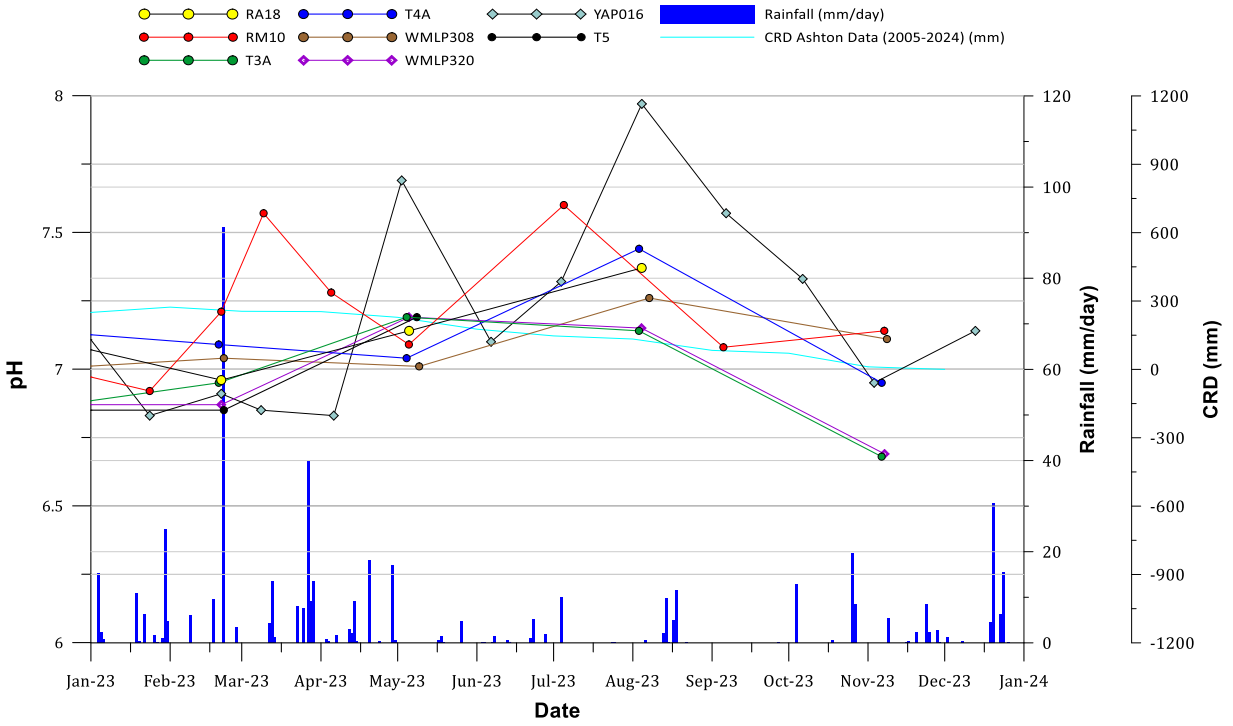


Figure 4.13 Other Bowmans Creek alluvium bore pH trends

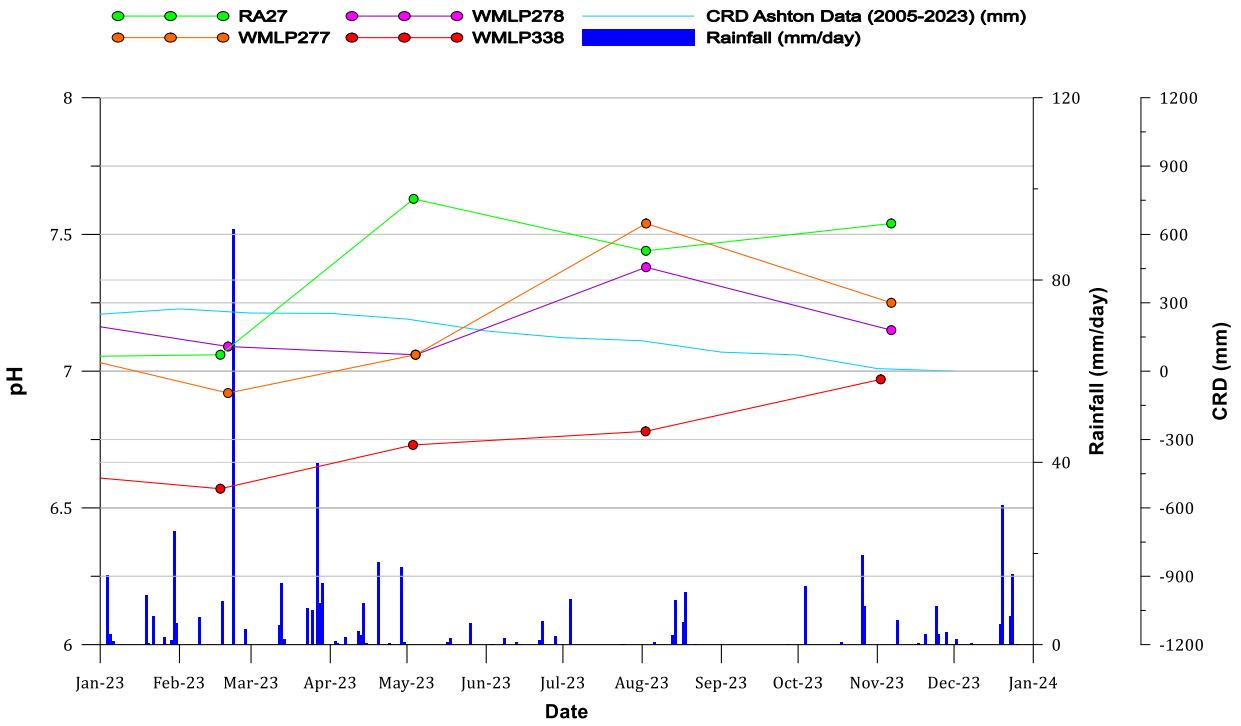


Figure 4.14 Other Hunter River alluvium bore pH trends

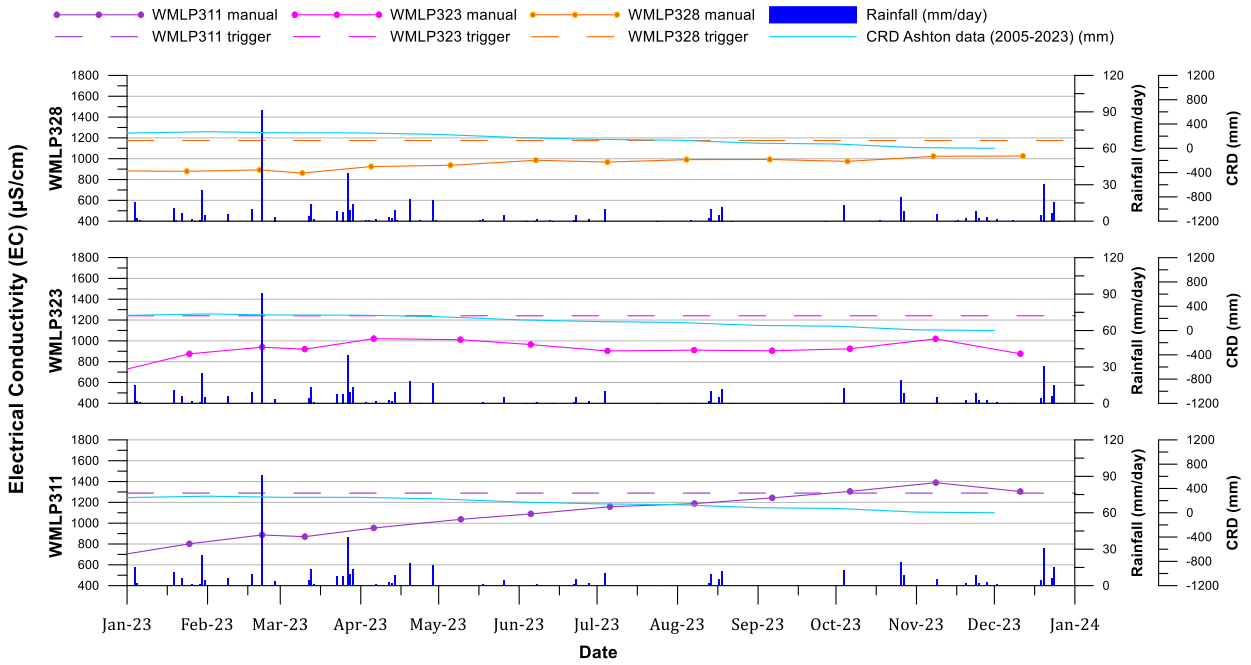


Figure 4.15 Bowmans Creek alluvium trigger bore EC trends (1)

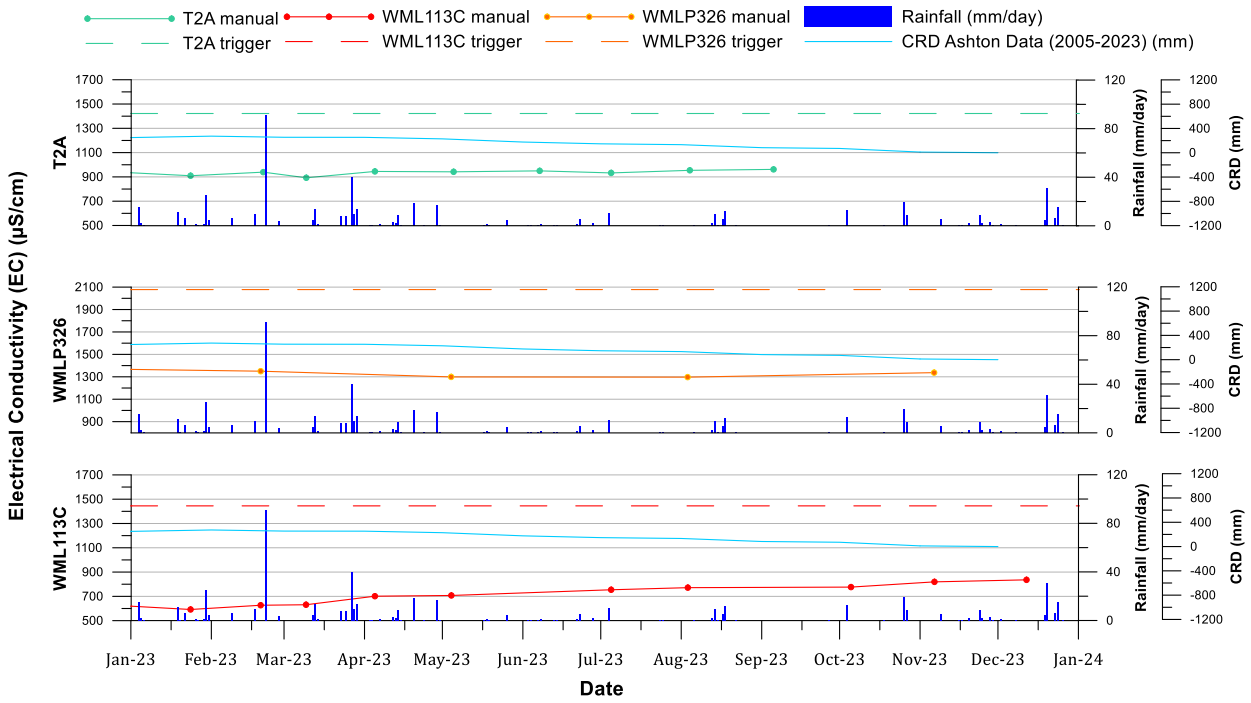


Figure 4.16 Bowmans Creek alluvium trigger bore EC trends (2)

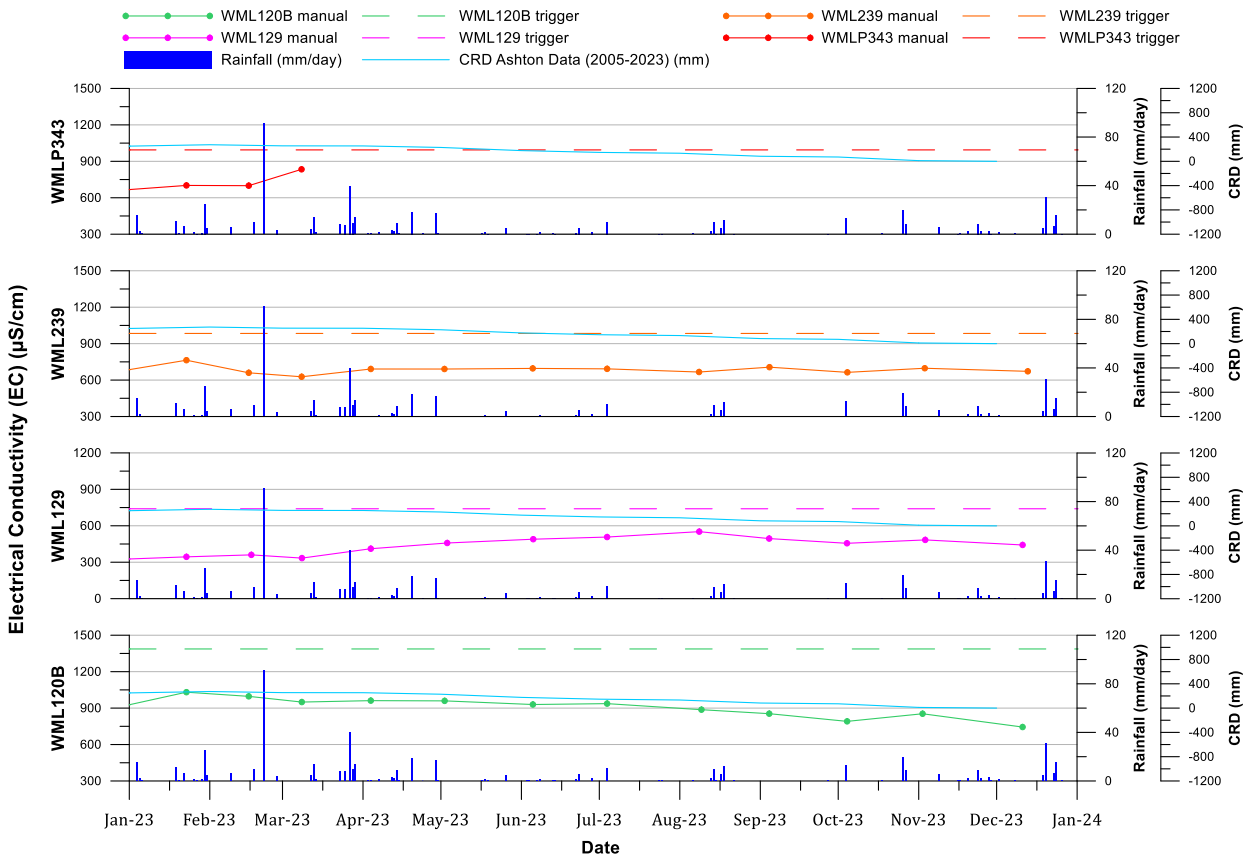


Figure 4.17 Glennies Creek alluvium trigger bore EC trends (1)

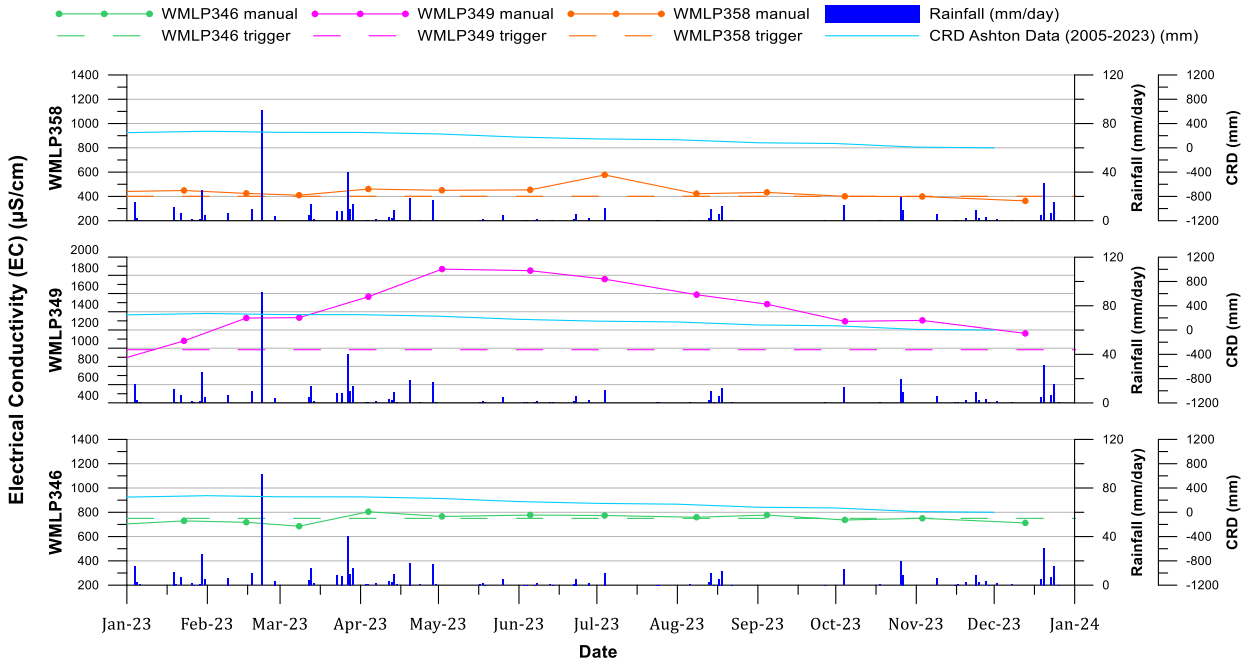


Figure 4.18 Glennies Creek alluvium trigger bore EC trends (2)

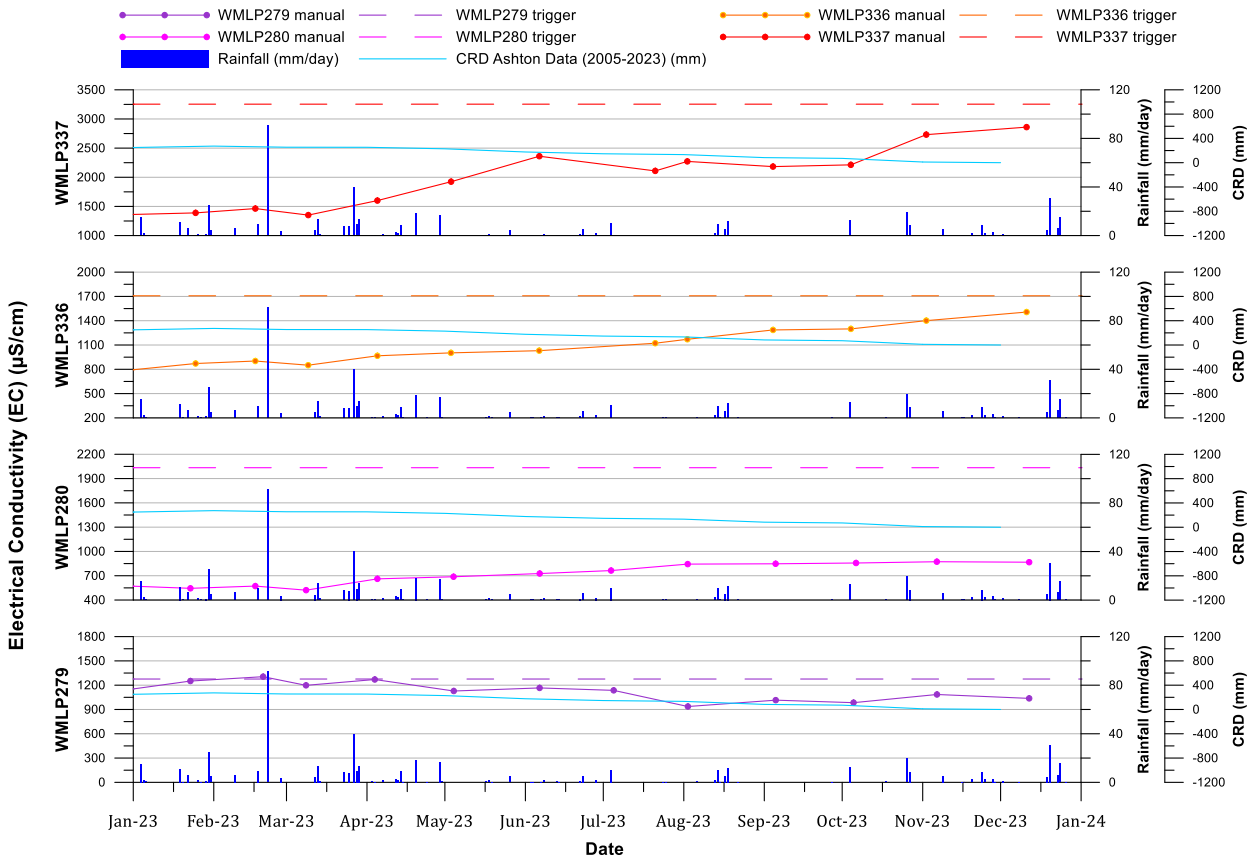


Figure 4.19 Hunter River alluvium trigger bore EC trends

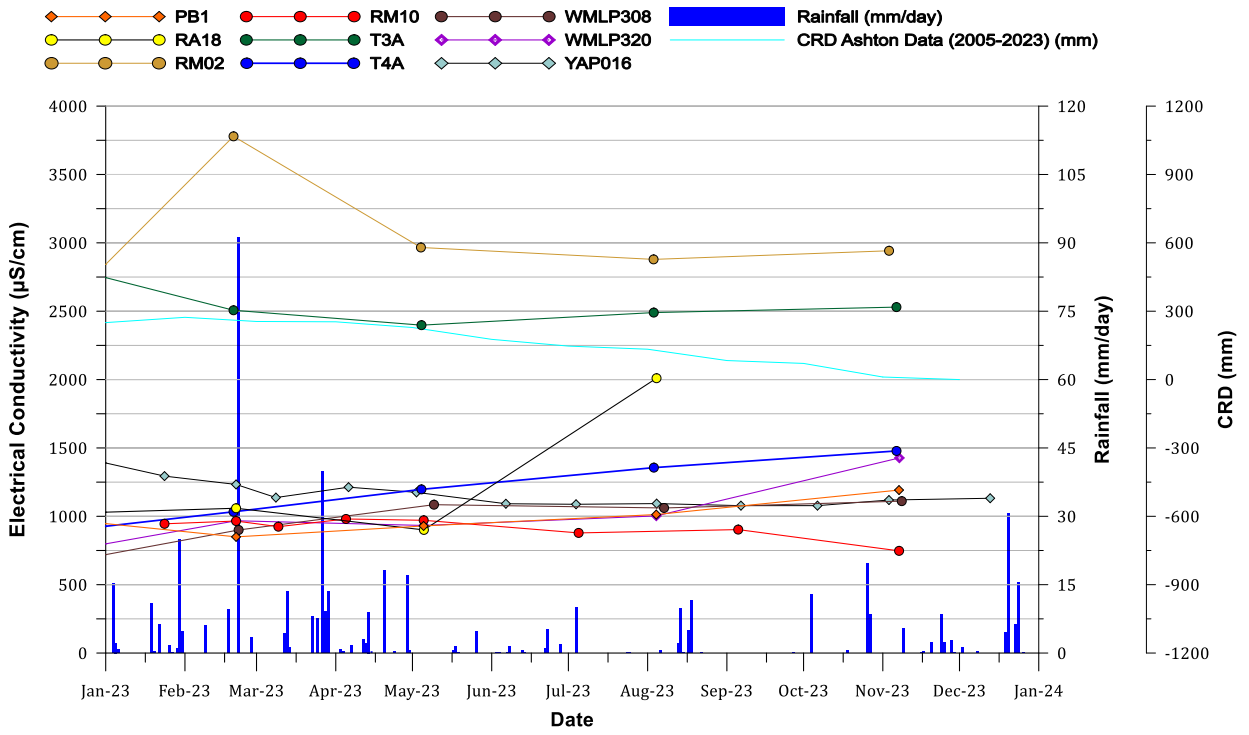


Figure 4.20 Other Bowmans Creek alluvium bore EC trends

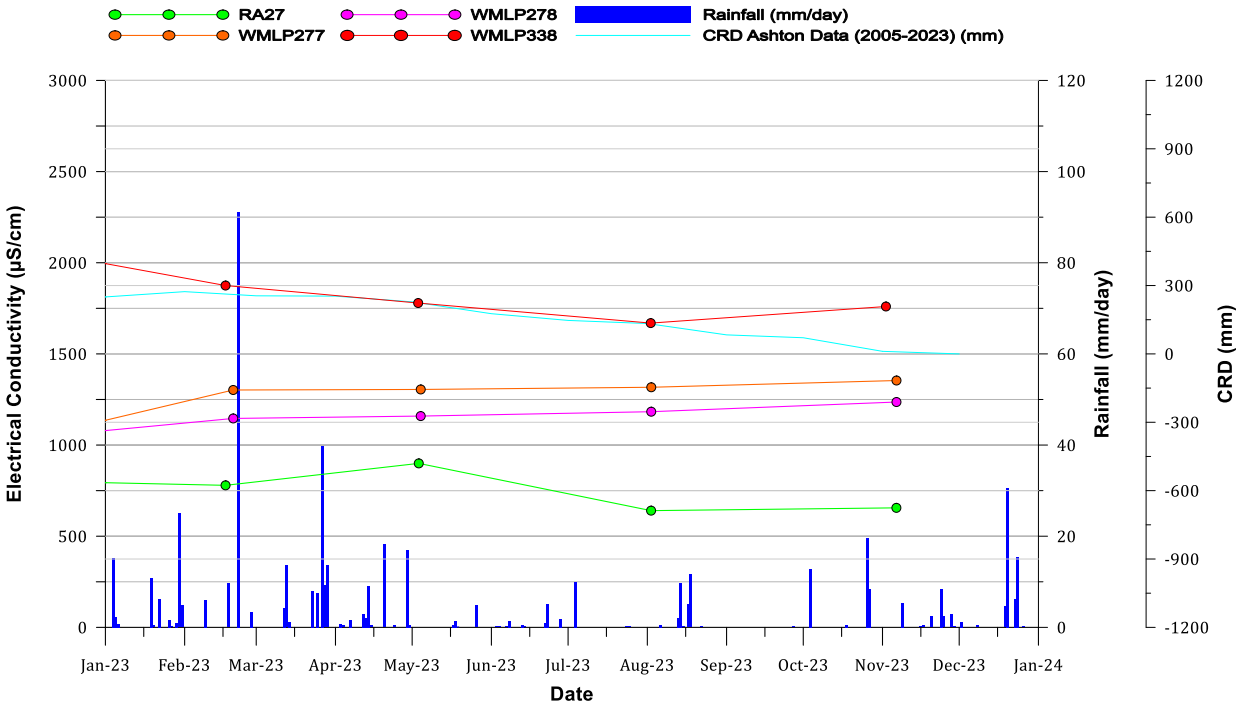


Figure 4.21 Other Hunter River alluvium bore EC trends

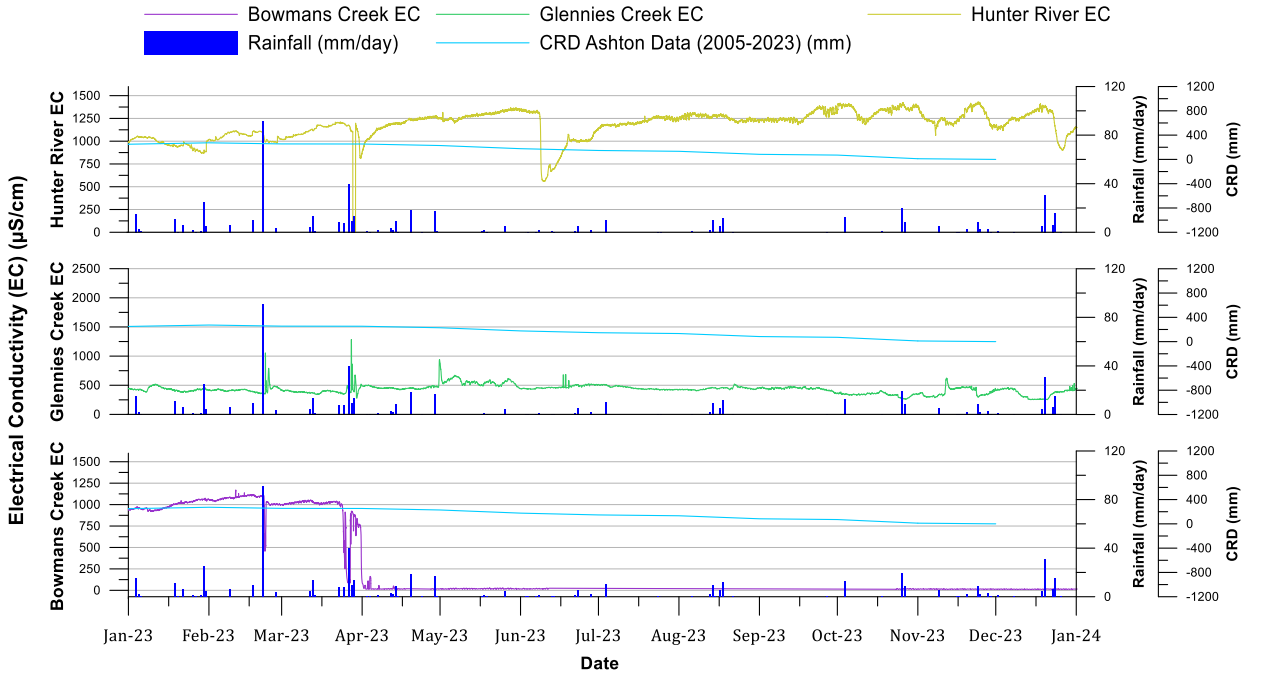


Figure 4.22 Surface water EC trends

4.1.4 Dissolved metals, select nutrients, turbidity and cyanide

Comprehensive lab analysis during August 2023 incorporated the measurement of select dissolved metals, select nutrients, turbidity and cyanide as tabulated in Appendix D. Dissolved metals concentrations were compared against ANZECC|ARMCANZ livestock limits (ANZECC & ARMCANZ, 2000), revealing no breaches for any of the metals assessed (arsenic, cadmium, chromium, copper, lead, nickel, selenium and zinc). Manganese and iron were detected at very low concentrations, though neither of these metals are regarded as specifically toxic at such concentrations; and no ANZECC|ARMCANZ livestock limit is established for these metals.

Select nutrients analysis included nitrite and nitrate as N, total Kjeldahl nitrogen as N, total nitrogen as N and total phosphorous as P. All N related concentrations were low, and no nitrate concentration were close to 400 mg/L. Nor were any nitrite concentration near 30 mg/L as defined in the ANZECC|ARMCANZ livestock standards. Total N figures were significantly less than the short-term trigger range of 25- 125 mg/L. Multiple monitoring bores exceeded the P concentration trigger (0.8-12 mg/L), with P concentration ranging from 0.17 mg/L (WMLP308) to 13.7 mg/L (WMLP337), as tabulated in Appendix D, however, no site-specific analysis has been conducted at Ashton to define an appropriate P trigger at this time. Turbidity does not have a defined livestock limit for comparison, though analysis of the results indicates that bores that are typically hand bailed rather than pumped yield the greatest turbidity. Cyanide concentrations were so low across samples that no reading was detected above the limit of reporting (LOR). Cyanide levels did not breach any outlined standards.

4.2 Coal measure and coal measure overburden (CMOB) aquifer monitoring

Groundwater level and quality measurements for coal measure and CMOB monitoring bores were taken throughout 2023. Longwall specific VWP pressure heads were also recorded. Hydrographs for these bores are presented in Figure 4.23 through to Figure 4.30.

4.2.1 Coal measure and CMOB aquifer groundwater levels

The groundwater level trends for coal measure and CMOB monitoring bores are presented in Figure 4.23 and Figure 4.24, respectively. Groundwater level measurements for LW206A/206B specific monitoring bores are presented in Figure 4.25. Longwall specific VWP readings for LW206A/LW206B are shown in Figure 4.26. Daily rainfall measurements and CRD have also been plotted and used to compare water elevation trends.

The following observations can be noted for 2023:

- Groundwater elevations were stable in coal measure bores throughout the year (Figure 4.23).
- Varied trends were observed in CMOB monitoring bores during 2023 (Figure 4.24). Groundwater elevation in WMLP324 and WMLP325 decreased from January to May 2023, then remained stable with increases in elevation occurring in response to prolonged periods of rainfall. T2P, T3P and WMLP327 recorded decreasing elevation throughout 2023. Groundwater elevation in WML115B decreased overall from January to July 2023, after which water would only be registered intermittently at the base of the bore.
- Groundwater elevations in monitoring bores within the vicinity of LW206A/206B decreased overall throughout the year (Figure 4.25).
- Pressure head at VWP WMLP269 in the vicinity of LW206A/LW206B remained stable throughout 2023. Sensors at 30 m and 59 m are still functional, whilst no data has been recorded in the remaining sensors (70 m, 97 m, 127 m and 147 m) since July 2021. A replacement VWP nearby WMLP269 is planned in 2024 to record pressure head data down to the Lower Barrett Coal Seam.
- coal measure and CMOB bores were not impacted by mining outside of predictions in 2023.

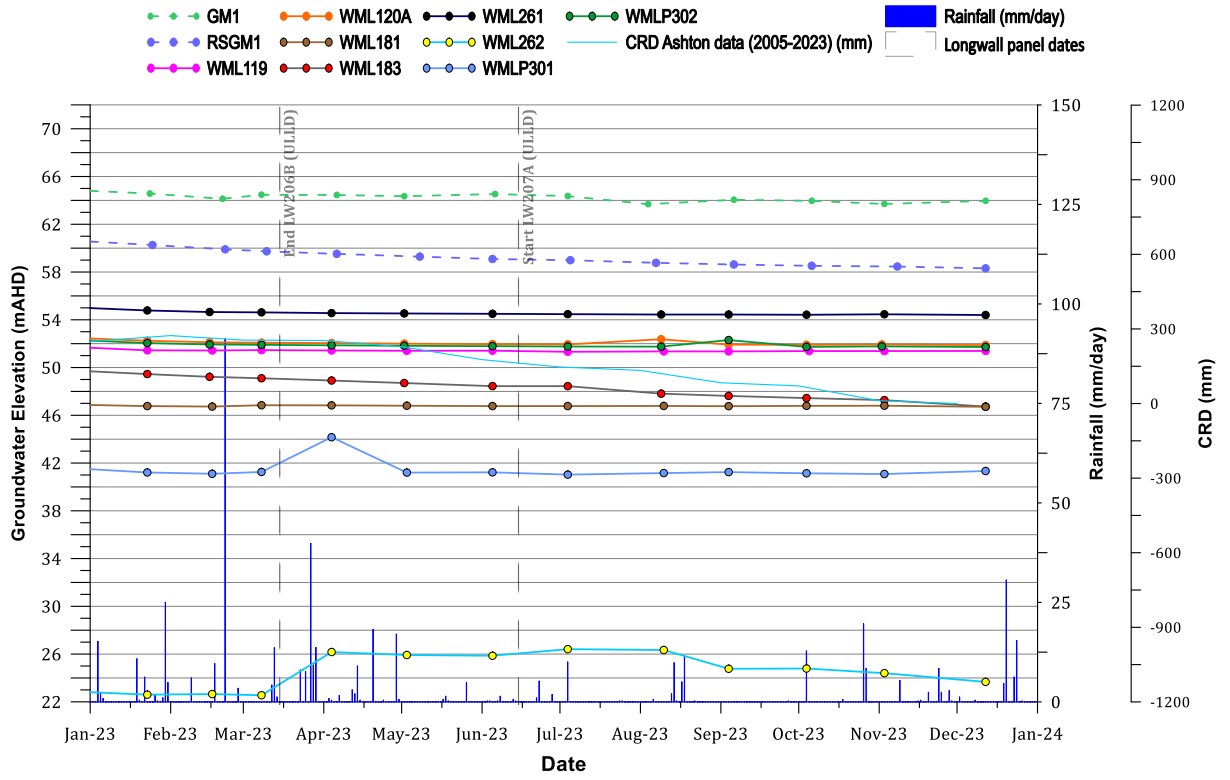


Figure 4.23 Coal measure bore hydrographs

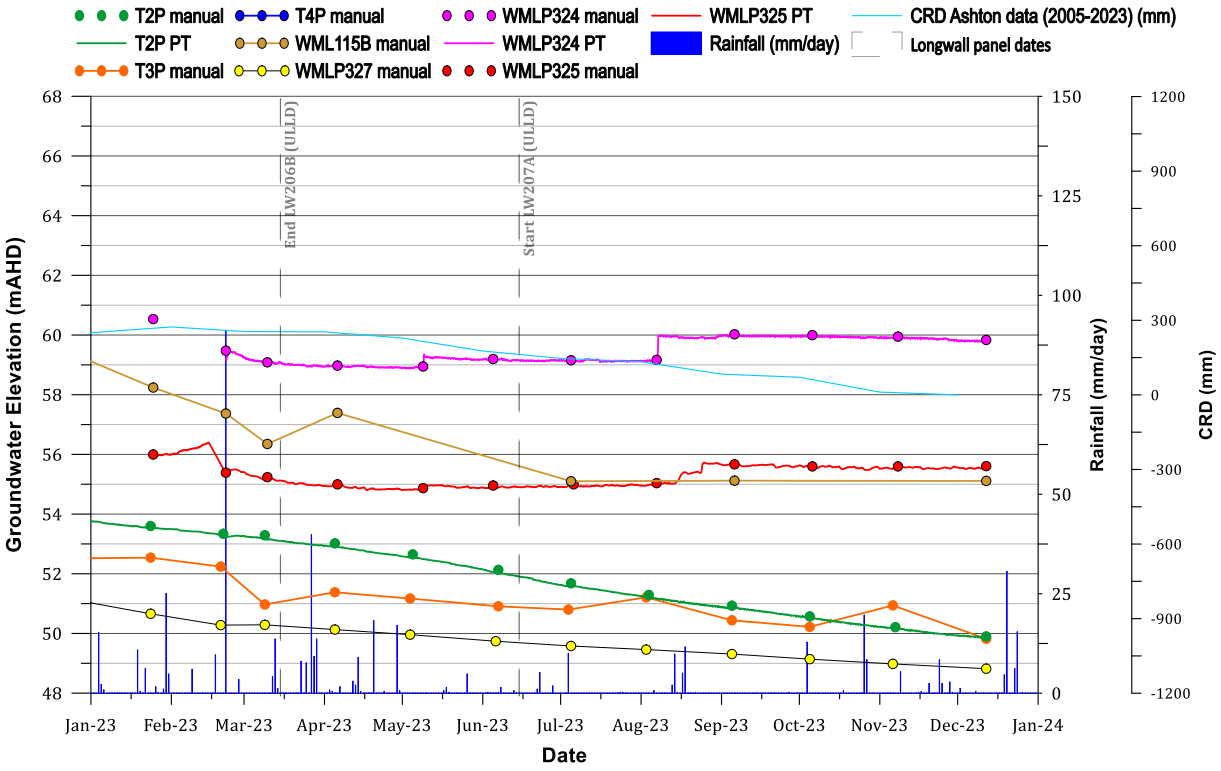


Figure 4.24 Coal measure overburden bore hydrographs

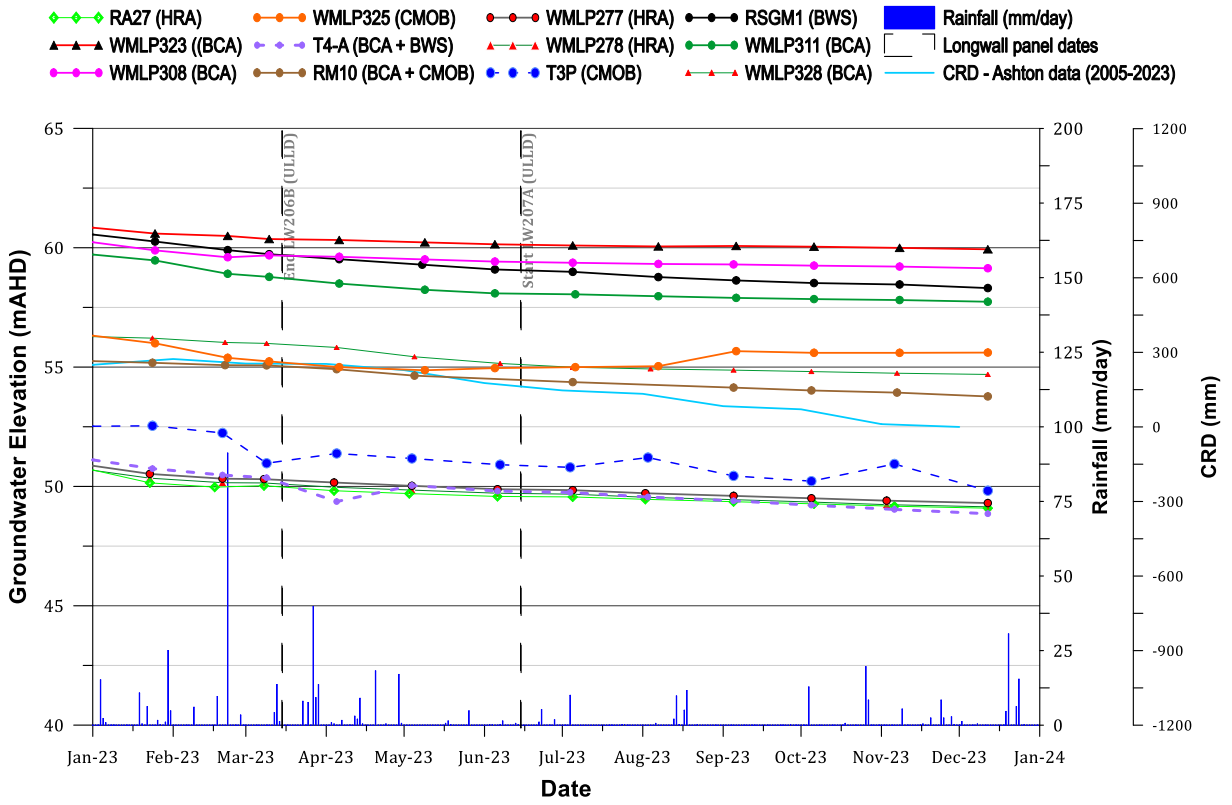


Figure 4.25 Hydrographs for monitoring bores in vicinity of LW206A/206B

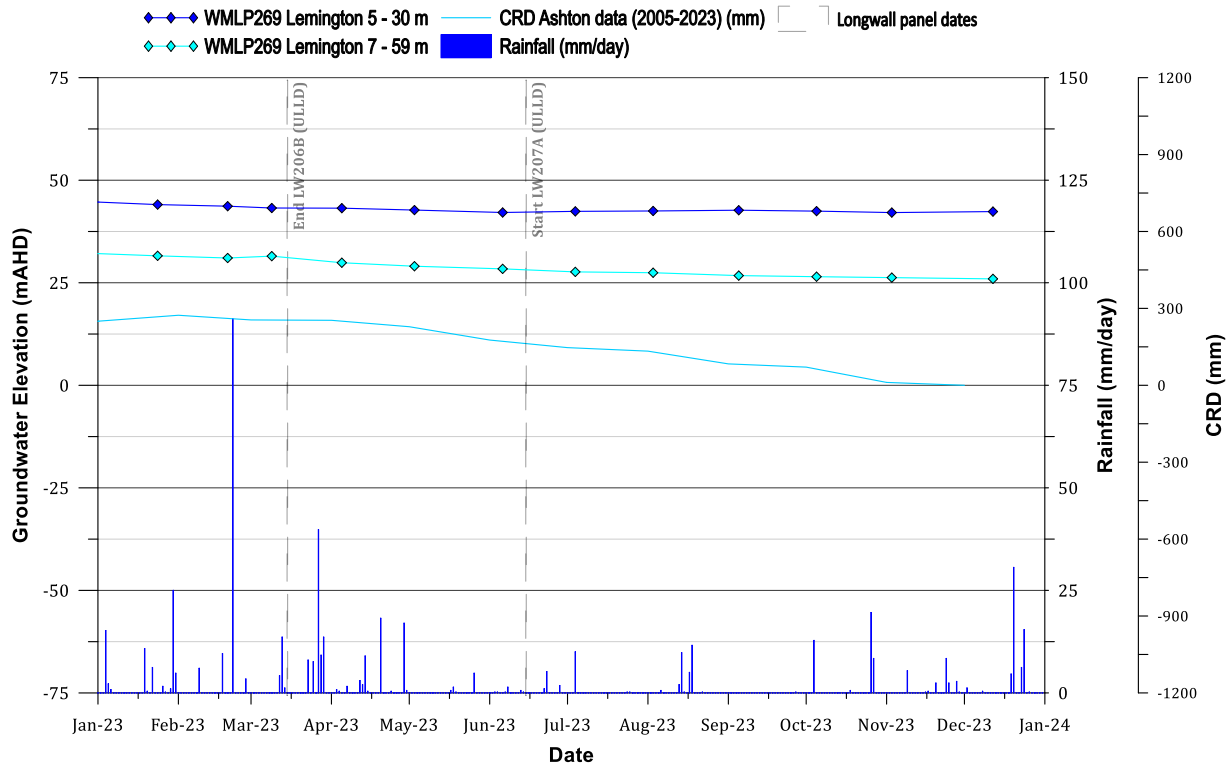


Figure 4.26 Hydrographs for VWP WMLP269 in vicinity of LW206A/LW206B

4.2.2 pH, electrical conductivity and major ions

Coal measure and CMOB bores across the ACP monitoring network were sampled for pH, EC and major ions during 2023, and the results are presented graphically in Figure 4.27 through to Figure 4.30. A complete table of results for the aforementioned parameters is presented in Appendix D; together with comprehensive analysis measurements recorded during annual sampling in August 2023. All associated laboratory files can be found in Appendix F.

Groundwater pH in coal measure and CMOB bores were generally neutral to slightly alkaline in 2023, as has been the case in previous years. pH readings were broadly stable over 2023, predominantly ranging from pH 6.5 to 7.5. Exceptions to the outlined pH range were few and minor, with the degree of variation considered within natural variation. The specific pH ranges measured within coal measure and CMOB bores in 2023 were:

- Coal measure – pH 6.62 (WMLP302) to pH 7.99 (WML262); and
- CMOB – pH 6.39 (T2P) to pH 7.4 (T3P).

Groundwater EC was fresh to brackish across the coal measure and CMOB monitoring network in 2023. Groundwater EC trends in coal measure monitoring bores varied throughout 2023. Groundwater EC in WML183 remained stable until May 2023, increased until August, and declined thereafter. EC values in RSGM1 decreased from January 2023 to August, increasing thereafter. EC values in all other coal measure bores remained stable overall in 2023. Groundwater EC in CMOB monitoring bores remained stable throughout 2023, with values in WMLP325 and T4P fluctuating throughout the year. EC ranges for coal measure and CMOB bores in 2023 were:

- Coal measure – 250.7 µS/cm (WML261) to 4,824 µS/cm (RSGM1); and
- CMOB – 532.2 µS/cm (T4P) to 2,002 µS/cm (T3P).

The major ion content for coal measure and CMOB bores was also assessed in 2023 (Appendix E). The cation water type in all monitoring bores were Na or Ca dominant. With respect to anions, Cl dominates coal measure and CMOB monitoring bores. The coal measure water types are readily distinguished from the CMOB water types with coal measure bores being enriched in Mg, whilst CMOB bores contain higher Ca concentrations.

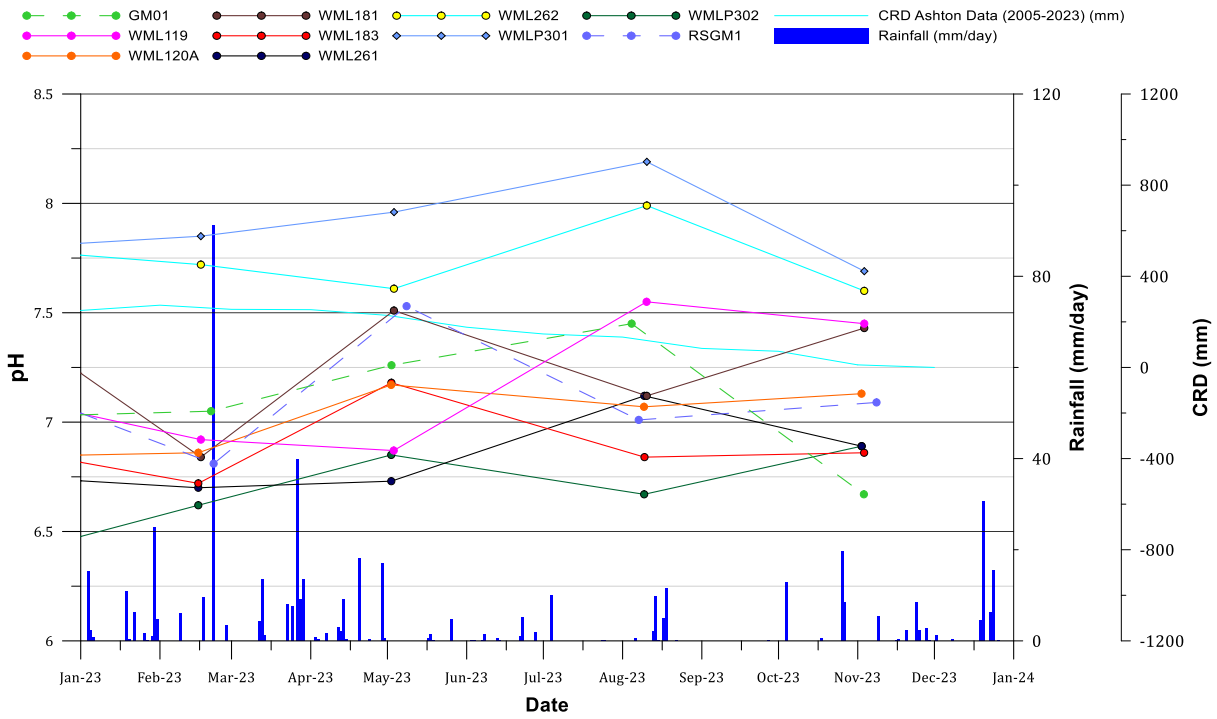


Figure 4.27 Coal measure bore pH trends

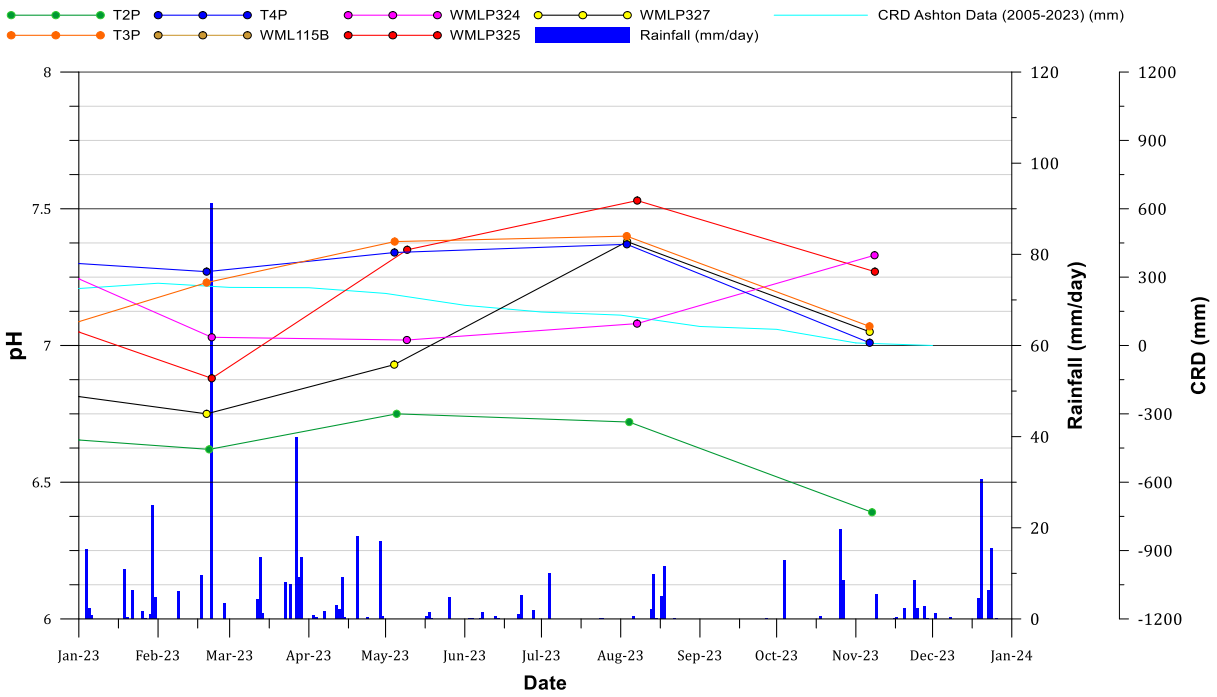


Figure 4.28 Coal measure overburden bore pH trends

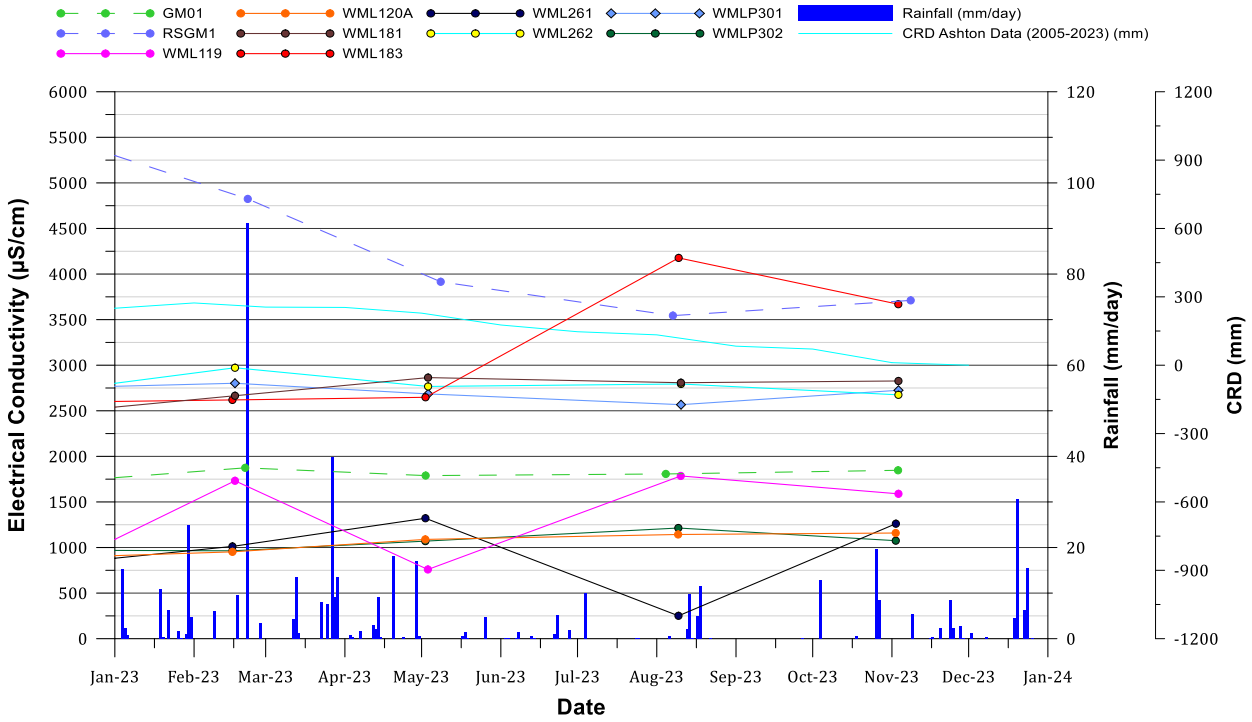


Figure 4.29 Coal measure bore EC trends

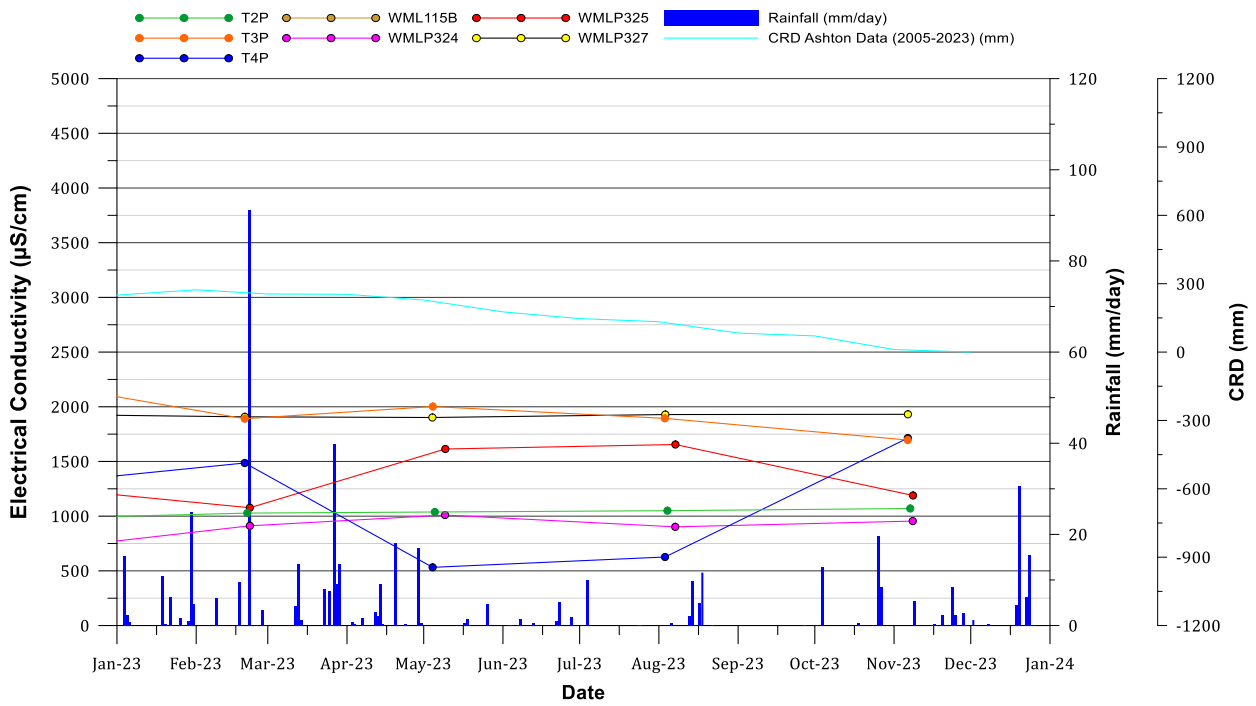


Figure 4.30 Coal measure overburden bore EC trends

4.2.3 Dissolved metals, select nutrients, turbidity and cyanide

Comprehensive lab analysis during August 2023 incorporated the measurement of select dissolved metals, select nutrients, turbidity and cyanide as tabulated in Appendix D.

Dissolved metals concentrations were compared against ANZECC|ARMCANZ livestock limits (ANZECC & ARMCANZ, 2000), revealing no breaches for any of the metals assessed (arsenic, cadmium, chromium, copper, lead, nickel, selenium and zinc). Manganese and iron were detected at very low concentrations, though neither of these metals are regarded as specifically toxic at such concentrations; and no ANZECC|ARMCANZ livestock limit is established for these metals.

Select nutrients analysis included nitrite and nitrate as N, total Kjeldahl nitrogen as N, total nitrogen as N and total phosphorous as P. All N related concentrations were low, and no nitrate concentration was close to 400 mg/L. Nor was any nitrite concentration near 30 mg/L as defined in the ANZECC|ARMCANZ livestock standards. Total N figures were less than the short-term trigger range of 25 to 125 mg/L. Multiple monitoring bores exceeded the P concentration trigger (0.8-12 mg/L), with P concentration ranging from 0.1 mg/L (GM01) to 10.2 mg/L (RSGM1), as tabulated in Appendix D, however, no site-specific analysis has been conducted at Ashton to define an appropriate P trigger at this time. Turbidity does not have a defined livestock limit for comparison, though analysis of the results indicates that bores that are typically hand bailed rather than pumped yield the greatest turbidity. Cyanide concentrations were so low across samples that no reading was detected above the limit of reporting (LOR). Cyanide levels did not breach any outlined standards.

5 EPL 11879 monitoring bores

Results for 2023 monitoring of EPL 11879 monitoring bores (per Licence Variation November 2022) are summarised in Table 5.1 (levels) and Table 5.2 (EC).

Table 5.1 EPL 11879 monitoring bore groundwater levels (2023)

Bore ID	Feb-23	May-23	Aug-23	Nov-23
	Groundwater levels (mTOC)			
YAP016	3.81	3.95	4.29	4.50
WMLP320	6.80	7.09	7.32	7.70
WMLP279	12.02	12.34	12.66	12.96
WMLP280	10.62	10.90	11.15	11.45
WML120B	8.27	8.33	8.37	8.36
WML129	4.40	4.42	4.45	4.42
WMLP336	10.97	11.55	11.87	11.99
GM1	9.37	9.09	9.76	9.74
WML120A	8.83	8.95	8.58	9.02
WML262	37.07	33.80	33.38	35.32
WML181	17.57	17.50	17.52	17.50
WML183	27.5	28.02	28.91	29.45

Note: mtoc = metres top of casing.

Table 5.2 EPL 11879 monitoring bore groundwater EC measurements (2023)

Bore ID	Feb-23	May-23	Aug-23	Nov-23
	Groundwater EC (µS/cm)			
YAP016	1,233	1,175	1,093	1,119
WMLP320	967.4	933.0	1,003	1,427
WMLP279	1,305	1,128	936.5	1,085
WMLP280	572.1	687.5	843.5	8,73.0
WML120B	996.7	959.5	886.9	8,53.4
WML129	360.5	458.2	551.7	4,83.6
WMLP336	902.2	1,003	1,171	1,401
GM1	1,874	1,789	1,807	1,847
WML120A	952.4	1,089	1,143	1,159
WML262	2,972	2,767	2,794	2,675
WML181	2,665	2,864	2,808	2,827
WML183	2,619	2,648	4,177	3,669

6 Mine inflow

Ashton underground mine inflows are calculated through a review of dewatering abstraction volumes and a water balance assessment. The water balance assessment is the most appropriate tool to assess mine inflows as the volume of abstracted water comprises water from several sources, including but not limited to groundwater, surface water, incidental take and groundwater transitioning from the point of entry to the abstraction point. The transition time of this "stored" water is assumed to be in the order of years and is normally not considered inflow that has occurred in the past year. It is considered that the stored water is largely from the groundwater sources (predominantly hard rock) rather than surface water. A proportion of abstracted water is understood to have in-flowed prior to 2023 and was stored temporarily in the goaf. A proportion of the 2023 incidental take has continued to be stored underground or was lost through coal moisture and water vapour via outgoing air.

Data utilised in the assessment includes:

- metered water volumes pumped to the mine from the various sources;
- metered water abstracted from the mine;
- partitioned water takes (from the groundwater modelling) from the surface water sources and the separate groundwater sources; and
- estimate of stored water pumped from the mine.

These volumes are summarised in Table 6.1. During 2023, Ashton abstracted 1,456.14 ML of water via borehole 6 (BH6), borehole 7 (BH7) and the underground portal. Mechanical flow meters were used from September 2023-onward, as these were found to be more accurate. Of that volume, 151.73 ML was introduced into the mine as operational water; therefore, the difference of 1,304.41 ML is considered a portion of the incidental water take. The remainder of the predicted incidental water is considered to be stored in the underground workings or to have been lost through the coal moisture and water vapour via out-by air; however, in 2023 the estimate of abstracted inflow was greater than the total predicted water take for 2023, with the remainder of predicted incidental water at -359.42 ML. This has been associated with anomalous inflows encountered during mining of LW207a, requiring a higher volume of water to be abstracted.

During 2023, ACOL engaged AGE to conduct an assessment to determine the potential sources of water for anomalously high-water inflow rates into the underground workings (AGE, 2023a). To understand the potential volume of groundwater lost from the alluvium above LW206B, BCA groundwater elevation trends between late 2022 and June 2023 were analysed to delineate the potentially impacted area. The analysis indicated that potentially, the most impacted area was likely in the northern extent of the BCA above LW206A/B and LW207A/B. The potential BCA volumetric contribution was then calculated using a range of applicable specific yield (1% - 15%), resulting in a potentially impacted volume of 543,000 m^3, or between 5 ML – 81 ML. Water chemistry analysis also supported the conclusion that the bulk of the anomalous inflow source water to the underground was likely deep groundwater from seams below and including the Pikes Gully coal seam.

The groundwater model (AGE, 2021) predicted that the underground inflow rate into the mine for the period of 2023 at 29.97 L/sec. The average 2023 water abstraction rate was 41.36 L/sec.

Table 6.1 Breakdown of abstracted water volumes (2023)

Total water abstracted from mine via BH6, BH7 and Portal	1,456.14 ML	Mine water input (metered)	151.73 ML		
		Estimate of abstracted water considered inflow water	1,304.41 ML	945.0 ML	Total predicted incidental water-take for 2023 (from 2023 GW)
		Portion of incidental water take considered stored in underground and/or lost via coal moisture and water vapour in out-by air	-359.42 ML		

7 Summary

Groundwater monitoring over the 2023 reporting period was consistent with the requirements outlined in the WMP. A summary of the findings of this report is as follows:

- Groundwater elevation in regulatory BCA monitoring bores decreased throughout 2023, with groundwater elevation exceedances detected in T2A (Sep and Oct 2023 – two consecutive exceedances) and WMLP328 (July 2023-onwards – six consecutive exceedances). It should be noted that ACP is approved to intercept the BCA groundwater resource under DA 309-11-2011-i MOD 5.
- Other BCA alluvial bores recorded decreasing groundwater elevations. Non-regulatory bore T5 was found to be dry from June 2023-onward.
- GCA groundwater elevations were generally stable throughout the year. A decrease in groundwater elevation from the end of 2022 to the beginning of 2023 followed lower than average rainfall, indicated by an declining CRD. All GCA groundwater elevations remained above established triggers in 2023.
- HRA regulatory bore groundwater elevations decreased throughout the year. All HRA groundwater elevations remained above established triggers in 2023.
- The other HRA bores responded to periods of decreased rainfall throughout 2023 with groundwater elevations decreasing throughout the year.
- Surface water elevation in Hunter River, Glennies Creek and Bowmans Creek declined throughout 2023 with increases to water elevation recorded following heavy rainfall events. Bowmans Creek was dry throughout the year, intermittently holding water immediately following rainfall events.
- Groundwater elevations were stable in coal measure bores throughout the year. No consistent trend in groundwater elevation was seen in CMOB bores throughout 2023.
- VWP measurements in WMLP269 (adjacent LW206A/206B) sensors at 30 m and 59 m were stable throughout the 2023 monitoring period. Pressure head in the remaining sensors (70 m, 97 m, 127 m and 147 m) have recorded erroneous data since July 2022. Erroneous data is likely due to fracturing of strata in which the deeper sensors are positioned.
- Groundwater pH measurements in alluvial bores were overall stable during 2023 with values typically ranging from pH 6.5 to pH 7.5. Discrepancies in pH were minor and considered within natural variation. WMLP311, WML113C, WML129, WML120B, WMLP358, WMLP349, WMLP336, and WMLP337 recorded exceedances throughout the year. The exceedances in WMLP311, WML113C, and WML129, WML120B, and WMLP336 were not consecutive for three months and as such did not require a response under the WMP. Revised investigation into the remaining bores, all GCA monitoring bores, resulted in the recommendation to revise pH and EC triggers for GCA bores to account for climatic variability.
- pH in coal measure and CMOB bores were stable over 2023, predominantly ranging from pH 6.5 to pH 7.5. Exceptions to the outlined pH range were few and minor, with the degree of variation considered within natural variation.
- Groundwater conditions in multiple bores exceeded the EC trigger criteria in 2023 - WMLP279, WMLP311, WMLP346, WMLP349, and WMLP358. However, only the exceedances in WMLP346, WMLP349, and WMLP358 were consecutive for three or more rounds, triggering an investigation under the WMP. Investigations in 2022 and 2023 concluded EC trigger values for GCA bores were not representative of climatic variability and should be derived using latest available data.
- GCA EC levels in 2023 were steady overall, and cases where exceedances were detected EC levels would fluctuate near to the EC trigger threshold. The exception to this is WMLP349 which increased until May 2023, and decreased thereafter. Recent investigations recommended revised EC (and pH) triggers be derived for GCA monitoring bores using the latest data collected which better represent seasonal climate variability at this location. No change in the beneficial use category of the groundwater at WMLP349 is noted, nor is environmental harm indicated by the recent EC observations at this monitoring bore.
- No consistent trends in EC levels were present in coal measure and CMOB monitoring bores during 2023, except for RSGM1 which recorded an overall decrease throughout the year.
- Major ion analysis indicated that the CMOB, BCA and HRA water types are similar and can be distinguished from the GCA and the coal measure water types, which is due to the water source and the recharge/discharge mechanism associated with each body.

- Dissolved metals, select nutrients, turbidity and cyanide concentrations within ACP monitoring bores were compared against ANZECC|ARMCANZ livestock limits (ANZECC & ARMCANZ, 2000), revealing no breaches for any of the analytes assessed. Multiple bores exceeded the lower trigger of phosphorous concentration (0.8-12 mg/L), however it is outlined in the guidelines that the value or range for phosphorous needs to be determined specific to a site. No site-specific analysis has been conducted at Ashton to define an appropriate phosphorous trigger at this time.
- EPL 11879 listed monitoring bore displayed varying results for groundwater elevations and EC during the 2023 monitoring period.
- Underground mine inflows were above predictions. An investigation into the source of the inflows concluded the majority of the groundwater inflows are likely from deep Permian strata and not from surficial water.

Generally, the site has experienced minimal impacts to the BCA, and no mining impacts to the GCA and HRA alluvial aquifers, whilst impacts remain within predictions in the coal measures.

8 References

Australasian Groundwater & Environmental Consultants (AGE) (2016), "*Yancoal Ashton Coal – Groundwater model rebuild*", Project No. G1758G. Submitted 22/11/2016.

Ashton Coal (2020), Water Management Plan version 11, HSEC Management System – Plan, Doc No. 3.4.1.8., Yancoal.

Australasian Groundwater & Environmental Consultants (AGE) (2021a), "*Ashton coal operations – UG Water Inflow Source Assessment",* Project No. G1922P. Submitted 15 October 2021.

Australasian Groundwater & Environmental Consultants (2022). *"Ashton Coal Operations – WMLP129 pH Exceedance Investigation".* Report No. ASH5006.001 Submitted to ACOL 22 August 2022.

Australasian Groundwater & Environmental Consultants (2022a). *"Ashton Coal – January 2022 Groundwater Monitoring Report – Appendix E".* Report No. ASH5005.001. Submitted to ACOL 17 March 2022.

Australasian Groundwater & Environmental Consultants (2023). *"Ashton Coal Operations – WMLP358 EC Exceedance Investigation".* Report No. ASH5005.001. Submitted to ACOL 8 March 2023.

Australasian Groundwater & Environmental Consultants (2023a). Email - McKay, Bryce *"Bowman's Creek Aquifer".* Received by Phillip Brown et al. 21 July 2023.

Australian and New Zealand Environment and Conservation Council (ANZECC), and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ), (2000), Australian and New Zealand Guidelines for Fresh and Marine Water Quality – Volume 1: The Guidelines (Chapters 1-7), National Water Quality Management Strategy Paper No. 4. October 2000.

Department of Primary Industries Office of Water (2016), Rivers and Streams Digital Data, http://realtimedata.water.nsw.gov.au/water, Sydney NSW.

Food and Agricultural Organisation of the United Nations (FAO), (1992) The use of saline waters for crop production – FAO irrigation and drainage paper 48. http://www.fao.org/docrep/t0667e/t0667e05.htm.

Appendix A

Summary of WMP monitoring locations

Table A 1 GWMP monitoring locations summary

ID	Type	Easting (GDA94 Z56)	Northing (GDA94 Z56)	Top of casing (mAHD)	Depth (mBGL)
Ashton Well	Monitoring bore	318355	6406029	62	-
GM1	EPL Monitoring bore*	318431	6407214	67	203
GM3A	Monitoring bore	320246.5	6405976.9	59	7.5
GM3B	Monitoring bore	320250.9	6405976.7	59	16.2
PB1	Monitoring bore	317545	6405301	61.1	7.8
RA02	Monitoring bore	317712.8	6405233	55.2	11.3
RA18	Monitoring bore	317821.8	6405434.2	62.6	8.5
RA27	Monitoring bore	317952.1	6403738	61.6	10.7
RM01	Monitoring bore	318041	6404109.5	69.4	9.8
RM02	Monitoring bore	317942	6404506	61.1	12.9
RM03	Monitoring bore	317667	6404844.5	62.1	9.5
RM10	Monitoring bore	317589	6405292	61.6	10.5
RSGM1	Monitoring bore	317655	6406302	65.6	8.5
T2-A	Monitoring bore	317583.3	6405217.4	60.8	7.9
T2-P	Monitoring bore	317587	6405222	60.7	14.5
T3-A	Monitoring bore	317654.2	6404708	59.9	10.8
T3-P	Monitoring bore	317650	6404702	59.8	22.8
T4-A	Monitoring bore	317685.8	6404323.1	58.6	10.7
T4-P	Monitoring bore	317683	6404319	58.5	17.5
T5	Monitoring bore	317946.1	6406549.4	65.3	8.3
WML113A	Vibrating wire piezometer	317369	6404529	60.2	125
WML113C	Monitoring bore	317377	6404526	60.2	11.2
WML115B	Monitoring bore	317881	6406704	66.4	13
WML115C	Monitoring bore	317888	6406710	66.2	6.2
WML119	Monitoring bore	319255.3	6403930.1	61.5	25.8
WML120A	EPL Monitoring bore*	319292	6404579.6	60.4	15
WML120B	EPL Monitoring bore*	319293.6	6404587.5	60.1	9
WML129	EPL Monitoring bore*	319468.4	6403527.8	55.3	4.6
WML181	EPL Monitoring bore*	319215	6403958.3	64.3	36.7
WML183	EPL Monitoring bore*	319188.2	6404325.2	76.7	45.5
WML213	Vibrating wire piezometer	317210	6404154	61.5	316
WML239	Monitoring bore	319345	6404044.8	58.8	12.2
WML245	Vibrating wire piezometer	320035	6404835	64.9	110
WML261	Monitoring bore	319320.2	6404705.9	58.7	43
WML262	EPL Monitoring bore*	319220.1	6403927.7	63.2	60.3
WMLP269	Vibrating wire piezometer	317850	6404073	65.5	147

ID	Type	Easting (GDA94 Z56)	Northing (GDA94 Z56)	Top of casing (mAHD)	Depth (mBGL)
WMLC144	Vibrating wire piezometer	319500	6404170	59.3	132
WMLC248	Vibrating wire piezometer	319326	6404721	58.5	144.6
WMLC334	Vibrating wire piezometer	318589	6403088	75.9	218.5
WMLC335	Vibrating wire piezometer	318892	6402936	64.5	200.5
WMLP277	Monitoring bore	317643.2	6403958.5	59	13.3
WMLP278	Monitoring bore	317626.3	6403894.2	62.3	11.5
WMLP279	EPL Monitoring bore*	317298.9	6403991.8	62.7	17.2
WMLP280	EPL Monitoring bore*	317797.6	6403793.4	62.5	14.9
WMLP301	Monitoring bore	319235	6403858	60.2	41.5
WMLP302	Monitoring bore	319299.6	6404600.2	59.7	25.2
WMLP308	Monitoring bore	318222.7	6406373	65.7	8.9
WMLP311	Monitoring bore	318178.9	6406047.9	63.6	7.6
WMLP320	EPL Monitoring bore*	317457.2	6405388	61.5	8.5
WMLP323	Monitoring bore	318242.2	6406594.7	64.5	7.3
WMLP324	Monitoring bore	318240	6406594	64.5	14.1
WMLP325	Monitoring bore	318181	6406050	63.7	14.6
WMLP326	Monitoring bore	317571	6404103.2	59.3	11.9
WMLP327	Monitoring bore	317573	6404103	59.4	18.3
WMLP328	Monitoring bore	317927.3	6405611.6	62.8	11.5
WMLP336	EPL Monitoring bore*	318965.4	6402841.9	60.6	15.5
WMLP337	Monitoring bore	318418	6403129	59.9	13.5
WMLP338	Monitoring bore	318624.7	6402794	58.8	12.9
WMLP343	Monitoring bore	319623	6404606	61	9.6
WMLP346	Monitoring bore	319366.5	6404457.2	60.68	11.5
WMLP349	Monitoring bore	319516	6404198	58.3	8.7
WMLP358	Monitoring bore	319560	6403704	59.49	9.3
WMLP361	Vibrating wire piezometer	317722	6405962	62.9	191
WMLP363	Vibrating wire piezometer	317963	6406634	66	164
YAP016	EPL Monitoring bore*	318438	6407195	66.8	7.3

Note: * Per EPL 11879 (Licence version date: 3 November 2022).

Appendix B

Summary of GWMP Plan – parameters and frequency

Table B 1 GWMP plan summary

ID	Type	Data recording method	Targets	Monthly	Quarterly	Annually
Ashton Well	Monitoring bore	-	BCA	Water level only	Monthly plus field parameters	Quarterly plus minor lab analysis
GM1	EPL Monitoring bore*	-	Coal measure	Water level only	Monthly plus field EC only	Quarterly plus field parameters and **comprehensive** analysis
GM3A	Monitoring bore	-	GCA	Water level only	Monthly plus field parameters	Quarterly plus minor lab analysis
GM3B	Monitoring bore	-	GCA	Water level only	Monthly plus field parameters	Quarterly plus minor lab analysis
PB1	Monitoring bore	-	BCA	Water level only	Monthly plus field EC only	Quarterly plus minor lab analysis
RA02	Monitoring bore	-	BCA + CMOB	Water level only	Monthly plus field EC only	Quarterly plus field parameters and **comprehensive** analysis
RA18	Monitoring bore	-	BCA	Water level only	Monthly plus field parameters	Quarterly plus minor lab analysis
RA27	Monitoring bore	-	HRA	Water level only	Monthly plus field parameters	Quarterly plus **comprehensive** analysis
RM01	Monitoring bore	-	BCA	Water level only	Monthly plus field EC only	Quarterly plus minor lab analysis
RM02	Monitoring bore	-	BCA + CMOB	Water level only	Monthly plus field EC only	Water level and field EC only
RM03	Monitoring bore	-	BCA + CMOB	Water level only	Monthly plus field EC only	Quarterly plus minor lab analysis
RM10	Monitoring bore	-	BCA + CMOB	Water level and field parameters	Monthly plus minor lab analysis	Quarterly plus minor lab analysis
RSGM1	Monitoring bore	-	Coal measure (BWS)	Water level only	Monthly plus field EC only	Quarterly plus field parameters and **comprehensive** analysis
T2-A	Monitoring bore	Pressure transducer	BCA	Water level and field parameters	Monthly plus minor lab analysis	Quarterly plus **comprehensive** analysis
T2-P	Monitoring bore	Pressure transducer	CMOB	Water level only	Monthly plus field parameters and minor lab analysis	Quarterly plus **comprehensive** analysis
T3-A	Monitoring bore	-	BCA	Water level only	Monthly plus field parameters	Quarterly plus **comprehensive** analysis
T3-P	Monitoring bore	-	CMOB	Water level only	Monthly plus field parameters	Quarterly plus **comprehensive** analysis

ID	Type	Data recording method	Targets	Monthly	Quarterly	Annually
T4-A	Monitoring bore	-	BCA + BWS	Water level only	Monthly plus field parameters and minor lab analysis	Quarterly plus **comprehensive** analysis
T4-P	Monitoring bore	-	CMOB	Water level only	Monthly plus field parameters and minor lab analysis	Quarterly plus **comprehensive** analysis
T5	Monitoring bore	Pressure transducer	BCA	Water level only	Monthly plus field parameters	Quarterly plus **comprehensive** analysis
WML113A	Vibrating wire piezometer	-	BW 2, Lem 4, Lem 9, Lem 11-12, Lem 15	Pressure head	Pressure head	Pressure head
WML113C	Monitoring bore	Pressure transducer	BCA	Water level and field parameters	Monthly plus minor lab analysis	Quarterly plus **comprehensive** analysis
WML115B	Monitoring bore	-	CMOB & Lem 3-4	Water level only	Monthly plus field parameters	Quarterly plus minor lab analysis
WML115C	Monitoring bore	-	BCA	Water level only	Monthly plus field parameters	Quarterly plus minor lab analysis
WML119	Monitoring bore	-	PG	Water level only	Monthly plus field parameters and minor lab analysis	Quarterly plus **comprehensive** analysis
WML120A	EPL Monitoring bore*	-	PG	Water level only	Monthly plus field parameters and minor lab analysis	Quarterly plus **comprehensive** analysis
WML120B	EPL Monitoring bore*	-	GCA	Water level and field parameters	Monthly plus minor lab analysis	Quarterly plus **comprehensive** analysis
WML129	EPL Monitoring bore*	Pressure transducer	GCA	Water level and field parameters	Monthly plus minor lab analysis	Quarterly plus **comprehensive** analysis
WML181	EPL Monitoring bore*	-	PG	Water level only	Monthly plus field parameters and minor lab analysis	Quarterly plus **comprehensive** analysis
WML183	EPL Monitoring bore*	-	PG	Water level only	Monthly plus field parameters and minor lab analysis	Quarterly plus **comprehensive** analysis
WML213	Vibrating wire piezometer	-	BWS, Lem 8-9, Lem 15, Lem 19, PG, ULD, ULLD, LB	Pressure head	Pressure head	Pressure head
WML239	Monitoring bore	Pressure transducer	GCA	Water level and field parameters	Monthly plus minor lab analysis	Quarterly plus **comprehensive** analysis

ID	Type	Data recording method	Targets	Monthly	Quarterly	Annually
WML245	Vibrating wire piezometer	-	ULD, MLD, LB, LB-HEB int	Pressure head	Pressure head	Pressure head
WML261	Monitoring bore	-	ULD	Water level only	Monthly plus field parameters and minor lab analysis	Quarterly plus **comprehensive** analysis
WML262	EPL Monitoring bore*	-	ULD	Water level only	Monthly plus field parameters and minor lab analysis	Quarterly plus **comprehensive** analysis
WMLP269	Vibrating wire piezometer	-	Lem 5, Lem 7, Lem 8-9, Lem 11-12, Lem 15, Lem 19	Pressure head	Pressure head	Pressure head
WMLC144	Vibrating wire piezometer	-	ULD, MLD1, MLD2, ULLD, LLLD, UBS, LB	Pressure head	Pressure head	Pressure head
WMLC248	Vibrating wire piezometer	-	ULD, ULLD, LB, HEB	Pressure head	Pressure head	Pressure head
WMLC334	Vibrating wire piezometer	-	Lem 13, Lem 15, Lem 18/19, Art, ULD, ULLD, UB, LB	Pressure head	Pressure head	Pressure head
WMLC335	Vibrating wire piezometer	-	Lem 15B, Lem 17, PG Upper, Art, ULD, LLLD, UB, LB	Pressure head	Pressure head	Pressure head
WMLP277	Monitoring bore	Pressure transducer	HRA	Water level only	Monthly plus field parameters	Quarterly plus **comprehensive** analysis
WMLP278	Monitoring bore	-	HRA	Water level only	Monthly plus field parameters	Quarterly plus **comprehensive** analysis
WMLP279	EPL Monitoring bore*	-	HRA	Water level and field parameters	Monthly plus minor lab analysis	Quarterly plus **comprehensive** analysis
WMLP280	EPL Monitoring bore*	-	HRA	Water level and field parameters	Monthly plus minor lab analysis	Quarterly plus **comprehensive** analysis
WMLP301	Monitoring bore	-	Arties Seam	Water level only	Monthly plus field parameters and minor lab analysis	Quarterly plus **comprehensive** analysis
WMLP302	Monitoring bore	-	Arties Seam	Water level only	Monthly plus field parameters and minor lab analysis	Quarterly plus **comprehensive** analysis

ID	Type	Data recording method	Targets	Monthly	Quarterly	Annually
WMLP308	Monitoring bore	-	BCA	Water level only	Monthly plus field parameters	Quarterly plus **comprehensive** analysis
WMLP311	Monitoring bore	Pressure transducer	BCA	Water level and field parameters	Monthly plus minor lab analysis	Quarterly plus **comprehensive** analysis
WMLP320	EPL Monitoring bore*	-	BCA	Water level only	Monthly plus field parameters	Quarterly plus minor lab analysis
WMLP323	Monitoring bore	Pressure transducer	BCA	Water level and field parameters	Monthly plus minor lab analysis	Quarterly plus **comprehensive** analysis
WMLP324	Monitoring bore	Pressure transducer	CMOB	Water level only	Monthly plus field parameters and minor lab analysis	Quarterly plus **comprehensive** analysis
WMLP325	Monitoring bore	Pressure transducer	CMOB	Water level only	Monthly plus field parameters	Quarterly plus **comprehensive** analysis
WMLP326	Monitoring bore	-	BCA	Water level only	Monthly plus field parameters	Quarterly plus minor lab analysis
WMLP327	Monitoring bore	-	CMOB	Water level only	Monthly plus field parameters	Quarterly plus minor lab analysis
WMLP328	Monitoring bore	Pressure transducer	BCA	Water level and field parameters	Monthly plus minor lab analysis	Quarterly plus **comprehensive** analysis
WMLP336	EPL Monitoring bore*	-	HRA + CMOB	Water level and field parameters	Monthly plus minor lab analysis	Quarterly plus **comprehensive** analysis
WMLP337	Monitoring bore	-	HRA	Water level and field parameters	Monthly plus minor lab analysis	Quarterly plus **comprehensive** analysis
WMLP338	Monitoring bore	-	HRA	Water level only	Monthly plus field parameters	Quarterly plus **comprehensive** analysis
WMLP343	Monitoring bore	Pressure transducer	GCA	Water level and field parameters	Monthly plus minor lab analysis	Quarterly plus **comprehensive** analysis
WMLP346	Monitoring bore	Pressure transducer	GCA	Water level and field parameters	Monthly plus minor lab analysis	Quarterly plus **comprehensive** analysis
WMLP349	Monitoring bore	-	GCA	Water level and field parameters	Monthly plus minor lab analysis	Quarterly plus **comprehensive** analysis
WMLP358	Monitoring bore	-	GCA	Water level and field parameters	Monthly plus minor lab analysis	Quarterly plus **comprehensive** analysis

ID	Type	Data recording method	Targets	Monthly	Quarterly	Annually
WMLP361	Vibrating wire piezometer	VWP datalogger	Lem 5, Lem 8, Lem 15A, Art, ULD	Pressure head	Pressure head	Pressure head
WMLP363	Vibrating wire piezometer	VWP datalogger	CMOB, Lem 8, Lem 9-10 int, Lem 12, Lem 14, Lem 15, PG roof, ULD	Pressure head	Pressure head	Pressure head
YAP016	EPL Monitoring bore*	Pressure transducer	BCA	Water level and field parameters	Monthly plus minor lab analysis	Quarterly plus **comprehensive** analysis

Note: * Per EPL 11879 (Licence version date: 3 November 2022).

Appendix C

Extract GWMP protocol for exceedance of groundwater trigger values (Yancoal, 2018)

In the event of a groundwater assessment criterion (Table 23 and Section 7.2) being exceeded, the following protocol will be followed:

1. Check and validate the data which indicates an exceedance of the criterion, including whether the exceedance is ongoing.
2. A preliminary investigation will be undertaken to establish the cause(s) and determine whether changes to the water management system or operations are required. This will involve the consideration of the monitoring results in conjunction with:
   a) site activities being undertaken at the time;
   b) activities at nearby operations (cumulative affects);
   c) groundwater extraction by others;
   d) baseline monitoring results and natural fluctuations;
   e) predictive modelling;
   f) groundwater monitoring at nearby locations;
   g) the prevailing and preceding meteorological and streamflow conditions; and
   h) changes to the land use/activities being undertaken nearby.
3. If the preliminary investigation shows that the impact is linked to activities undertaken by ACOL, a report will be emailed to the DPE and any other relevant department. Causal factors will be addressed and rectified if possible. Contingency measures will be developed in consultation with the DPE and any other relevant department and implemented in response to the outcomes of the investigation.
4. Remedial/compensatory measures will be developed in consultation with DPE and any other relevant department and implemented in response to the outcomes of the investigations.
5. Monitoring would be implemented as required to confirm the effectiveness of remedial measures.
6. Where required, an independent hydrogeologist will be engaged to conduct investigations. ACOL will seek the Secretary of DPE's approval in selecting a hydrogeologist.

Any exceedances and responses taken to ameliorate these exceedances will be reported in the Annual Review.

Appendix D

Annual groundwater quality laboratory results 2023

Bore ID	Geology	Laboratory ID	Date	pH Value (Field)	pH Value (Lab)	pH RPD	EC (Field)	EC (Lab)	EC RPD	Total Dissolved Solids (TDS)
Units				**pH**	**pH**	**%**	**µS/cm**	**µS/cm**	**%**	**mg/L**
Limit of Reporting (LOR)				**-**	**0.01**	**-**	**-**	**1**	**-**	**10**
ANZECC livestock limits				**-**	**-**	**-**	**5970**	**5970**	**-**	**4000**
DUPLICATE	BCA	ES2326174025	04/08/2023	7.97	7.27	9.19	1093	1100	-0.64	672
GM01	Coal	ES2326174024	04/08/2023	7.45	7.31	1.90	1807	1810	-0.17	1040
GM3A	GCA	ES2326174016	03/08/2023	7.39	7.47	-1.08	5362	5240	2.30	3270
PB1	BCA	ES2326174019	04/08/2023	6.79	6.80	-0.15	1013	1030	-1.66	582
RA18	BCA	ES2326174022	04/08/2023	7.37	7.27	1.37	2010	2100	-4.38	1340
RA27	HRA	ES2326174004	02/08/2023	7.44	7.22	3.00	640.3	656	-2.42	711
RSGM1	Coal	ES2326641001	07/08/2023	7.01	7.41	-5.55	3544	3600	-1.57	2730
T2A	BCA	ES2326174017	04/08/2023	6.92	7.25	-4.66	954.1	961	-0.72	636
T2P	CMOB	ES2326174018	04/08/2023	6.72	6.93	-3.08	1050	1040	0.96	616
T3A	BCA	ES2326174010	03/08/2023	7.14	7.08	0.84	2490	2490	0.00	1600
T3P	CMOB	ES2326174009	03/08/2023	7.40	7.60	-2.67	1894	1890	0.21	1080
T4A	BCA	ES2326174012	03/08/2023	7.44	7.21	3.14	1356	1360	-0.29	893
T4P	CMOB	ES2326174011	03/08/2023	7.37	7.20	2.33	626.6	624	0.42	367
WML113C	BCA	ES2326174015	03/08/2023	7.26	7.11	2.09	771.6	768	0.47	601
WML115C	BCA	ES2326641007	07/08/2023	7.85	7.10	10.03	840.3	864	-2.78	----
WML119	Coal	ES2326911006	10/08/2023	7.55	7.19	4.88	1785	1800	-0.84	1000
WML120A	Coal	ES2326911002	09/08/2023	7.07	7.31	-3.34	1143	1150	-0.61	----
WML120B	GCA	ES2326911001	09/08/2023	6.70	6.74	-0.60	886.9	879	0.89	484
WML129	GCA	ES2326641012	07/08/2023	7.37	7.02	4.86	551.7	521	5.72	280
WML181	Coal	ES2326911007	10/08/2023	7.12	7.07	0.70	2808	2770	1.36	1680
WML183	Coal	ES2326911005	09/08/2023	6.84	7.02	-2.60	4177	4180	-0.07	2540
WML239	GCA	ES2326641010	07/08/2023	7.02	6.90	1.72	666.3	706	-5.79	531
WML261	Coal	ES2326911004	09/08/2023	7.12	6.87	3.57	250.7	225	10.81	164

Bore ID	Geology	Laboratory ID	Date	pH Value (Field)	pH Value (Lab)	pH RPD	EC (Field)	EC (Lab)	EC RPD	Total Dissolved Solids (TDS)
Units				**pH**	**pH**	**%**	**µS/cm**	**µS/cm**	**%**	**mg/L**
Limit of Reporting (LOR)				**-**	**0.01**	**-**	**-**	**1**	**-**	**10**
ANZECC livestock limits				**-**	**-**	**-**	**5970**	**5970**	**-**	**4000**
WML262	Coal	ES2326911008	10/08/2023	7.99	7.98	0.13	2794	2700	3.42	1640
WMLP277	HRA	ES2326174007	02/08/2023	7.54	7.30	3.23	1317	1350	-2.47	1070
WMLP278	HRA	ES2326174006	02/08/2023	7.38	7.21	2.33	1183	1200	-1.43	756
WMLP279	HRA	ES2326174008	02/08/2023	7.28	7.11	2.36	936.5	943	-0.69	638
WMLP280	HRA	ES2326174005	02/08/2023	7.11	7.05	0.85	843.5	850	-0.77	590
WMLP301	Coal	ES2326911009	10/08/2023	8.19	8.03	1.97	2567	2580	-0.51	1560
WMLP302	Coal	ES2326911003	09/08/2023	6.67	6.69	-0.30	1214	1190	2.00	----
WMLP308	BCA	ES2326641004	07/08/2023	7.26	7.14	1.67	1061	1110	-4.51	612
WMLP311	BCA	ES2326641006	07/08/2023	7.45	6.93	7.23	1188	1240	-4.28	766
WMLP320	BCA	ES2326174020	04/08/2023	7.15	6.92	3.27	1003	1020	-1.68	610
WMLP323	BCA	ES2326641002	07/08/2023	7.71	7.18	7.12	910.6	942	-3.39	590
WMLP324	CMOB	ES2326641003	07/08/2023	7.08	7.18	-1.40	902.3	950	-5.15	578
WMLP325	CMOB	ES2326641005	07/08/2023	7.53	7.37	2.15	1655	1820	-9.50	1060
WMLP326	BCA	ES2326174013	03/08/2023	7.59	7.35	3.21	1297	1280	1.32	767
WMLP327	CMOB	ES2326174014	03/08/2023	7.38	7.18	2.75	1929	1900	1.51	1190
WMLP328	BCA	ES2326174021	04/08/2023	7.53	7.52	0.13	991.1	990	0.11	640
WMLP336	HRA	ES2326174003	02/08/2023	6.98	6.69	4.24	1171	1190	-1.61	914
WMLP337	HRA	ES2326174002	02/08/2023	7.14	7.25	-1.53	2272	2380	-4.64	1470
WMLP338	HRA	ES2326174001	02/08/2023	6.78	6.94	-2.33	1669	1710	-2.43	1160
WMLP346	GCA	ES2326641009	07/08/2023	6.61	6.82	-3.13	759.2	792	-4.23	476
WMLP349	GCA	ES2326641011	07/08/2023	6.87	6.81	0.88	1587	1670	-5.10	958
WMLP358	GCA	ES2326641008	07/08/2023	6.61	6.68	-1.05	422.1	434	-2.78	319
YAP016	BCA	ES2326174023	04/08/2023	7.97	7.27	9.19	1093	1100	-0.64	668

Bore ID	Geology	Laboratory ID	Date	Calcium	Magnesium	Sodium	Potassium	Chloride
Units				mg/L	mg/L	mg/L	mg/L	mg/L
Limit of Reporting (LOR)				1	1	1	1	1
ANZECC livestock limits				-	-	-	-	-
DUPLICATE	BCA	ES2326174025	04/08/2023	40	26	168	2	191
GM01	Coal	ES2326174024	04/08/2023	70	49	261	3	376
GM3A	GCA	ES2326174016	03/08/2023	29	24	1250	6	1230
PB1	BCA	ES2326174019	04/08/2023	48	24	125	3	170
RA18	BCA	ES2326174022	04/08/2023	117	67	259	2	543
RA27	HRA	ES2326174004	02/08/2023	20	16	102	<1	79
RSGM1	Coal	ES2326641001	07/08/2023	40	46	702	2	759
T2A	BCA	ES2326174017	04/08/2023	46	24	128	2	153
T2P	CMOB	ES2326174018	04/08/2023	80	35	89	2	197
T3A	BCA	ES2326174010	03/08/2023	67	61	358	<1	700
T3P	CMOB	ES2326174009	03/08/2023	49	42	308	4	385
T4A	BCA	ES2326174012	03/08/2023	63	29	176	1	323
T4P	CMOB	ES2326174011	03/08/2023	27	16	68	14	94
WML113C	BCA	ES2326174015	03/08/2023	39	18	94	1	115
WML115C	BCA	ES2326641007	07/08/2023	17	8	166	<1	156
WML119	Coal	ES2326911006	10/08/2023	28	29	345	6	327
WML120A	Coal	ES2326911002	09/08/2023	44	41	148	3	223
WML120B	GCA	ES2326911001	09/08/2023	50	34	90	<1	144
WML129	GCA	ES2326641012	07/08/2023	31	17	48	2	89
WML181	Coal	ES2326911007	10/08/2023	18	24	625	4	539
WML183	Coal	ES2326911005	09/08/2023	103	174	662	10	813
WML239	GCA	ES2326641010	07/08/2023	45	20	78	1	98

Bore ID	Geology	Laboratory ID	Date	Calcium	Magnesium	Sodium	Potassium	Chloride
Units				mg/L	mg/L	mg/L	mg/L	mg/L
Limit of Reporting (LOR)				1	1	1	1	1
ANZECC livestock limits				-	-	-	-	-
WML261	Coal	ES2326911004	09/08/2023	8	5	27	7	33
WML262	Coal	ES2326911008	10/08/2023	8	10	659	4	469
WMLP277	HRA	ES2326174007	02/08/2023	47	30	202	<1	244
WMLP278	HRA	ES2326174006	02/08/2023	49	26	176	<1	221
WMLP279	HRA	ES2326174008	02/08/2023	55	30	102	2	197
WMLP280	HRA	ES2326174005	02/08/2023	35	22	120	1	150
WMLP301	Coal	ES2326911009	10/08/2023	4	5	630	2	400
WMLP302	Coal	ES2326911003	09/08/2023	27	36	177	3	248
WMLP308	BCA	ES2326641004	07/08/2023	49	29	142	2	174
WMLP311	BCA	ES2326641006	07/08/2023	58	37	151	2	214
WMLP320	BCA	ES2326174020	04/08/2023	58	30	123	2	154
WMLP323	BCA	ES2326641002	07/08/2023	48	26	118	2	137
WMLP324	CMOB	ES2326641003	07/08/2023	46	26	117	2	138
WMLP325	CMOB	ES2326641005	07/08/2023	72	41	259	3	320
WMLP326	BCA	ES2326174013	03/08/2023	46	25	207	1	199
WMLP327	CMOB	ES2326174014	03/08/2023	82	42	285	4	416
WMLP328	BCA	ES2326174021	04/08/2023	53	27	128	3	151
WMLP336	HRA	ES2326174003	02/08/2023	85	42	86	10	272
WMLP337	HRA	ES2326174002	02/08/2023	91	101	287	4	437
WMLP338	HRA	ES2326174001	02/08/2023	78	51	207	1	396
WMLP346	GCA	ES2326641009	07/08/2023	46	25	81	<1	132
WMLP349	GCA	ES2326641011	07/08/2023	78	42	206	1	354
WMLP358	GCA	ES2326641008	07/08/2023	35	16	30	<1	68
YAP016	BCA	ES2326174023	04/08/2023	38	26	167	2	186

Bore ID	Geology	Laboratory ID	Date	Hydroxide Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Bicarbonate Alkalinity as CaCO3	Total Alkalinity	Sulfate as SO4
Units				**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Limit of Reporting (LOR)				**1**	**1**	**1**	**1**	**1**
ANZECC livestock limits				**-**	**-**	**-**	**-**	**1000**
DUPLICATE	BCA	ES2326174025	04/08/2023	<1	<1	230	230	108
GM01	Coal	ES2326174024	04/08/2023	<1	<1	283	283	196
GM3A	GCA	ES2326174016	03/08/2023	<1	<1	1150	1150	45
PB1	BCA	ES2326174019	04/08/2023	<1	<1	186	186	94
RA18	BCA	ES2326174022	04/08/2023	<1	<1	301	301	96
RA27	HRA	ES2326174004	02/08/2023	<1	<1	226	226	27
RSGM1	Coal	ES2326641001	07/08/2023	<1	<1	414	414	264
T2A	BCA	ES2326174017	04/08/2023	<1	<1	206	206	94
T2P	CMOB	ES2326174018	04/08/2023	<1	<1	156	156	146
T3A	BCA	ES2326174010	03/08/2023	<1	<1	169	169	161
T3P	CMOB	ES2326174009	03/08/2023	<1	<1	364	364	158
T4A	BCA	ES2326174012	03/08/2023	<1	<1	189	189	92
T4P	CMOB	ES2326174011	03/08/2023	<1	<1	172	172	8
WML113C	BCA	ES2326174015	03/08/2023	<1	<1	161	161	71
WML115C	BCA	ES2326641007	07/08/2023	<1	<1	158	158	65
WML119	Coal	ES2326911006	10/08/2023	<1	<1	499	499	5
WML120A	Coal	ES2326911002	09/08/2023	<1	<1	277	277	21
WML120B	GCA	ES2326911001	09/08/2023	<1	<1	206	206	49
WML129	GCA	ES2326641012	07/08/2023	<1	<1	109	109	25
WML181	Coal	ES2326911007	10/08/2023	<1	<1	695	695	74
WML183	Coal	ES2326911005	09/08/2023	<1	<1	825	825	302

Bore ID	Geology	Laboratory ID	Date	Hydroxide Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Bicarbonate Alkalinity as CaCO3	Total Alkalinity	Sulfate as SO4
Units				mg/L	mg/L	mg/L	mg/L	mg/L
Limit of Reporting (LOR)				1	1	1	1	1
ANZECC livestock limits				-	-	-	-	1000
WML239	GCA	ES2326641010	07/08/2023	<1	<1	194	194	30
WML261	Coal	ES2326911004	09/08/2023	<1	<1	53	53	10
WML262	Coal	ES2326911008	10/08/2023	<1	<1	878	878	<10
WMLP277	HRA	ES2326174007	02/08/2023	<1	<1	269	269	142
WMLP278	HRA	ES2326174006	02/08/2023	<1	<1	249	249	110
WMLP279	HRA	ES2326174008	02/08/2023	<1	<1	192	192	45
WMLP280	HRA	ES2326174005	02/08/2023	<1	<1	190	190	58
WMLP301	Coal	ES2326911009	10/08/2023	<1	<1	862	862	3
WMLP302	Coal	ES2326911003	09/08/2023	<1	<1	230	230	39
WMLP308	BCA	ES2326641004	07/08/2023	<1	<1	197	197	115
WMLP311	BCA	ES2326641006	07/08/2023	<1	<1	203	203	123
WMLP320	BCA	ES2326174020	04/08/2023	<1	<1	203	203	144
WMLP323	BCA	ES2326641002	07/08/2023	<1	<1	196	196	90
WMLP324	CMOB	ES2326641003	07/08/2023	<1	<1	203	203	86
WMLP325	CMOB	ES2326641005	07/08/2023	<1	<1	341	341	121
WMLP326	BCA	ES2326174013	03/08/2023	<1	<1	269	269	134
WMLP327	CMOB	ES2326174014	03/08/2023	<1	<1	347	347	152
WMLP328	BCA	ES2326174021	04/08/2023	<1	<1	216	216	117
WMLP336	HRA	ES2326174003	02/08/2023	<1	<1	177	177	70
WMLP337	HRA	ES2326174002	02/08/2023	<1	<1	670	670	102
WMLP338	HRA	ES2326174001	02/08/2023	<1	<1	370	370	60
WMLP346	GCA	ES2326641009	07/08/2023	<1	<1	184	184	18
WMLP349	GCA	ES2326641011	07/08/2023	<1	<1	191	191	97

Bore ID	Geology	Laboratory ID	Date	Hydroxide Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Bicarbonate Alkalinity as CaCO3	Total Alkalinity	Sulfate as SO4
Units				mg/L	mg/L	mg/L	mg/L	mg/L
Limit of Reporting (LOR)				1	1	1	1	1
ANZECC livestock limits				-	-	-	-	1000
WMLP358	GCA	ES2326641008	07/08/2023	<1	<1	99	99	21
YAP016	BCA	ES2326174023	04/08/2023	<1	<1	223	223	107

Bore ID	Geology	Laboratory ID	Date	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manga-nese	Nickel	Selen-ium	Zinc
Units				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Limit of Reporting (LOR)				0.001	0.0001	0.001	0.001	0.05	0.001	0.001	0.001	0.01	0.005
ANZECC livestock limits				0.5	0.1	1	0.4	-	0.1	-	1	0.02	20
DUPLICATE	BCA	ES2326174025	04/08/2023	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.018	<0.001	<0.01	<0.005
GM01	Coal	ES2326174024	04/08/2023	<0.001	<0.0001	<0.001	<0.001	0.77	<0.001	0.524	<0.001	<0.01	0.006
GM3A	GCA	ES2326174016	03/08/2023	0.007	<0.0001	<0.001	<0.001	<0.05	<0.001	0.218	0.008	<0.01	<0.005
PB1	BCA	ES2326174019	04/08/2023	0.001	<0.0001	<0.001	<0.001	1.10	<0.001	0.056	<0.001	<0.01	<0.005
RA18	BCA	ES2326174022	04/08/2023	<0.001	<0.0001	<0.001	0.003	<0.05	<0.001	0.515	0.005	<0.01	<0.005
RA27	HRA	ES2326174004	02/08/2023	<0.001	<0.0001	0.006	<0.001	<0.05	<0.001	<0.001	<0.001	<0.01	<0.005
RSGM1	Coal	ES2326641001	07/08/2023	0.003	<0.0001	<0.001	<0.001	<0.05	<0.001	0.034	<0.001	<0.01	0.010
T2A	BCA	ES2326174017	04/08/2023	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.005	<0.001	<0.01	<0.005
T2P	CMOB	ES2326174018	04/08/2023	0.004	<0.0001	<0.001	<0.001	2.36	<0.001	0.389	0.003	<0.01	0.023
T3A	BCA	ES2326174010	03/08/2023	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.002	<0.001	<0.01	<0.005
T3P	CMOB	ES2326174009	03/08/2023	<0.001	<0.0001	0.002	<0.001	0.22	<0.001	0.058	0.003	<0.01	<0.005
T4A	BCA	ES2326174012	03/08/2023	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.088	<0.001	<0.01	<0.005
T4P	CMOB	ES2326174011	03/08/2023	0.001	<0.0001	0.001	<0.001	2.28	<0.001	0.866	0.003	<0.01	<0.005
WML113C	BCA	ES2326174015	03/08/2023	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.030	<0.001	<0.01	<0.005

Bore ID	Geology	Laboratory ID	Date	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manga-nese	Nickel	Selen-ium	Zinc
Units				**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Limit of Reporting (LOR)				**0.001**	**0.0001**	**0.001**	**0.001**	**0.05**	**0.001**	**0.001**	**0.001**	**0.01**	**0.005**
ANZECC livestock limits				**0.5**	**0.1**	**1**	**0.4**	**-**	**0.1**	**-**	**1**	**0.02**	**20**
WML115C	BCA	ES2326641007	07/08/2023	----	----	----	----	----	----	----	----	----	----
WML119	Coal	ES2326911006	10/08/2023	<0.001	<0.0001	0.001	<0.001	0.28	<0.001	0.178	<0.001	<0.01	<0.005
WML120A	Coal	ES2326911002	09/08/2023	<0.001	<0.0001	<0.001	<0.001	0.08	<0.001	0.059	<0.001	<0.01	<0.005
WML120B	GCA	ES2326911001	09/08/2023	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.017	<0.001	<0.01	<0.005
WML129	GCA	ES2326641012	07/08/2023	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.310	<0.001	<0.01	<0.005
WML181	Coal	ES2326911007	10/08/2023	<0.001	<0.0001	0.020	<0.001	0.11	<0.001	0.045	<0.001	<0.01	<0.005
WML183	Coal	ES2326911005	09/08/2023	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.434	0.003	<0.01	0.007
WML239	GCA	ES2326641010	07/08/2023	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.034	<0.001	<0.01	<0.005
WML261	Coal	ES2326911004	09/08/2023	<0.001	<0.0001	<0.001	0.002	0.13	<0.001	0.002	<0.001	<0.01	0.228
WML262	Coal	ES2326911008	10/08/2023	<0.001	<0.0001	<0.001	<0.001	0.19	<0.001	0.050	<0.001	<0.01	<0.005
WMLP277	HRA	ES2326174007	02/08/2023	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.383	0.004	<0.01	<0.005
WMLP278	HRA	ES2326174006	02/08/2023	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.047	0.002	<0.01	<0.005
WMLP279	HRA	ES2326174008	02/08/2023	<0.001	<0.0001	<0.001	<0.001	0.07	<0.001	0.374	0.002	<0.01	<0.005
WMLP280	HRA	ES2326174005	02/08/2023	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.099	0.002	<0.01	0.006
WMLP301	Coal	ES2326911009	10/08/2023	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.016	<0.001	<0.01	<0.005
WMLP302	Coal	ES2326911003	09/08/2023	<0.001	<0.0001	<0.001	<0.001	1.08	<0.001	0.048	<0.001	<0.01	0.112
WMLP308	BCA	ES2326641004	07/08/2023	<0.001	<0.0001	<0.001	<0.001	0.18	<0.001	0.038	<0.001	<0.01	<0.005
WMLP311	BCA	ES2326641006	07/08/2023	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.034	<0.001	<0.01	<0.005
WMLP320	BCA	ES2326174020	04/08/2023	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.009	<0.001	<0.01	<0.005
WMLP323	BCA	ES2326641002	07/08/2023	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.142	<0.001	<0.01	<0.005
WMLP324	CMOB	ES2326641003	07/08/2023	0.002	<0.0001	<0.001	<0.001	0.63	<0.001	0.276	<0.001	<0.01	<0.005
WMLP325	CMOB	ES2326641005	07/08/2023	<0.001	<0.0001	<0.001	<0.001	0.63	<0.001	0.438	<0.001	<0.01	<0.005
WMLP326	BCA	ES2326174013	03/08/2023	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.108	0.001	<0.01	<0.005

Bore ID	Geology	Laboratory ID	Date	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manga-nese	Nickel	Selen-ium	Zinc
Units				**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Limit of Reporting (LOR)				**0.001**	**0.0001**	**0.001**	**0.001**	**0.05**	**0.001**	**0.001**	**0.001**	**0.01**	**0.005**
ANZECC livestock limits				**0.5**	**0.1**	**1**	**0.4**	**-**	**0.1**	**-**	**1**	**0.02**	**20**
WMLP327	CMOB	ES2326174014	03/08/2023	0.002	<0.0001	<0.001	<0.001	<0.05	<0.001	0.099	0.005	<0.01	0.007
WMLP328	BCA	ES2326174021	04/08/2023	0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.247	0.002	<0.01	<0.005
WMLP336	HRA	ES2326174003	02/08/2023	0.001	<0.0001	<0.001	<0.001	1.30	<0.001	0.451	0.003	<0.01	0.012
WMLP337	HRA	ES2326174002	02/08/2023	0.003	<0.0001	<0.001	<0.001	1.24	<0.001	1.27	0.004	<0.01	0.009
WMLP338	HRA	ES2326174001	02/08/2023	0.003	<0.0001	<0.001	<0.001	1.88	<0.001	0.557	0.004	<0.01	0.024
WMLP346	GCA	ES2326641009	07/08/2023	<0.001	<0.0001	<0.001	<0.001	0.16	<0.001	0.228	<0.001	<0.01	<0.005
WMLP349	GCA	ES2326641011	07/08/2023	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.088	0.001	<0.01	0.005
WMLP358	GCA	ES2326641008	07/08/2023	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.004	<0.001	<0.01	0.007
YAP016	BCA	ES2326174023	04/08/2023	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.043	<0.001	<0.01	<0.005

Bore ID	Geology	Laboratory ID	Date	Turbidity	Total Cyanide	Nitrite + Nitrate as N	Total Kjeldahl Nitrogen as N	Total Nitrogen as N	Total Phosphorous as P	Total Anions	Total Cations	Ionic Balance
Units				**NTU**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**meq/L**	**meq/L**	**%**
Limit of Reporting (LOR)				**0.1**	**0.004**	**0.01**	**0.1**	**0.1**	**0.01**	**0.01**	**0.01**	**0.01**
ANZECC livestock limits				**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
DUPLICATE	BCA	ES2326174025	04/08/2023	1820	<0.004	0.12	2.2	2.3	0.67	12.2	11.5	3.11
GM01	Coal	ES2326174024	04/08/2023	38.0	<0.004	0.02	0.6	0.6	0.10	20.3	19.0	3.53
GM3A	GCA	ES2326174016	03/08/2023	767	----	0.03	30.5	30.5	2.10	58.6	57.9	0.57
PB1	BCA	ES2326174019	04/08/2023	267	----	0.01	17.1	17.1	1.82	10.5	9.88	2.87
RA18	BCA	ES2326174022	04/08/2023	3900	----	0.10	8.4	8.5	3.92	23.3	22.7	1.44

Bore ID	Geology	Laboratory ID	Date	Turbidity	Total Cyanide	Nitrite + Nitrate as N	Total Kjeldahl Nitrogen as N	Total Nitrogen as N	Total Phosphorous as P	Total Anions	Total Cations	Ionic Balance
Units				**NTU**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**meq/L**	**meq/L**	**%**
Limit of Reporting (LOR)				**0.1**	**0.004**	**0.01**	**0.1**	**0.1**	**0.01**	**0.01**	**0.01**	**0.01**
ANZECC livestock limits				**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
RA27	HRA	ES2326174004	02/08/2023	3330	<0.004	0.47	3.2	3.7	6.20	7.31	6.75	3.94
RSGM1	Coal	ES2326641001	07/08/2023	13200	<0.004	1.49	18.0	19.5	10.2	35.2	36.4	1.66
T2A	BCA	ES2326174017	04/08/2023	656	<0.004	0.16	0.7	0.9	0.79	10.4	9.89	2.46
T2P	CMOB	ES2326174018	04/08/2023	84.6	<0.004	0.02	0.5	0.5	0.14	11.7	10.8	4.08
T3A	BCA	ES2326174010	03/08/2023	1880	<0.004	1.52	1.2	2.7	1.26	26.5	23.9	5.04
T3P	CMOB	ES2326174009	03/08/2023	43.4	<0.004	0.04	1.3	1.3	0.21	21.4	19.4	4.95
T4A	BCA	ES2326174012	03/08/2023	677	<0.004	0.03	1.6	1.6	1.74	14.8	13.2	5.68
T4P	CMOB	ES2326174011	03/08/2023	47.3	<0.004	0.06	4.8	4.9	1.48	6.25	5.98	2.24
WML113C	BCA	ES2326174015	03/08/2023	3910	<0.004	0.22	1.6	1.8	2.74	7.94	7.54	2.56
WML115C	BCA	ES2326641007	07/08/2023	----	----	----	----	----	----	8.91	8.73	1.04
WML119	Coal	ES2326911006	10/08/2023	233	<0.004	0.06	4.5	4.6	0.59	19.3	18.9	0.93
WML120A	Coal	ES2326911002	09/08/2023	----	<0.004	0.02	3.0	3.0	0.85	12.3	12.1	0.73
WML120B	GCA	ES2326911001	09/08/2023	1340	<0.004	0.48	2.1	2.6	1.08	9.20	9.21	0.05
WML129	GCA	ES2326641012	07/08/2023	931	<0.004	0.11	3.2	3.3	2.60	5.21	5.08	1.20
WML181	Coal	ES2326911007	10/08/2023	247	<0.004	0.01	2.0	2.0	0.22	30.6	30.2	0.77
WML183	Coal	ES2326911005	09/08/2023	33300	<0.004	0.04	21.3	21.3	7.09	45.7	48.5	2.98
WML239	GCA	ES2326641010	07/08/2023	3160	<0.004	0.11	7.5	7.6	5.24	7.26	7.31	0.31
WML261	Coal	ES2326911004	09/08/2023	16.4	<0.004	0.22	0.8	1.0	0.30	2.20	2.16	----
WML262	Coal	ES2326911008	10/08/2023	43.4	<0.004	0.01	2.1	2.1	0.33	30.8	30.0	1.29
WMLP277	HRA	ES2326174007	02/08/2023	3760	<0.004	0.77	2.7	3.5	3.83	15.2	13.6	5.60
WMLP278	HRA	ES2326174006	02/08/2023	1230	<0.004	0.69	1.4	2.1	2.13	13.5	12.2	4.89
WMLP279	HRA	ES2326174008	02/08/2023	3760	<0.004	0.23	4.6	4.8	8.10	10.3	9.70	3.14

Bore ID	Geology	Laboratory ID	Date	Turbidity	Total Cyanide	Nitrite + Nitrate as N	Total Kjeldahl Nitrogen as N	Total Nitrogen as N	Total Phosphorous as P	Total Anions	Total Cations	Ionic Balance
Units				**NTU**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**meq/L**	**meq/L**	**%**
Limit of Reporting (LOR)				**0.1**	**0.004**	**0.01**	**0.1**	**0.1**	**0.01**	**0.01**	**0.01**	**0.01**
ANZECC livestock limits				**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
WMLP280	HRA	ES2326174005	02/08/2023	343	<0.004	0.65	0.8	1.4	0.93	9.24	8.80	2.40
WMLP301	Coal	ES2326911009	10/08/2023	33.2	<0.004	0.02	2.5	2.5	0.13	28.6	28.1	0.89
WMLP302	Coal	ES2326911003	09/08/2023	----	<0.004	0.02	1.2	1.2	0.18	12.4	12.1	1.30
WMLP308	BCA	ES2326641004	07/08/2023	113	<0.004	0.04	0.4	0.4	0.17	11.2	11.0	0.80
WMLP311	BCA	ES2326641006	07/08/2023	317	<0.004	0.03	1.6	1.6	0.63	12.6	12.6	0.38
WMLP320	BCA	ES2326174020	04/08/2023	207	<0.004	0.11	0.5	0.6	0.25	11.4	10.8	2.86
WMLP323	BCA	ES2326641002	07/08/2023	1640	<0.004	0.05	8.4	8.4	3.16	9.65	9.72	0.33
WMLP324	CMOB	ES2326641003	07/08/2023	985	<0.004	0.04	7.4	7.4	4.78	9.74	9.58	0.85
WMLP325	CMOB	ES2326641005	07/08/2023	4440	<0.004	0.01	7.9	7.9	2.66	18.4	18.3	0.13
WMLP326	BCA	ES2326174013	03/08/2023	148	----	0.26	0.4	0.7	0.36	13.8	13.4	1.46
WMLP327	CMOB	ES2326174014	03/08/2023	1850	----	0.17	3.1	3.3	2.24	21.8	20.0	4.26
WMLP328	BCA	ES2326174021	04/08/2023	1430	<0.004	0.07	3.2	3.3	1.26	11.0	10.5	2.32
WMLP336	HRA	ES2326174003	02/08/2023	1370	<0.004	3.88	8.4	12.3	3.09	12.7	11.7	3.99
WMLP337	HRA	ES2326174002	02/08/2023	15100	<0.004	0.34	11.5	11.8	13.7	27.8	25.4	4.50
WMLP338	HRA	ES2326174001	02/08/2023	16700	<0.004	0.54	15.7	16.2	11.8	19.8	17.1	7.29
WMLP346	GCA	ES2326641009	07/08/2023	754	<0.004	0.01	5.1	5.1	2.70	7.77	7.88	0.65
WMLP349	GCA	ES2326641011	07/08/2023	466	<0.004	1.05	1.8	2.8	0.86	15.8	16.3	1.60
WMLP358	GCA	ES2326641008	07/08/2023	251	<0.004	1.35	1.6	3.0	0.83	4.33	4.37	0.40
YAP016	BCA	ES2326174023	04/08/2023	1260	<0.004	0.11	2.0	2.1	0.61	11.9	11.4	2.49

Appendix E

Groundwater chemistry – aquifer speciation

Table E1 Ashton August 2023 key monitoring bore water types

Bore ID	Geology	Individual Water Type	General Water Type
WMLP358	GCA	Ca-Mg-Na-Cl-HCO3	Ca-Mg
WMLP336	HRA	Ca-Na-Mg-Cl-HCO3	Ca-Na
T2P	CMOB	Ca-Na-Mg-Cl-SO4-HCO3	
T4A	BCA	Na-Ca-Cl-HCO3	Na-Ca
WML113C	BCA	Na-Ca-Cl-HCO3	
WMLP325	CMOB	Na-Ca-Cl-HCO3	
WMLP327	CMOB	Na-Ca-Cl-HCO3	
WMLP349	GCA	Na-Ca-Mg-Cl	
PB1	BCA	Na-Ca-Mg-Cl-HCO3	
RA18	BCA	Na-Ca-Mg-Cl-HCO3	
WML129	GCA	Na-Ca-Mg-Cl-HCO3	
WMLP279	HRA	Na-Ca-Mg-Cl-HCO3	
WMLP324	CMOB	Na-Ca-Mg-Cl-HCO3	
WMLP346	GCA	Na-Ca-Mg-Cl-HCO3	
T2A	BCA	Na-Ca-Mg-Cl-HCO3-SO4	
WMLP308	BCA	Na-Ca-Mg-Cl-HCO3-SO4	
WMLP320	BCA	Na-Ca-Mg-Cl-HCO3-SO4	
WMLP323	BCA	Na-Ca-Mg-Cl-HCO3-SO4	
WMLP328	BCA	Na-Ca-Mg-Cl-HCO3-SO4	
T4P	CMOB	Na-Ca-Mg-HCO3-Cl	
WML239	GCA	Na-Ca-Mg-HCO3-Cl	
RSGM1	Coal	Na-Cl	Na-Cl
GM3A	GCA	Na-Cl-HCO3	
T3P	CMOB	Na-Cl-HCO3	
WML115C	BCA	Na-Cl-HCO3	
WML119	Coal	Na-Cl-HCO3	
WML181	Coal	Na-Cl-HCO3	
WML261	Coal	Na-Cl-HCO3	
WMLP278	HRA	Na-Cl-HCO3	
YAP016	BCA	Na-Cl-HCO3	
WMLP277	HRA	Na-Cl-HCO3-SO4	
WMLP326	BCA	Na-Cl-HCO3-SO4	
RA27	HRA	Na-HCO3-Cl	Na-HCO3
WML262	Coal	Na-HCO3-Cl	
WMLP301	Coal	Na-HCO3-Cl	
WML120B	GCA	Na-Mg-Ca-Cl-HCO3	Na-Mg
WMLP280	HRA	Na-Mg-Ca-Cl-HCO3	
WMLP338	HRA	Na-Mg-Ca-Cl-HCO3	
WMLP311	BCA	Na-Mg-Ca-Cl-HCO3-SO4	
T3A	BCA	Na-Mg-Cl	
WML120A	Coal	Na-Mg-Cl-HCO3	
WML183	Coal	Na-Mg-Cl-HCO3	
WMLP302	Coal	Na-Mg-Cl-HCO3	
WMLP337	HRA	Na-Mg-Cl-HCO3	
GM01	Coal	Na-Mg-Cl-HCO3-SO4	

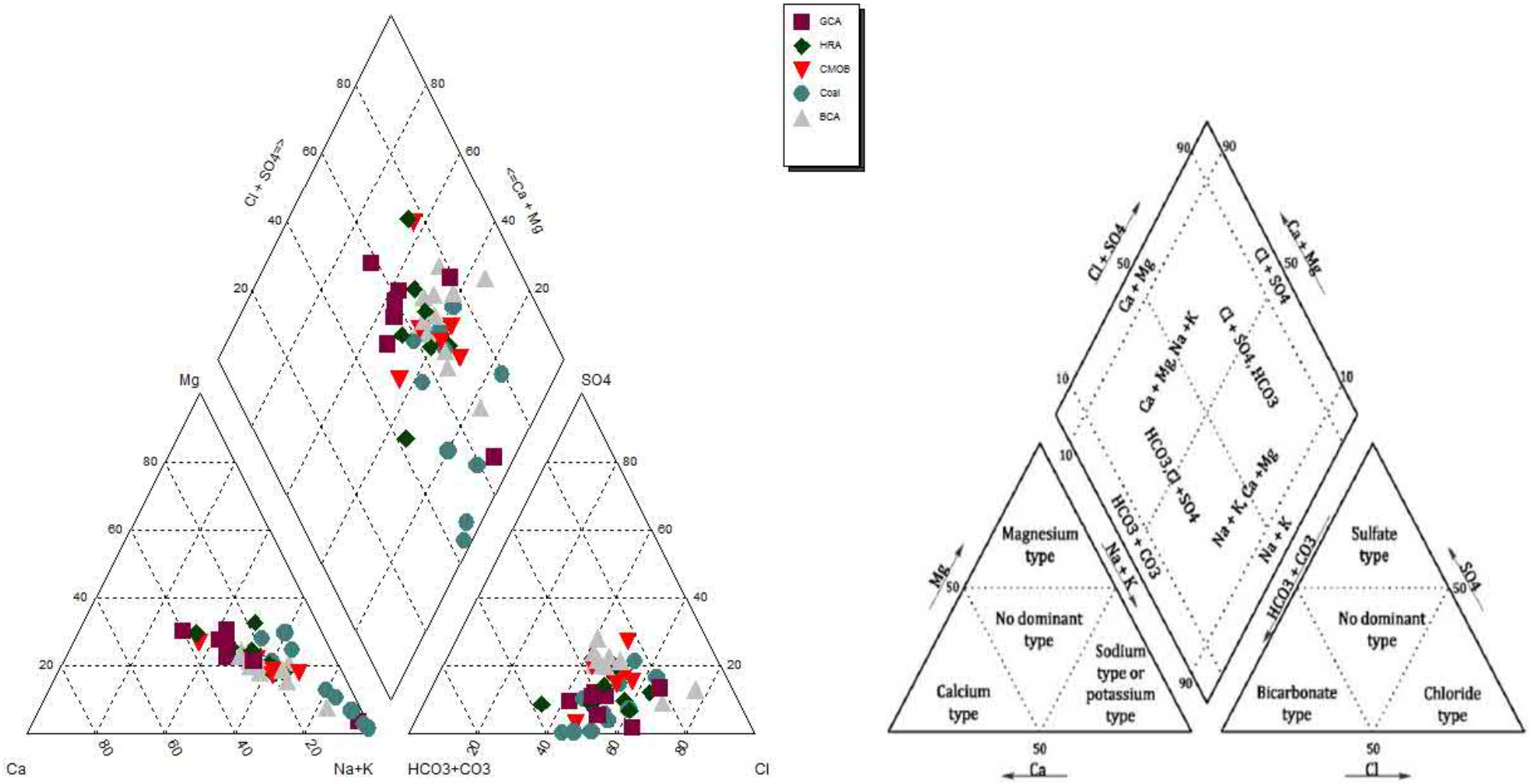


Figure E1 Ashton August 2023 key monitoring bore Piper Diagram

Appendix F

Laboratory certificate of analysis and chain of custody documents (August 2023)

CERTIFICATE OF ANALYSIS

Work Order	: **ES2326174**	Page	: 1 of 12
Client	: **AUSTRALASIAN GROUNDWATER AND ENVIRONMENTAL CONSULTANTS PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: BYRCE MCKAY	Contact	: Customer Services ES
Address	: 4 HUDSON STREET HAMILTON NSW 2303	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: AUS5009 Ashton Coal Mine GW Sampling	Date Samples Received	: 04-Aug-2023 14:53
Order number	: AUS5009	Date Analysis Commenced	: 04-Aug-2023
C-O-C number	: ----	Issue Date	: 15-Aug-2023 17:58
Sampler	: EDWARD HUNT		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 25		
No. of samples analysed	: 25		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Ruby Buller	Laboratory Technician	Chemistry, Newcastle West, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H+ to the Cations and Nitrate, SiO2 and Fluoride to the Anions.
- ED037: Alkalinity has been performed on the supernatant for sample 15.
- TDS by method EA-015 may bias high for various samples due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- TDS by method EA-015 may bias high for various samples due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	WMLP338	WMLP337	WMLP336	RA27	WMLP280
			Sampling date / time	02-Aug-2023 07:50	02-Aug-2023 08:30	02-Aug-2023 09:05	02-Aug-2023 11:15	02-Aug-2023 12:05
Compound	CAS Number	LOR	Unit	ES2326174-001	ES2326174-002	ES2326174-003	ES2326174-004	ES2326174-005
				Result	Result	Result	Result	Result
EA005: pH								
pH Value	----	0.01	pH Unit	**6.94**	**7.25**	**6.69**	**7.22**	**7.05**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**1710**	**2380**	**1190**	**656**	**850**
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**1160**	**1470**	**914**	**711**	**590**
EA045: Turbidity								
Turbidity	----	0.1	NTU	**16700**	**15100**	**1370**	**3330**	**343**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**370**	**670**	**177**	**226**	**190**
Total Alkalinity as CaCO3	----	1	mg/L	**370**	**670**	**177**	**226**	**190**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**60**	**102**	**70**	**27**	**58**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**396**	**437**	**272**	**79**	**150**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**78**	**91**	**85**	**20**	**35**
Magnesium	7439-95-4	1	mg/L	**51**	**101**	**42**	**16**	**22**
Sodium	7440-23-5	1	mg/L	**207**	**287**	**86**	**102**	**120**
Potassium	7440-09-7	1	mg/L	**1**	**4**	**10**	<1	**1**
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	**0.003**	**0.003**	**0.001**	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	**0.006**	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	**0.004**	**0.004**	**0.003**	<0.001	**0.002**
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	**0.024**	**0.009**	**0.012**	<0.005	**0.006**
Manganese	7439-96-5	0.001	mg/L	**0.557**	**1.27**	**0.451**	<0.001	**0.099**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Iron	7439-89-6	0.05	mg/L	**1.88**	**1.24**	**1.30**	<0.05	<0.05
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	WMLP338	WMLP337	WMLP336	RA27	WMLP280
				Sampling date / time	02-Aug-2023 07:50	02-Aug-2023 08:30	02-Aug-2023 09:05	02-Aug-2023 11:15	02-Aug-2023 12:05
Compound	CAS Number	LOR	Unit		ES2326174-001	ES2326174-002	ES2326174-003	ES2326174-004	ES2326174-005
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Arsenic	7440-38-2	0.001	mg/L		**0.063**	**0.021**	**0.010**	**0.012**	**0.004**
Cadmium	7440-43-9	0.0001	mg/L		**0.0009**	**0.0008**	<0.0001	**0.0004**	<0.0001
Chromium	7440-47-3	0.001	mg/L		**0.277**	**0.200**	**0.028**	**0.153**	**0.031**
Copper	7440-50-8	0.001	mg/L		**0.222**	**0.230**	**0.034**	**0.132**	**0.019**
Nickel	7440-02-0	0.001	mg/L		**0.172**	**0.213**	**0.024**	**0.388**	**0.041**
Lead	7439-92-1	0.001	mg/L		**0.149**	**0.102**	**0.014**	**0.044**	**0.006**
Zinc	7440-66-6	0.005	mg/L		**1.02**	**1.12**	**0.196**	**0.364**	**0.072**
Manganese	7439-96-5	0.001	mg/L		**1.74**	**2.97**	**0.604**	**7.48**	**1.02**
Selenium	7782-49-2	0.01	mg/L		**0.04**	**0.03**	<0.01	**0.02**	<0.01
Iron	7439-89-6	0.05	mg/L		**209**	**154**	**28.3**	**124**	**20.5**
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	<0.004	<0.004	<0.004	<0.004
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**0.50**	**0.31**	**3.63**	**0.47**	**0.65**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**0.54**	**0.34**	**3.88**	**0.47**	**0.65**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**15.7**	**11.5**	**8.4**	**3.2**	**0.8**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**16.2**	**11.8**	**12.3**	**3.7**	**1.4**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**11.8**	**13.7**	**3.09**	**6.20**	**0.93**
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**19.8**	**27.8**	**12.7**	**7.31**	**9.24**
ø Total Cations	----	0.01	meq/L		**17.1**	**25.4**	**11.7**	**6.75**	**8.80**
ø Ionic Balance	----	0.01	%		**7.29**	**4.50**	**3.99**	**3.94**	**2.40**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	WMLP278	WMLP277	WMLP279	T3P	T3A
			Sampling date / time	02-Aug-2023 12:35	02-Aug-2023 13:00	02-Aug-2023 13:40	03-Aug-2023 08:30	03-Aug-2023 09:20
Compound	CAS Number	LOR	Unit	ES2326174-006	ES2326174-007	ES2326174-008	ES2326174-009	ES2326174-010
				Result	Result	Result	Result	Result
EA005: pH								
pH Value	----	0.01	pH Unit	**7.21**	**7.30**	**7.11**	**7.60**	**7.08**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**1200**	**1350**	**943**	**1890**	**2490**
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**756**	**1070**	**638**	**1080**	**1600**
EA045: Turbidity								
Turbidity	----	0.1	NTU	**1230**	**3760**	**3760**	**43.4**	**1880**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**249**	**269**	**192**	**364**	**169**
Total Alkalinity as CaCO3	----	1	mg/L	**249**	**269**	**192**	**364**	**169**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**110**	**142**	**45**	**158**	**161**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**221**	**244**	**197**	**385**	**700**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**49**	**47**	**55**	**49**	**67**
Magnesium	7439-95-4	1	mg/L	**26**	**30**	**30**	**42**	**61**
Sodium	7440-23-5	1	mg/L	**176**	**202**	**102**	**308**	**358**
Potassium	7440-09-7	1	mg/L	<1	<1	**2**	**4**	<1
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	**0.002**	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	**0.002**	**0.004**	**0.002**	**0.003**	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Manganese	7439-96-5	0.001	mg/L	**0.047**	**0.383**	**0.374**	**0.058**	**0.002**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	**0.07**	**0.22**	<0.05
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	WMLP278	WMLP277	WMLP279	T3P	T3A
			Sampling date / time	02-Aug-2023 12:35	02-Aug-2023 13:00	02-Aug-2023 13:40	03-Aug-2023 08:30	03-Aug-2023 09:20
Compound	CAS Number	LOR	Unit	ES2326174-006	ES2326174-007	ES2326174-008	ES2326174-009	ES2326174-010
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Arsenic	7440-38-2	0.001	mg/L	**0.004**	**0.016**	**0.034**	<0.001	**0.016**
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	**0.0003**	<0.0001	<0.0001	**0.0001**
Chromium	7440-47-3	0.001	mg/L	**0.040**	**0.170**	**0.052**	**0.020**	**0.092**
Copper	7440-50-8	0.001	mg/L	**0.025**	**0.142**	**0.048**	**0.009**	**0.037**
Nickel	7440-02-0	0.001	mg/L	**0.049**	**0.250**	**0.045**	**0.014**	**0.060**
Lead	7439-92-1	0.001	mg/L	**0.008**	**0.046**	**0.017**	**0.003**	**0.031**
Zinc	7440-66-6	0.005	mg/L	**0.067**	**0.328**	**0.122**	**0.142**	**0.134**
Manganese	7439-96-5	0.001	mg/L	**0.964**	**2.84**	**1.61**	**0.076**	**1.27**
Selenium	7782-49-2	0.01	mg/L	<0.01	**0.02**	<0.01	<0.01	**0.01**
Iron	7439-89-6	0.05	mg/L	**28.7**	**125**	**79.4**	**2.77**	**49.9**
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.69**	**0.77**	**0.23**	**0.04**	**1.52**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.69**	**0.77**	**0.23**	**0.04**	**1.52**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**1.4**	**2.7**	**4.6**	**1.3**	**1.2**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**2.1**	**3.5**	**4.8**	**1.3**	**2.7**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**2.13**	**3.83**	**8.10**	**0.21**	**1.26**
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**13.5**	**15.2**	**10.3**	**21.4**	**26.5**
ø Total Cations	----	0.01	meq/L	**12.2**	**13.6**	**9.70**	**19.4**	**23.9**
ø Ionic Balance	----	0.01	%	**4.89**	**5.60**	**3.14**	**4.95**	**5.04**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	T4P	T4A	WMLP326	WMLP327	WML113C
			Sampling date / time	03-Aug-2023 09:50	03-Aug-2023 10:30	03-Aug-2023 11:05	03-Aug-2023 12:15	03-Aug-2023 13:00
Compound	CAS Number	LOR	Unit	ES2326174-011	ES2326174-012	ES2326174-013	ES2326174-014	ES2326174-015
				Result	Result	Result	Result	Result
EA005: pH								
pH Value	----	0.01	pH Unit	**7.20**	**7.21**	**7.35**	**7.18**	**7.11**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**624**	**1360**	**1280**	**1900**	**768**
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**367**	**893**	**767**	**1190**	**601**
EA045: Turbidity								
Turbidity	----	0.1	NTU	**47.3**	**677**	**148**	**1850**	**3910**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**172**	**189**	**269**	**347**	**161**
Total Alkalinity as CaCO3	----	1	mg/L	**172**	**189**	**269**	**347**	**161**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**8**	**92**	**134**	**152**	**71**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**94**	**323**	**199**	**416**	**115**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**27**	**63**	**46**	**82**	**39**
Magnesium	7439-95-4	1	mg/L	**16**	**29**	**25**	**42**	**18**
Sodium	7440-23-5	1	mg/L	**68**	**176**	**207**	**285**	**94**
Potassium	7440-09-7	1	mg/L	**14**	**1**	**1**	**4**	**1**
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	**0.001**	<0.001	<0.001	**0.002**	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	**0.001**	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	**0.003**	<0.001	**0.001**	**0.005**	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	**0.007**	<0.005
Manganese	7439-96-5	0.001	mg/L	**0.866**	**0.088**	**0.108**	**0.099**	**0.030**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Iron	7439-89-6	0.05	mg/L	**2.28**	<0.05	<0.05	<0.05	<0.05
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	T4P	T4A	WMLP326	WMLP327	WML113C
				Sampling date / time	03-Aug-2023 09:50	03-Aug-2023 10:30	03-Aug-2023 11:05	03-Aug-2023 12:15	03-Aug-2023 13:00
Compound	CAS Number	LOR	Unit		ES2326174-011	ES2326174-012	ES2326174-013	ES2326174-014	ES2326174-015
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Arsenic	7440-38-2	0.001	mg/L		**0.003**	**0.010**	**0.002**	**0.026**	**0.028**
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	**0.0006**	**0.0002**
Chromium	7440-47-3	0.001	mg/L		**0.007**	**0.024**	**0.017**	**0.076**	**0.048**
Copper	7440-50-8	0.001	mg/L		**0.006**	**0.025**	**0.010**	**0.095**	**0.041**
Nickel	7440-02-0	0.001	mg/L		**0.009**	**0.019**	**0.015**	**0.090**	**0.034**
Lead	7439-92-1	0.001	mg/L		**0.003**	**0.020**	**0.004**	**0.043**	**0.064**
Zinc	7440-66-6	0.005	mg/L		**0.119**	**0.102**	**0.034**	**0.331**	**0.203**
Manganese	7439-96-5	0.001	mg/L		**0.904**	**0.649**	**0.294**	**0.802**	**0.748**
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Iron	7439-89-6	0.05	mg/L		**6.08**	**41.0**	**11.1**	**57.1**	**92.8**
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	<0.004	----	----	<0.004
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**0.05**	**0.03**	**0.26**	**0.17**	**0.22**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**0.06**	**0.03**	**0.26**	**0.17**	**0.22**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**4.8**	**1.6**	**0.4**	**3.1**	**1.6**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**4.9**	**1.6**	**0.7**	**3.3**	**1.8**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**1.48**	**1.74**	**0.36**	**2.24**	**2.74**
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**6.25**	**14.8**	**13.8**	**21.8**	**7.94**
ø Total Cations	----	0.01	meq/L		**5.98**	**13.2**	**13.4**	**20.0**	**7.54**
ø Ionic Balance	----	0.01	%		**2.24**	**5.68**	**1.46**	**4.26**	**2.56**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	GM3A	T2A	T2P	PB1	WMLP320
			Sampling date / time	03-Aug-2023 14:05	04-Aug-2023 07:30	04-Aug-2023 08:20	04-Aug-2023 08:55	04-Aug-2023 09:25
Compound	CAS Number	LOR	Unit	ES2326174-016	ES2326174-017	ES2326174-018	ES2326174-019	ES2326174-020
				Result	Result	Result	Result	Result
EA005: pH								
pH Value	----	0.01	pH Unit	**7.47**	**7.25**	**6.93**	**6.80**	**6.92**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**5240**	**961**	**1040**	**1030**	**1020**
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**3270**	**636**	**616**	**582**	**610**
EA045: Turbidity								
Turbidity	----	0.1	NTU	**767**	**656**	**84.6**	**267**	**207**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**1150**	**206**	**156**	**186**	**203**
Total Alkalinity as CaCO3	----	1	mg/L	**1150**	**206**	**156**	**186**	**203**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**45**	**94**	**146**	**94**	**144**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**1230**	**153**	**197**	**170**	**154**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**29**	**46**	**80**	**48**	**58**
Magnesium	7439-95-4	1	mg/L	**24**	**24**	**35**	**24**	**30**
Sodium	7440-23-5	1	mg/L	**1250**	**128**	**89**	**125**	**123**
Potassium	7440-09-7	1	mg/L	**6**	**2**	**2**	**3**	**2**
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	**0.007**	<0.001	**0.004**	**0.001**	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	**0.008**	<0.001	**0.003**	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	**0.023**	<0.005	<0.005
Manganese	7439-96-5	0.001	mg/L	**0.218**	**0.005**	**0.389**	**0.056**	**0.009**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	**2.36**	**1.10**	<0.05
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	GM3A	T2A	T2P	PB1	WMLP320
			Sampling date / time	03-Aug-2023 14:05	04-Aug-2023 07:30	04-Aug-2023 08:20	04-Aug-2023 08:55	04-Aug-2023 09:25
Compound	CAS Number	LOR	Unit	ES2326174-016	ES2326174-017	ES2326174-018	ES2326174-019	ES2326174-020
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Arsenic	7440-38-2	0.001	mg/L	**0.024**	**0.003**	**0.010**	**0.006**	**0.002**
Cadmium	7440-43-9	0.0001	mg/L	**0.0003**	<0.0001	<0.0001	**0.0001**	<0.0001
Chromium	7440-47-3	0.001	mg/L	**0.030**	**0.023**	**0.007**	**0.017**	**0.005**
Copper	7440-50-8	0.001	mg/L	**0.058**	**0.013**	**0.007**	**0.035**	**0.005**
Nickel	7440-02-0	0.001	mg/L	**0.044**	**0.020**	**0.010**	**0.013**	**0.004**
Lead	7439-92-1	0.001	mg/L	**0.048**	**0.010**	**0.006**	**0.013**	**0.008**
Zinc	7440-66-6	0.005	mg/L	**1.45**	**0.058**	**0.077**	**0.233**	**0.033**
Manganese	7439-96-5	0.001	mg/L	**0.529**	**0.361**	**0.438**	**0.131**	**0.098**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Iron	7439-89-6	0.05	mg/L	**36.8**	**25.0**	**5.94**	**20.8**	**6.44**
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	0.004	mg/L	**----**	<0.004	<0.004	**----**	<0.004
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.03**	**0.16**	**0.02**	**0.01**	**0.11**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.03**	**0.16**	**0.02**	**0.01**	**0.11**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**30.5**	**0.7**	**0.5**	**17.1**	**0.5**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**30.5**	**0.9**	**0.5**	**17.1**	**0.6**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**2.10**	**0.79**	**0.14**	**1.82**	**0.25**
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**58.6**	**10.4**	**11.7**	**10.5**	**11.4**
ø Total Cations	----	0.01	meq/L	**57.9**	**9.89**	**10.8**	**9.88**	**10.8**
ø Ionic Balance	----	0.01	%	**0.57**	**2.46**	**4.08**	**2.87**	**2.86**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	WMLP328	RA18	YAP016	GM01	DUPLICATE
			Sampling date / time	04-Aug-2023 10:40	04-Aug-2023 11:30	04-Aug-2023 12:30	04-Aug-2023 13:00	04-Aug-2023 00:00
Compound	CAS Number	LOR	Unit	ES2326174-021	ES2326174-022	ES2326174-023	ES2326174-024	ES2326174-025
				Result	Result	Result	Result	Result
EA005: pH								
pH Value	----	0.01	pH Unit	**7.52**	**7.27**	**7.27**	**7.31**	**7.27**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**990**	**2100**	**1100**	**1810**	**1100**
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**640**	**1340**	**668**	**1040**	**672**
EA045: Turbidity								
Turbidity	----	0.1	NTU	**1430**	**3900**	**1260**	**38.0**	**1820**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**216**	**301**	**223**	**283**	**230**
Total Alkalinity as CaCO3	----	1	mg/L	**216**	**301**	**223**	**283**	**230**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**117**	**96**	**107**	**196**	**108**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**151**	**543**	**186**	**376**	**191**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**53**	**117**	**38**	**70**	**40**
Magnesium	7439-95-4	1	mg/L	**27**	**67**	**26**	**49**	**26**
Sodium	7440-23-5	1	mg/L	**128**	**259**	**167**	**261**	**168**
Potassium	7440-09-7	1	mg/L	**3**	**2**	**2**	**3**	**2**
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	**0.001**	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	**0.003**	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	**0.002**	**0.005**	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	**0.006**	<0.005
Manganese	7439-96-5	0.001	mg/L	**0.247**	**0.515**	**0.043**	**0.524**	**0.018**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	**0.77**	<0.05
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	WMLP328	RA18	YAP016	GM01	DUPLICATE
				Sampling date / time	04-Aug-2023 10:40	04-Aug-2023 11:30	04-Aug-2023 12:30	04-Aug-2023 13:00	04-Aug-2023 00:00
Compound	CAS Number	LOR	Unit		ES2326174-021	ES2326174-022	ES2326174-023	ES2326174-024	ES2326174-025
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Arsenic	7440-38-2	0.001	mg/L		0.014	0.021	0.052	0.002	0.023
Cadmium	7440-43-9	0.0001	mg/L		0.0002	0.0004	0.0041	<0.0001	0.0016
Chromium	7440-47-3	0.001	mg/L		0.019	0.095	0.228	0.003	0.070
Copper	7440-50-8	0.001	mg/L		0.057	0.246	0.275	0.003	0.108
Nickel	7440-02-0	0.001	mg/L		0.028	0.069	0.198	0.002	0.066
Lead	7439-92-1	0.001	mg/L		0.033	0.074	0.337	0.003	0.180
Zinc	7440-66-6	0.005	mg/L		0.161	0.359	0.741	0.046	0.304
Manganese	7439-96-5	0.001	mg/L		1.23	2.82	28.1	0.765	8.66
Selenium	7782-49-2	0.01	mg/L		<0.01	0.02	0.05	<0.01	0.02
Iron	7439-89-6	0.05	mg/L		25.7	96.9	236	3.70	83.1
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	----	<0.004	<0.004	<0.004
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.07	0.10	0.11	0.02	0.12
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.07	0.10	0.11	0.02	0.12
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		3.2	8.4	2.0	0.6	2.2
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		3.3	8.5	2.1	0.6	2.3
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		1.26	3.92	0.61	0.10	0.67
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		11.0	23.3	11.9	20.3	12.2
ø Total Cations	----	0.01	meq/L		10.5	22.7	11.4	19.0	11.5
ø Ionic Balance	----	0.01	%		2.32	1.44	2.49	3.53	3.11

Inter-Laboratory Testing

Analysis conducted by ALS Newcastle - Water, NATA accreditation no. 825, site no. 1656 (Chemistry) 9854 (Biology).

(WATER) EA005: pH

CERTIFICATE OF ANALYSIS

Work Order	: **ES2326641**	Page	: 1 of 8
Client	: **AUSTRALASIAN GROUNDWATER AND ENVIRONMENTAL CONSULTANTS PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: BYRCE MCKAY	Contact	: Customer Services ES
Address	: 4 HUDSON STREET HAMILTON NSW 2303	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: ASH5009 Ashton Coal Mine GW Sampling	Date Samples Received	: 09-Aug-2023 11:07
Order number	: ASH5009	Date Analysis Commenced	: 09-Aug-2023
C-O-C number	: ----	Issue Date	: 16-Aug-2023 15:45
Sampler	: EDWARD HUNT		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 12		
No. of samples analysed	: 12		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Christopher Cameron	Laboratory Technician	Chemistry, Newcastle West, NSW
Dian Dao	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H+ to the Cations and Nitrate, SiO2 and Fluoride to the Anions.
- TDS by method EA-015 may bias high for various samples due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	RSGM1	WMLP323	WMLP324	WMLP308	WMLP325
			Sampling date / time	07-Aug-2023 07:30	07-Aug-2023 09:05	07-Aug-2023 09:45	07-Aug-2023 10:15	07-Aug-2023 11:15
Compound	CAS Number	LOR	Unit	ES2326641-001	ES2326641-002	ES2326641-003	ES2326641-004	ES2326641-005
				Result	Result	Result	Result	Result
EA005: pH								
pH Value	----	0.01	pH Unit	**7.41**	**7.18**	**7.18**	**7.14**	**7.37**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**3600**	**942**	**950**	**1110**	**1820**
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**2730**	**590**	**578**	**612**	**1060**
EA045: Turbidity								
Turbidity	----	0.1	NTU	**13200**	**1640**	**985**	**113**	**4440**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**414**	**196**	**203**	**197**	**341**
Total Alkalinity as CaCO3	----	1	mg/L	**414**	**196**	**203**	**197**	**341**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**264**	**90**	**86**	**115**	**121**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**759**	**137**	**138**	**174**	**320**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**40**	**48**	**46**	**49**	**72**
Magnesium	7439-95-4	1	mg/L	**46**	**26**	**26**	**29**	**41**
Sodium	7440-23-5	1	mg/L	**702**	**118**	**117**	**142**	**259**
Potassium	7440-09-7	1	mg/L	**2**	**2**	**2**	**2**	**3**
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	**0.003**	<0.001	**0.002**	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	**0.010**	<0.005	<0.005	<0.005	<0.005
Manganese	7439-96-5	0.001	mg/L	**0.034**	**0.142**	**0.276**	**0.038**	**0.438**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	**0.63**	**0.18**	**0.63**
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	RSGM1	WMLP323	WMLP324	WMLP308	WMLP325
				Sampling date / time	07-Aug-2023 07:30	07-Aug-2023 09:05	07-Aug-2023 09:45	07-Aug-2023 10:15	07-Aug-2023 11:15
Compound	CAS Number	LOR	Unit		ES2326641-001	ES2326641-002	ES2326641-003	ES2326641-004	ES2326641-005
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Arsenic	7440-38-2	0.001	mg/L		0.088	0.002	0.077	0.002	0.007
Cadmium	7440-43-9	0.0001	mg/L		0.0049	<0.0001	0.0015	<0.0001	0.0002
Chromium	7440-47-3	0.001	mg/L		0.464	0.004	0.140	0.005	0.020
Copper	7440-50-8	0.001	mg/L		0.499	0.017	0.365	0.007	0.037
Nickel	7440-02-0	0.001	mg/L		0.213	0.007	0.185	0.004	0.024
Lead	7439-92-1	0.001	mg/L		0.413	0.015	0.195	0.004	0.024
Zinc	7440-66-6	0.005	mg/L		2.04	0.050	0.979	0.027	0.108
Manganese	7439-96-5	0.001	mg/L		2.16	0.869	7.01	0.089	0.732
Selenium	7782-49-2	0.01	mg/L		0.12	<0.01	0.05	<0.01	<0.01
Iron	7439-89-6	0.05	mg/L		365	5.55	304	9.42	28.3
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	<0.004	<0.004	<0.004	<0.004
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		1.49	0.05	0.04	0.04	0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		1.49	0.05	0.04	0.04	0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		18.0	8.4	7.4	0.4	7.9
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		19.5	8.4	7.4	0.4	7.9
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		10.2	3.16	4.78	0.17	2.66
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		35.2	9.65	9.74	11.2	18.4
ø Total Cations	----	0.01	meq/L		36.4	9.72	9.58	11.0	18.3
ø Ionic Balance	----	0.01	%		1.66	0.33	0.85	0.80	0.13

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	WMLP311	WML115C	WMLP358	WMLP346	WML239
			Sampling date / time	07-Aug-2023 11:45	07-Aug-2023 12:30	07-Aug-2023 08:15	07-Aug-2023 09:05	07-Aug-2023 09:45
Compound	CAS Number	LOR	Unit	ES2326641-006	ES2326641-007	ES2326641-008	ES2326641-009	ES2326641-010
				Result	Result	Result	Result	Result
EA005: pH								
pH Value	----	0.01	pH Unit	**6.93**	**7.10**	**6.68**	**6.82**	**6.90**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**1240**	**864**	**434**	**792**	**706**
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**766**	**----**	**319**	**476**	**531**
EA045: Turbidity								
Turbidity	----	0.1	NTU	**317**	**----**	**251**	**754**	**3160**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**203**	**158**	**99**	**184**	**194**
Total Alkalinity as CaCO3	----	1	mg/L	**203**	**158**	**99**	**184**	**194**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**123**	**65**	**21**	**18**	**30**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**214**	**156**	**68**	**132**	**98**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**58**	**17**	**35**	**46**	**45**
Magnesium	7439-95-4	1	mg/L	**37**	**8**	**16**	**25**	**20**
Sodium	7440-23-5	1	mg/L	**151**	**166**	**30**	**81**	**78**
Potassium	7440-09-7	1	mg/L	**2**	<1	<1	<1	**1**
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	**----**	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	**----**	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	**----**	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	**----**	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	**----**	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	**----**	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	**----**	**0.007**	<0.005	<0.005
Manganese	7439-96-5	0.001	mg/L	**0.034**	**----**	**0.004**	**0.228**	**0.034**
Selenium	7782-49-2	0.01	mg/L	<0.01	**----**	<0.01	<0.01	<0.01
Iron	7439-89-6	0.05	mg/L	<0.05	**----**	<0.05	**0.16**	<0.05
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	WMLP311	WML115C	WMLP358	WMLP346	WML239
				Sampling date / time	07-Aug-2023 11:45	07-Aug-2023 12:30	07-Aug-2023 08:15	07-Aug-2023 09:05	07-Aug-2023 09:45
Compound	CAS Number	LOR	Unit		ES2326641-006	ES2326641-007	ES2326641-008	ES2326641-009	ES2326641-010
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Arsenic	7440-38-2	0.001	mg/L		**0.002**	----	**0.003**	**0.006**	**0.048**
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	----	<0.0001	**0.0008**	**0.0004**
Chromium	7440-47-3	0.001	mg/L		**0.029**	----	**0.030**	**0.038**	**0.120**
Copper	7440-50-8	0.001	mg/L		**0.007**	----	**0.067**	**0.035**	**0.190**
Nickel	7440-02-0	0.001	mg/L		**0.010**	----	**0.014**	**0.023**	**0.082**
Lead	7439-92-1	0.001	mg/L		**0.005**	----	**0.015**	**0.017**	**0.098**
Zinc	7440-66-6	0.005	mg/L		**0.032**	----	**0.074**	**0.116**	**0.421**
Manganese	7439-96-5	0.001	mg/L		**0.256**	----	**0.436**	**0.465**	**0.902**
Selenium	7782-49-2	0.01	mg/L		<0.01	----	<0.01	<0.01	**0.04**
Iron	7439-89-6	0.05	mg/L		**11.8**	----	**15.8**	**31.8**	**196**
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	----	<0.004	<0.004	<0.004
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**0.03**	----	**1.35**	**0.01**	**0.11**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**0.03**	----	**1.35**	**0.01**	**0.11**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**1.6**	----	**1.6**	**5.1**	**7.5**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**1.6**	----	**3.0**	**5.1**	**7.6**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.63**	----	**0.83**	**2.70**	**5.24**
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**12.6**	**8.91**	**4.33**	**7.77**	**7.26**
ø Total Cations	----	0.01	meq/L		**12.6**	**8.73**	**4.37**	**7.88**	**7.31**
ø Ionic Balance	----	0.01	%		**0.38**	**1.04**	**0.40**	**0.65**	**0.31**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	WMLP349	WML129	----	----	----
			Sampling date / time	07-Aug-2023 10:15	07-Aug-2023 11:30	----	----	----
Compound	CAS Number	LOR	Unit	ES2326641-011	ES2326641-012	--------	--------	--------
				Result	Result	----	----	----
EA005: pH								
pH Value	----	0.01	pH Unit	**6.81**	**7.02**	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**1670**	**521**	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**958**	**280**	----	----	----
EA045: Turbidity								
Turbidity	----	0.1	NTU	**466**	**931**	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**191**	**109**	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**191**	**109**	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**97**	**25**	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**354**	**89**	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**78**	**31**	----	----	----
Magnesium	7439-95-4	1	mg/L	**42**	**17**	----	----	----
Sodium	7440-23-5	1	mg/L	**206**	**48**	----	----	----
Potassium	7440-09-7	1	mg/L	**1**	**2**	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	----	----	----
Nickel	7440-02-0	0.001	mg/L	**0.001**	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	----	----	----
Zinc	7440-66-6	0.005	mg/L	**0.005**	<0.005	----	----	----
Manganese	7439-96-5	0.001	mg/L	**0.088**	**0.310**	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	----	----	----
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	WMLP349	WML129	----	----	----
				Sampling date / time	07-Aug-2023 10:15	07-Aug-2023 11:30	----	----	----
Compound	CAS Number	LOR	Unit		ES2326641-011	ES2326641-012	--------	--------	--------
					Result	Result	----	----	----
EG020T: Total Metals by ICP-MS - Continued									
Arsenic	7440-38-2	0.001	mg/L		**0.006**	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	----	----	----
Chromium	7440-47-3	0.001	mg/L		**0.021**	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L		**0.013**	<0.001	----	----	----
Nickel	7440-02-0	0.001	mg/L		**0.018**	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L		**0.009**	<0.001	----	----	----
Zinc	7440-66-6	0.005	mg/L		**0.062**	<0.005	----	----	----
Manganese	7439-96-5	0.001	mg/L		**0.415**	**0.326**	----	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	----	----	----
Iron	7439-89-6	0.05	mg/L		**25.4**	<0.05	----	----	----
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	<0.004	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**1.05**	**0.11**	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**1.05**	**0.11**	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**1.8**	**3.2**	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**2.8**	**3.3**	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.86**	**2.60**	----	----	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**15.8**	**5.21**	----	----	----
ø Total Cations	----	0.01	meq/L		**16.3**	**5.08**	----	----	----
ø Ionic Balance	----	0.01	%		**1.60**	**1.20**	----	----	----

Inter-Laboratory Testing

Analysis conducted by ALS Newcastle - Water, NATA accreditation no. 825, site no. 1656 (Chemistry) 9854 (Biology).

(WATER) EA005: pH

CERTIFICATE OF ANALYSIS

Work Order	: **ES2326911**	Page	: 1 of 6
Client	: **AUSTRALASIAN GROUNDWATER AND ENVIRONMENTAL CONSULTANTS PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: BYRCE MCKAY	Contact	: Customer Services ES
Address	: 4 HUDSON STREET HAMILTON NSW 2303	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: ASH5010 ASHTON COAL MINE GW SAMPLING	Date Samples Received	: 10-Aug-2023 13:42
Order number	: ----	Date Analysis Commenced	: 10-Aug-2023
C-O-C number	: ----	Issue Date	: 18-Aug-2023 14:04
Sampler	: EDWARD HUNT		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 9		
No. of samples analysed	: 9		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Dian Dao	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Ruby Buller	Laboratory Technician	Chemistry, Newcastle West, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- ED041G: LOR raised for Sulfate on sample no: 8 due to sample matrix.
- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H+ to the Cations and Nitrate, SiO2 and Fluoride to the Anions.
- TDS by method EA-015 may bias high for various samples due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	WML120B	WML120A	WMLP302	WML261	WML183
			Sampling date / time	09-Aug-2023 07:55	09-Aug-2023 08:40	09-Aug-2023 10:30	09-Aug-2023 11:50	09-Aug-2023 13:30
Compound	CAS Number	LOR	Unit	ES2326911-001	ES2326911-002	ES2326911-003	ES2326911-004	ES2326911-005
				Result	Result	Result	Result	Result
EA005: pH								
pH Value	----	0.01	pH Unit	**6.74**	**7.31**	**6.69**	**6.87**	**7.02**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**879**	**1150**	**1190**	**225**	**4180**
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**484**	**----**	**----**	**164**	**2540**
EA045: Turbidity								
Turbidity	----	0.1	NTU	**1340**	**----**	**----**	**16.4**	**33300**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**206**	**277**	**230**	**53**	**825**
Total Alkalinity as CaCO3	----	1	mg/L	**206**	**277**	**230**	**53**	**825**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**49**	**21**	**39**	**10**	**302**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**144**	**223**	**248**	**33**	**813**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**50**	**44**	**27**	**8**	**103**
Magnesium	7439-95-4	1	mg/L	**34**	**41**	**36**	**5**	**174**
Sodium	7440-23-5	1	mg/L	**90**	**148**	**177**	**27**	**662**
Potassium	7440-09-7	1	mg/L	<1	**3**	**3**	**7**	**10**
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	**0.002**	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	**0.003**
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	**0.112**	**0.228**	**0.007**
Manganese	7439-96-5	0.001	mg/L	**0.017**	**0.059**	**0.048**	**0.002**	**0.434**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Iron	7439-89-6	0.05	mg/L	<0.05	**0.08**	**1.08**	**0.13**	<0.05
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	WML120B	WML120A	WMLP302	WML261	WML183
				Sampling date / time	09-Aug-2023 07:55	09-Aug-2023 08:40	09-Aug-2023 10:30	09-Aug-2023 11:50	09-Aug-2023 13:30
Compound	CAS Number	LOR	Unit		ES2326911-001	ES2326911-002	ES2326911-003	ES2326911-004	ES2326911-005
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Arsenic	7440-38-2	0.001	mg/L		**0.006**	**0.009**	**0.002**	<0.001	**0.048**
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	**0.0022**
Chromium	7440-47-3	0.001	mg/L		**0.044**	**0.014**	**0.007**	**0.001**	**0.308**
Copper	7440-50-8	0.001	mg/L		**0.024**	**0.020**	**0.012**	**0.002**	**0.662**
Nickel	7440-02-0	0.001	mg/L		**0.022**	**0.012**	**0.004**	**0.002**	**0.340**
Lead	7439-92-1	0.001	mg/L		**0.017**	**0.014**	**0.005**	<0.001	**0.371**
Zinc	7440-66-6	0.005	mg/L		**0.089**	**0.063**	**0.404**	**0.282**	**2.08**
Manganese	7439-96-5	0.001	mg/L		**0.542**	**0.255**	**0.122**	**0.008**	**3.80**
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	**0.05**
Iron	7439-89-6	0.05	mg/L		**33.1**	**37.7**	**5.63**	**1.25**	**390**
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	<0.004	<0.004	<0.004	<0.004
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**0.48**	**0.01**	**0.02**	**0.22**	**0.04**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**0.48**	**0.02**	**0.02**	**0.22**	**0.04**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**2.1**	**3.0**	**1.2**	**0.8**	**21.3**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**2.6**	**3.0**	**1.2**	**1.0**	**21.3**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**1.08**	**0.85**	**0.18**	**0.30**	**7.09**
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**9.20**	**12.3**	**12.4**	**2.20**	**45.7**
ø Total Cations	----	0.01	meq/L		**9.21**	**12.1**	**12.1**	**2.16**	**48.5**
ø Ionic Balance	----	0.01	%		**0.05**	**0.73**	**1.30**	**----**	**2.98**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	WML119	WML181	WML262	WMLP301	----
			Sampling date / time	10-Aug-2023 09:15	10-Aug-2023 10:30	10-Aug-2023 11:15	10-Aug-2023 11:45	----
Compound	CAS Number	LOR	Unit	ES2326911-006	ES2326911-007	ES2326911-008	ES2326911-009	--------
				Result	Result	Result	Result	----
EA005: pH								
pH Value	----	0.01	pH Unit	**7.19**	**7.07**	**7.98**	**8.03**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**1800**	**2770**	**2700**	**2580**	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**1000**	**1680**	**1640**	**1560**	----
EA045: Turbidity								
Turbidity	----	0.1	NTU	**233**	**247**	**43.4**	**33.2**	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**499**	**695**	**878**	**862**	----
Total Alkalinity as CaCO3	----	1	mg/L	**499**	**695**	**878**	**862**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**5**	**74**	<10	**3**	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**327**	**539**	**469**	**400**	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**28**	**18**	**8**	**4**	----
Magnesium	7439-95-4	1	mg/L	**29**	**24**	**10**	**5**	----
Sodium	7440-23-5	1	mg/L	**345**	**625**	**659**	**630**	----
Potassium	7440-09-7	1	mg/L	**6**	**4**	**4**	**2**	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L	**0.001**	**0.020**	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	----
Manganese	7439-96-5	0.001	mg/L	**0.178**	**0.045**	**0.050**	**0.016**	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Iron	7439-89-6	0.05	mg/L	**0.28**	**0.11**	**0.19**	<0.05	----
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	WML119	WML181	WML262	WMLP301	----
				Sampling date / time	10-Aug-2023 09:15	10-Aug-2023 10:30	10-Aug-2023 11:15	10-Aug-2023 11:45	----
Compound	CAS Number	LOR	Unit		ES2326911-006	ES2326911-007	ES2326911-008	ES2326911-009	--------
					Result	Result	Result	Result	----
EG020T: Total Metals by ICP-MS - Continued									
Arsenic	7440-38-2	0.001	mg/L		**0.001**	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L		**0.015**	**0.056**	**0.002**	**0.002**	----
Copper	7440-50-8	0.001	mg/L		**0.008**	**0.006**	**0.002**	<0.001	----
Nickel	7440-02-0	0.001	mg/L		**0.006**	**0.014**	**0.002**	**0.001**	----
Lead	7439-92-1	0.001	mg/L		**0.018**	**0.003**	**0.003**	<0.001	----
Zinc	7440-66-6	0.005	mg/L		**0.086**	**0.048**	**0.061**	**0.023**	----
Manganese	7439-96-5	0.001	mg/L		**0.249**	**0.083**	**0.073**	**0.025**	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Iron	7439-89-6	0.05	mg/L		**5.78**	**3.11**	**1.66**	**0.67**	----
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	<0.004	<0.004	<0.004	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**0.06**	**0.01**	**0.01**	**0.02**	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**0.06**	**0.01**	**0.01**	**0.02**	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**4.5**	**2.0**	**2.1**	**2.5**	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**4.6**	**2.0**	**2.1**	**2.5**	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.59**	**0.22**	**0.33**	**0.13**	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**19.3**	**30.6**	**30.8**	**28.6**	----
ø Total Cations	----	0.01	meq/L		**18.9**	**30.2**	**30.0**	**28.1**	----
ø Ionic Balance	----	0.01	%		**0.93**	**0.77**	**1.29**	**0.89**	----

Inter-Laboratory Testing

Analysis conducted by ALS Newcastle - Water, NATA accreditation no. 825, site no. 1656 (Chemistry) 9854 (Biology).

(WATER) EA005: pH

CHAIN OF CUSTODY

ALS Environmental

ALS Laboratory: please tick →

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☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: AGE Consultants	**TURNAROUND REQUIREMENTS :** (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☐ Standard TAT (List due date):
OFFICE: Newcastle		☐ Non Standard or urgent TAT (List due date):
PROJECT: Ashton Coal Mine GW Sampling	**ALS QUOTE NO.:** EN/222/21	**COC SEQUENCE NUMBER (Circle)** COC: (1) 2 3 4 5 6 7
PROJECT ID: AUS5009		OF: 1 2 (3) 4 5 6 7
PROJECT MANAGER: Bryce McKay	**CONTACT PH:** 0414 324 504	
SAMPLER: Edward Hunt	**SAMPLER MOBILE:** 0428 283 457	
COC Emailed to ALS? YES	**EDD FORMAT (or default):** XTAB, ENMRG, ESDAT, PDF, MonPro	
Email Reports to: Edward@ageconsultants.com.au, Jordan@ageconsultants.com.au, Oliver@ageconsultants.com.au, BryceM@ageconsultants.com.au		
Email Invoice to: As above + accounts@ageconsultants.com.au		

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact?	Yes	No	N/A
Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt:		°C	
Other comment:	21.0		

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
	JN	KD 4/8/23	SG 4/8/23 AD
DATE/TIME:	DATE/TIME: 4.8.23 1450	DATE/TIME: 8	DATE/TIME: 4/8/23 1935

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where **Metals** are required, specify **Total** (unfiltered bottle required) or **Dissolved** (field filtered bottle required).										Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL CONTAINERS	pH & EC	NT-1 & NT-2	W-1 (7 metals)	EG020 - Fe, Mn, Se	EA015H - TDS	EA045 - turdidity	NT-11 - Total P, Total N	EK058G - NO3	ED035 - HCO3	EK02SF	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	WMLP338	2/08/2023 7:50	W	P	4	X	X	X	X	X	X	X	X	X	X	
2	WMLP337	2/08/2023 8:30	W	P	4	X	X	X	X	x	x	X	X	X	X	
3	WMLP336	2/08/2023 9:05	W	P	4	X	X	X	X	x	x	X	X	X	X	
4	RA27	2/08/2023 11:15	W	P	4	X	X	X	X	X	X	X	X	X	X	
5	WMLP280	2/08/2023 12:05	W	P	4	X	X	X	X	X	X	X	X	X	X	
6	WMLP278	2/08/2023 12:35	W	P	4	X	X	X	X	X	X	X	X	X	X	
7	WMLP277	2/08/2023 13:00	W	P	4	X	X	X	X	X	X	X	X	X	X	
8	WMLP279	2/08/2023 13:40	W	P	4	X	X	X	X	X	X	X	X	X	X	
9	T3P	3/08/2023 8:30	W	P	4	X	X	X	X	X	X	X	X	X	X	
10	T3A	3/08/2023 9:20	W	P	4	X	X	X	X	X	X	X	X	X	X	
11	T4P	3/08/2023 9:50	W	P	4	X	X	X	X	X	X	X	X	X	X	
12	T4A	3/08/2023 10:30	W	P	4	X	X	X	X	X	X	X	X	X	X	
				TOTAL	48											

AS OF ORD NEWCAS

EMAILED

pH @ WN

Environmental Division Sydney
Work Order Reference
ES2326174

Telephone : +61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formal
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

CHAIN OF CUSTODY

ALS Environmental

ALS Laboratory: please tick →

☐ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
☐BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
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☐NEWCASTLE 5 Rose Gum Road Warabrook NSW 2304 Ph: 02 4968 9433 E: samples.newcastle@alsglobal.com
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☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville environmental@alsglobal.com
☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: AGE Consultants	**TURNAROUND REQUIREMENTS :** (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☐ Standard TAT (List due date):	**FOR LABORATORY USE ONLY (Circle)**
OFFICE: Newcastle		☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes No N/A
PROJECT: Ashton Coal Mine GW Sampling	**ALS QUOTE NO.:** EN/222/21	**COC SEQUENCE NUMBER (Circle)**	Free ice / frozen ice bricks present upon receipt? Yes No N/A
PROJECT ID: AUS5009		COC: 1 (2) 3 4 5 6 7	Random Sample Temperature on Receipt: 2.0 °C
PROJECT MANAGER: Bryce McKay	**CONTACT PH:** 0414 324 504	OF: 1 2 (3) 4 5 6 7	Other comment:
SAMPLER: Edward Hunt	**SAMPLER MOBILE:** 0428 283 457	**RELINQUISHED BY:**	**RECEIVED BY:** JN 4.8.23 1450
COC Emailed to ALS? YES	**EDD FORMAT (or default):** XTAB, ENMRG, ESDAT, PDF, MonPro		**RELINQUISHED BY:** 4/8/23 8
Email Reports to: Edward@ageconsultants.com.au, Jordan@ageconsultants.com.au, Oliver@ageconsultants.com.au, BryceM@ageconsultants.com.au		DATE/TIME:	DATE/TIME:
Email Invoice to: As above + accounts@ageconsultants.com.au			**RECEIVED BY:** 4/8/23 1435

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where **Metals** are required, specify **Total** (unfiltered bottle required) or **Dissolved** (field filtered bottle required).										Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL CONTAINERS	pH & EC	NT-1 & NT-2	W-1 (7 metals)	EG020 - Fe, Mn, Se	EA015H - TDS	EA045 - turdidity	NT-11 - Total P, Total N	EK058G - NO3	ED035 - HCO3	EK02SF	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1 13	WMLP326	3/08/2023 11:05	W	P	1	X	X									LAB OF ORIGIN: NEWCASTLE
2 14	WMLP327	3/08/2023 12:15	W	P	1	X	X									
3 15	WML113C	3/08/2023 13:00	W	P	4	X	X	X	X	X	X	X	X	X	X	
4 16	GM3A	3/08/2023 14:05	W	P	1	X	X									
5 17	T2A	4/08/2023 7:30	W	P	4	X	X	X	X	X	X	X	X	X	X	
6 18	T2P	4/08/2023 8:20	W	P	4	X	X	X	X	X	X	X	X	X	X	
7 19	PB1	4/08/2023 8:55	W	P	1	X	X									
8 20	WMLP320	4/08/2023 9:25	W	P	4	X	X	X	X	X	X	X	X	X	X	
9 21	WMLP328	4/08/2023 10:40	W	P	4	X	X	X	X	X	X	X	X	X	X	
10 22	RA18	4/08/2023 11:30	W	P	1	X	X									
11 23	YAP016	4/08/2023 12:30	W	P	4	X	X	X	X	X	X	X	X	X	X	
12 24	GM01	4/08/2023 13:00	W	P	4	X	X	X	X	X	X	X	X	X	X	
				TOTAL	33											

EMAILED PH @ WN

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
☐BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
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☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com
☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: AGE Consultants
OFFICE: Newcastle
PROJECT: Ashton Coal Mine GW Sampling
PROJECT ID: AUS5009
PROJECT MANAGER: Bryce McKay — CONTACT PH: 0414 324 504
SAMPLER: Edward Hunt — SAMPLER MOBILE: 0428 283 457
COC Emailed to ALS? YES — EDD FORMAT (or default): XTAB, ENMRG, ESDAT, PDF, MonPro
Email Reports to: Edward@ageconsultants.com.au, Jordan@ageconsultants.com.au, Oliver@ageconsultants.com.au, BryceM@ageconsultants.com.au
Email Invoice to: As above + accounts@ageconsultants.com.au

TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)
☐ Standard TAT (List due date):
☐ Non Standard or urgent TAT (List due date):
ALS QUOTE NO.: EN/222/21

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 5 6 7 (3 circled)
OF: 1 2 3 4 5 6 7 (3 circled)

RELINQUISHED BY:
DATE/TIME:

RECEIVED BY: JN 4.8.23
DATE/TIME: 1450

RELINQUISHED BY: [signature]
DATE/TIME: 4/8/23

RECEIVED BY: [signature] AD.
DATE/TIME: 4/8/23 1935

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A (N/A circled)
Free ice / frozen ice bricks present upon receipt? Yes No N/A (Yes circled)
Random Sample Temperature on Receipt: 2.0 °C
Other comment:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).										Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	pH & EC	NT-1 & NT-2	W-1 (7 metals)	EG020 - Fe, Mn, Se	EA015H - TDS	EA045 - turdidity	NT-11 - Total P, Total N	EK058G - NO3	ED035 - HCO3	EK02SF	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
~~1~~ 25	DUPLICATE	4/08/2023 0:00	W	P	4	X	X	X	X	X	X	X	X	X	X	
~~2~~			W	P												
~~3~~			W	P												
~~4~~			W	P												
~~5~~			W	P												
~~6~~			W	P												
~~7~~			W	P												
~~8~~			W	P												
~~9~~			W	P												
~~10~~			W	P												
~~11~~			W	P												
~~12~~			W	P												
				TOTAL	4											

PH @ WN

LAB OF ORIGIN: NEWCASTLE

E-MAILED

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: AGE Consultants
OFFICE: Newcastle
PROJECT: Ashton Coal Mine GW Sampling
PROJECT ID: ASH5009
PROJECT MANAGER: Bryce McKay — CONTACT PH: 0414 324 504
SAMPLER: Edward Hunt — SAMPLER MOBILE: 0428 283 457
COC Emailed to ALS? YES — EDD FORMAT (or default): XTAB, ENMRG, ESDAT, PDF, MonPro
Email Reports to: Edward@ageconsultants.com.au, Jordan@ageconsultants.com.au, BryceM@ageconsultants.com.au
Email Invoice to: As above + accounts@ageconsultants.com.au

TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)
☐ Standard TAT (List due date):
☐ Non Standard or urgent TAT (List due date):

ALS QUOTE NO.: EN/222/21

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 5 6 7
OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No (N/A)
Free ice / frozen ice bricks present upon receipt? (Yes) No N/A
Random Sample Temperature on Receipt: 2.2 °C
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
	IC		[signature] AS
DATE/TIME:	DATE/TIME: 09/08/23 1107	DATE/TIME:	DATE/TIME: 9/8/23 1935

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where **Metals** are required, specify **Total** (unfiltered bottle required) or **Dissolved** (field filtered bottle required).										Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	pH & EC	NT-1 & NT-2	W-1 (7 metals)	EG020 - Fe, Mn, Se	EA015H - TDS	EA045 - turdidity	NT-11 - Total P, Total N	EK058G - NO3	ED035 - HCO3	EK02SF	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	RSGM1	7/08/2023 7:30	W	P	4	X	X	X	X	X	X	X	X	X	X	
2	WMLP323	7/08/2023 9:05	W	P	4	X	X	X	X	X	X	X	X	X	X	
3	WMLP324	7/08/2023 9:45	W	P	4	X	X	X	X	X	X	X	X	X	X	
4	WMLP308	7/08/2023 10:15	W	P	4	X	X	X	X	X	X	X	X	X	X	
5	WMLP325	7/08/2023 11:15	W	P	4	X	X	X	X	X	X	X	X	X	X	
6	WMLP311	7/08/2023 11:45	W	P	4	X	X	X	X	X	X	X	X	X	X	
7	WML115C	7/08/2023 12:30	W	P	1	X	X									
8	WMLP358	8/08/2023 8:15	W	P	4	X	X	X	X	X	X	X	X	X	X	
9	WMLP346	8/08/2023 9:05	W	P	4	X	X	X	X	X	X	X	X	X	X	
10	WML239	8/08/2023 9:45	W	P	4	X	X	X	X	X	X	X	X	X	X	
11	WMLP349	8/08/2023 10:15	W	P	4	X	X	X	X	X	X	X	X	X	X	
12	WML129	8/08/2023 11:30	W	P	4	X	X	X	X	X	X	X	X	X	X	
				TOTAL	45											

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Fo
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

Environmental Division
Sydney
Work Order Reference
ES2326641

Telephone : + 61-2-8784 8555

pH @ WN

CHAIN OF CUSTODY

ALS Environmental

ALS Laboratory: please tick →

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☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

pH @WN

CLIENT: AGE Consultants	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE: Newcastle			Custody Seal Intact? Yes No N/A (circled)
PROJECT: Ashton Coal Mine GW Sampling	ALS QUOTE NO.: EN/222/21	COC SEQUENCE NUMBER (Circle)	Free ice / frozen ice bricks present upon receipt? Yes (circled) No N/A
PROJECT ID: ASH5010		COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: 2.0 °C
PROJECT MANAGER: Bryce McKay	CONTACT PH: 0414 324 504	OF: 1 2 3 4 5 6 7	Other comment:

SAMPLER: Edward Hunt — SAMPLER MOBILE: 0428 283 457	RELINQUISHED BY:	RECEIVED BY: [signature]	RELINQUISHED BY: [signature]	RECEIVED BY: SO[illegible]
COC Emailed to ALS? YES — EDD FORMAT (or default): XTAB, ENMRG, ESDAT, PDF, MonPro				
Email Reports to: Edward@ageconsultants.com.au, Jordan@ageconsultants.com.au, Oliver@ageconsultants.com.au, BryceM@ageconsultants.com.au	DATE/TIME:	DATE/TIME: 10/8/23 1342.	DATE/TIME: 10-8-23 5pm	DATE/TIME: 10/8/23 1935
Email Invoice to: As above + accounts@ageconsultants.com.au				

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).										Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	pH & EC	NT-1 & NT-2	W-1 (7 metals)	EG020 - Fe, Mn, Se	EA015H - TDS	EA045 - turdidity	NT-11 - Total P, Total N	EK058G - NO3	ED035 - HCO3	EK02SF	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	WML120B	9/08/2023 7:55	W	P	4	X	X	X	X	X	X	X	X	X	X	
2	WML120A	9/08/2023 8:40	W	P	4	X	X	X	X	X	X	X	X	X	X	
3	WMLP302	9/08/2023 10:30	W	P	4	X	X	X	X	X	X	X	X	X	X	
4	WML261	9/08/2023 11:50	W	P	4	X	X	X	X	X	X	X	X	X	X	
5	WML183	9/08/2023 13:30	W	P	4	X	X	X	X	X	X	X	X	X	X	
6	WML119	10/08/2023 9:15	W	P	4	X	X	X	X	X	X	X	X	X	X	
7	WML181	10/08/2023 10:30	W	P	4	X	X	X	X	X	X	X	X	X	X	
8	WML262	10/08/2023 11:15	W	P	4	X	X	X	X	X	X	X	X	X	X	
9	WMLP301	10/08/2023 11:45	W	P	4	X	X	X	X	X	X	X	X	X	X	
10			W	P												
11			W	P												
12			W	P												
				TOTAL	36											

Environmental Division
Sydney
Work Order Reference
ES2326911

Telephone : + 61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Fo
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.