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 2022 – 31 December 2022

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ASHTON COAL

PTY LTD

ABN: 22 078 556 500

Annual Review

for the

Ashton Coal Project

1 January 2022 – 31 December 2022

Prepared for:

Ashton Coal Operations Pty Limited
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Ref No. 737/28c March 2023

AshtonCoal
PART OF THE YANCOAL AUSTRALIA GROUP

TITLE BLOCK

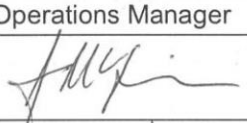
Name of Operation	Ashton Coal Project
Name of Operator	Ashton Coal Operations Pty Limited
Development consent / project approval #	309-11-2001-i
Name of holder of development consent / project approval	Ashton Coal Operations Pty Limited
Mining Lease #	Multiple - see Section 3
Name of holder of mining 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	01/01/2022
Annual Review end date	31/12/2022

I, Aaron McGuigan, certify that, to the best of my knowledge, this report is a true and accurate record of the compliance status of the Ashton Coal Project for the period 1 January 2022 to 31 December 2022 and that I am authorised to make this statement of behalf of Ashton Coal Operations Pty Limited.

Note.

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

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

Name of authorised reporting officer	Aaron McGuigan
Title of authorised reporting officer	Operations Manager
Signature of authorised reporting officer	
Date	30/3/23.

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1. STATEMENT OF COMPLIANCE

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

Table 1.1
Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	**Yes / No**
Development Consent 309-11-2001-i	Yes
Mining Leases 1529, 1533, 1623 (ACP Area)	Yes
Mining Leases 1834, 1835, 1836, 1837 (ACOL-operated RUM)	NYA^
Water Access Licences 1358, 15583, 8404, 997, 1120, 1121, 6346, 23912, 984, 19510, 36702, 36703, 29566, 41501, 41552, 41553, 41529*	Yes

^NYA = Not Yet Applicable. Mining Leases were transferred at the end of the current reporting period.
* = WAL 41529 will be transferred as part of the RUMex Project, however, this WAL is not yet applicable to the ACOL operation.

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

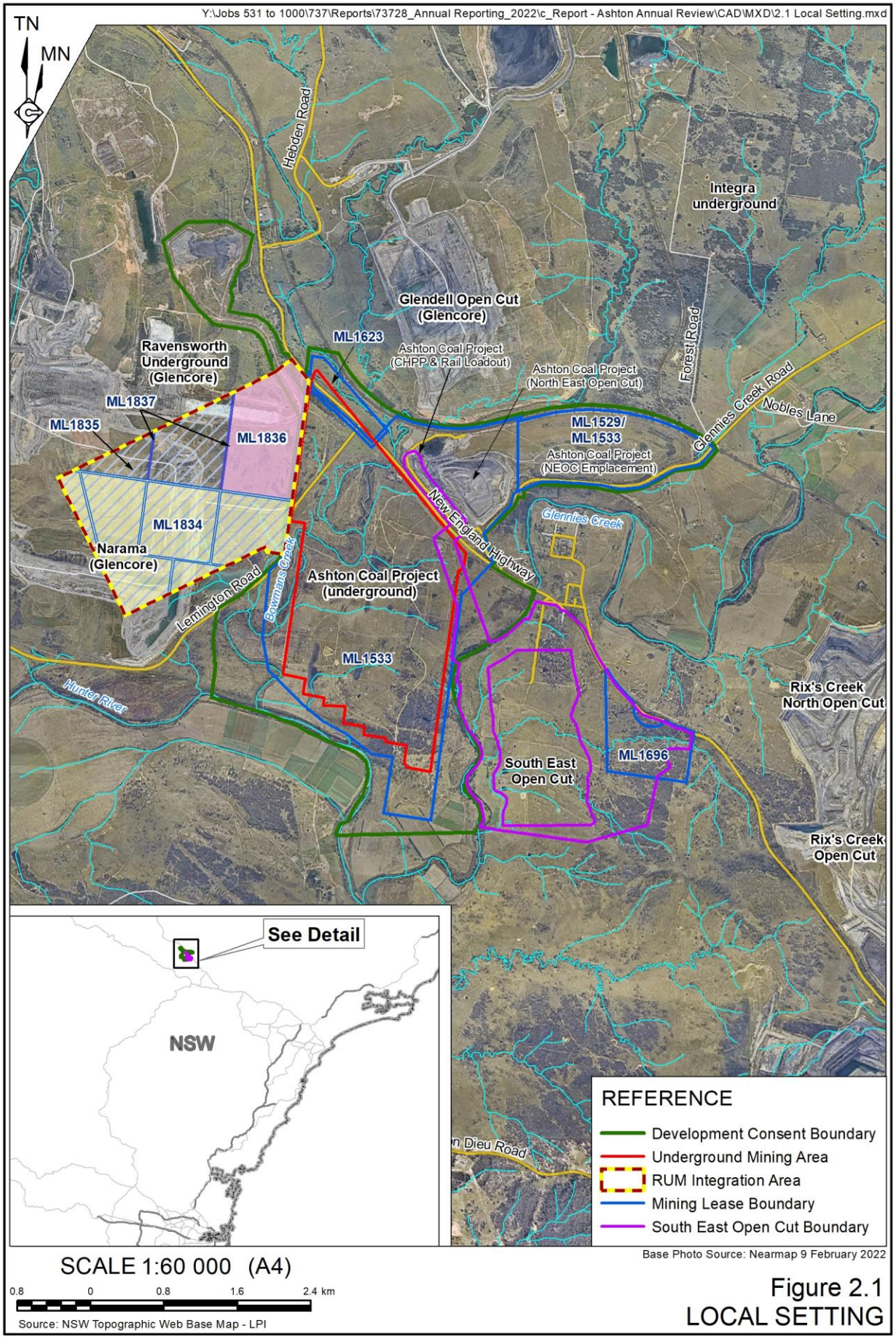
The Ashton underground operations commenced in December 2005 with the first longwall coal extracted within the Pikes Gully Seam in March 2007. Construction of the Bowmans Creek Diversion was completed in November 2012 allowing extraction of coal from beneath those excised sections of Bowmans Creek. Coal 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 had not yet 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
Ravensworth Underground (Glencore)
ML1837
ML1835
ML1836
ML1529/ ML1533
Ashton Coal Project (NEOC Emplacement)
Glennies Creek Road
Nobles Lane
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
South East Open Cut
Rix's Creek Open Cut
See Detail
NSW
REFERENCE
Development Consent Boundary
Underground Mining Area
RUM Integration Area
Mining Lease Boundary
South East Open Cut Boundary
Base Photo Source: Nearmap 9 February 2022
SCALE 1:60 000 (A4)
0.8 0 0.8 1.6 2.4 km
Source: NSW Topographic Web Base Map - LPI
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 eighth Annual Review submitted for the ACP, following eleven Annual Environmental Management Reports, and is applicable for the period 1 January 2022 to 31 December 2022 ("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 Department of Planning and Environment's (DPE) *Annual Review Guideline* dated October 2015.

2.3 KEY PERSONNEL CONTACT DETAILS

The Operations Manager, Mr Aaron McGuigan is the primary mine contact (Tel: 02 6570 9104) 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 2024	Granted by the (then) Minister for Mineral Resources. Incorporates 883.4ha of surface area. A renewal application was lodged. 21 February 2023
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.
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.
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.

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 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[3]	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**.

Note 3: WAL 41529 to be transferred to ACOL on completion of the sale agreement between Yancoal and Glencore as part of the RUMEx approval.

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.

It is noted that, during the reporting period, the conditions of the Mining Leases were updated by the Department of Regional NSW (DRNSW) in accordance with the amendments to the *Mining Regulation 2016* and the Operational Rehabilitation Reform. As a result, separate annual reporting requirements now also apply to the Mining Leases. These reports will be lodged directly with DRNSW in accordance with the latest requirements and guidance.

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, i.e. during the reporting period. 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) 206A and LW206B within the ULLD, and commencement of initial development of the PG seam 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 2,093,565t of Run of Mine (ROM) coal was mined from underground operations during the reporting period and a total of approximately 861,936t 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]	2,600,721	2,093,565	2,465,455
Coarse Reject (t)	None specified	1,096,474	842,048	1,037,041
Fine Reject (Tailings) (t)	None specified	315,718	297,894	366,877
Saleable Product (t)	None specified	1,184,981	861,936	1,079,330

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

Three gas drainage borehole wells, located above LW206A and LW206B, were constructed during the reporting period as well as two gas risers either side of Bowmans Creek. The gas drainage plant functioned throughout the reporting period, although flaring[1] was sporadically unable to be undertaken due to low methane concentrations and low gas flows. However, to improve this issue, throughout 2022 the burner nozzles and control system for one of the flares was changed to allow flaring at flows as low as 60 litres per second of gas. In some cases, buffering allows flows below 60l/s to still be flared. This has allowed a significantly greater proportion of captured gas to be flared even at low flows.

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

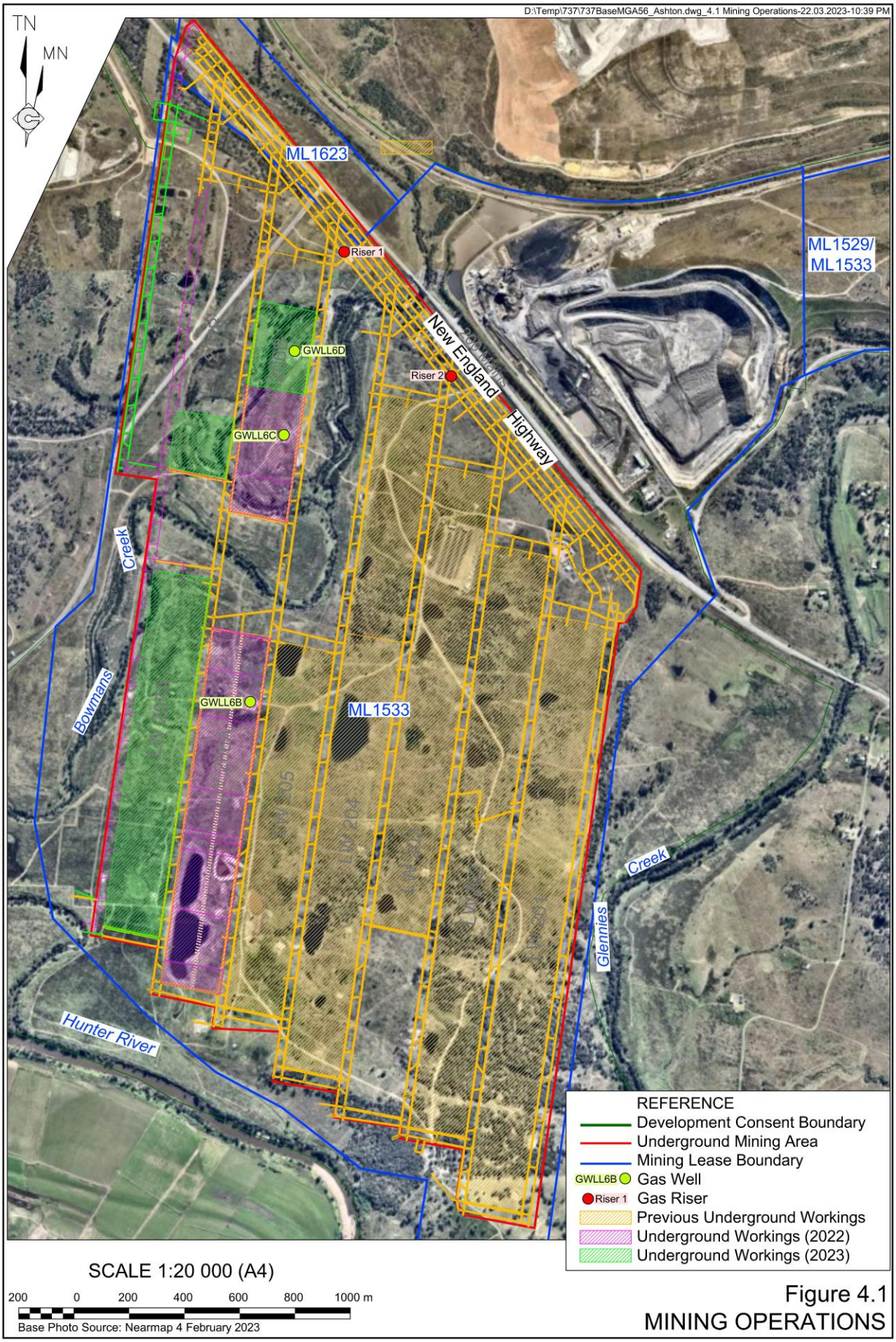


Figure 4.1
MINING OPERATIONS

Greenhouse gas emissions continued to be reported as required by the National Greenhouse Gas and Energy Reporting (NGER) requirements (see Section 6).

4.3 OTHER OPERATIONS DURING THE REPORTING PERIOD

Ground Disturbing Works

A total of 18 internal Ground Disturbance Permits (GDPs) were applicable during the reporting period (see **Table 4.2**).

Table 4.2
Ground Disturbance Permits - 2022

Ground Disturbance Permit No.	Purpose	Rehabilitation Status
191	ROW drainage repairs	Rehabilitation complete / permit closed.
192	LW204-205 subsidence repairs	Rehabilitation pending / not yet started.
193	Construction of 3x gas well pads, access tracks, pipeline trenching (GWLL6B-6C-6D)	Rehabilitation ongoing.
194	All weather access to Repeater Station above LW203	Rehabilitation pending / not yet started.
195	Construction of U/S and D/S block bank for Eastern Diversion of Bowmans Creek (incl. borrow pit area)	Rehabilitation ongoing.
196	Construction of 2x gas riser pads, access tracks, pipeline trenching (gas drainage - PG workings)	Rehabilitation ongoing.
197	132kV powerpole replacement - CN-88024	Works postponed until Feb 2023.
198	CHPP to Portal power cable trench	Rehabilitation pending / not yet started.
199	Borehole 8 (including pad preparation, drilling and all-weather access track upgrade)	Works ongoing.
200	Borehole 4 (Excavate trench to recover power service - 400mm x 30m)	Rehabilitation ongoing.
201	Temporary Artefact Storage Container	Rehabilitation ongoing.
202	Access track subsidence repairs (adjacent to yellow house)	Rehabilitation pending / not yet started.
203	Test pitting for LW207 salvage.	Works ongoing.
204	Dairy Land drainage repairs	Rehabilitation complete / permit closed.
205	RUMEx boundary geotechnical hole	Works commenced in 2023
206	BH7 dewatering line duplication	Rehabilitation complete / permit closed.
207	Install concrete pillar for survey baseline	Rehabilitation complete / permit closed.
208	Install/fix road drainage channels to P130 ROW	Rehabilitation pending / not yet started.

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 a Rehabilitation Management Plan (RMP) and Forward Program were prepared in accordance with the Operational Rehabilitation Reforms and amendments to the *Mining Regulation 2016*. The RMP reflects the updated rehabilitation / biodiversity completion and performance criteria as developed through the ecological monitoring undertaken to date and planned changes to rehabilitation of the NEOC emplacement. The RMP also addresses matters raised by the Resources Regulator in their letter 27 August 2021, including completion of a revised risk assessment, review of available material to achieve final landform and rehabilitation outcomes, and monitoring of erosion.

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, Water Management Plan, Air Quality and Greenhouse Gas Management Plan, and Noise Management Plan were submitted to the Department of Planning and Environment (DPE) for approval in November 2022 and remain under assessment.

Review and update of the Biodiversity Management Plan and Heritage Management Plan also commenced and will be finalised and submitted during the next reporting period.

4.4 NEXT REPORTING PERIOD

The activities proposed for 2023 will principally involve a continuation of activities undertaken during the previous twelve months together with the commencement 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 LW206B, LW207A and LW207B within the ULLD seam and mine development within 400NM and 400SW within the Pikes Gully Seam (see **Figure 4.1**). It is estimated that in the order of 2,465,455t of ROM coal will be extracted during the next reporting period.

Gas Drainage

Construction of gas drainage boreholes is planned to be undertaken during the next reporting period for LW207A and LW207B.

Rehabilitation

Rehabilitation activities planned for the 2023 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

During the next reporting period the review and update of the Biodiversity Management Plan and Heritage Management Plan will be completed and the plans submitted to DPE for approval.

5. ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

The 2021 Annual Review was submitted to the Resources Regulator and the DPE on 31 March 2022. A notice of receipt and acceptance was received from DPE 13 May 2022 confirming that the Annual Review was considered to generally satisfy the conditions of the approval with no further actions raised.

No response was received from the Resources Regulator in relation to the 2021 Annual Review.

In addition, correspondence from DPE on 16 December 2022 outlined additional reporting content for future Annual Reviews. This additional reporting content is required for all coal mines and includes reporting on the following.

1. Biodiversity offsets – reporting on the long-term security arrangements for biodiversity offsets including information on the type of long-term security arrangements that have been/are to be implemented. – *Refer to Section 6.6.*

2. Greenhouse gas – reporting on the greenhouse gases for the reporting period and comparison of actual emissions against the predictions in the environmental assessment. Reporting of all reasonable and feasible steps undertaken during the reporting period to improve energy efficiency and reduce greenhouse gas emissions. – *Refer to Section 6.5*.

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 blasting during reporting period.	Not applicable – no blasting	As no blasting planned for the next reporting period, no specific actions are required.
Air Quality	No exceedances of 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 or issues raised.	Implies management actions are currently adequate.	No additional management action currently required.
Subsidence	Subsidence management in accordance with approved Subsidence Management Plan / Extraction Plan.	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**
Average	*64.1*	*90.4*	*107.9*	*49.3*	*31.2*	*61.4*	*39.6*	*34.3*	*43.3*	*55.1*	*83.0*	*66.5*	*723.7*

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

Total rainfall during the 2022 calendar year was 1,341.1mm, significantly above the average annual rainfall of 723.7mm.

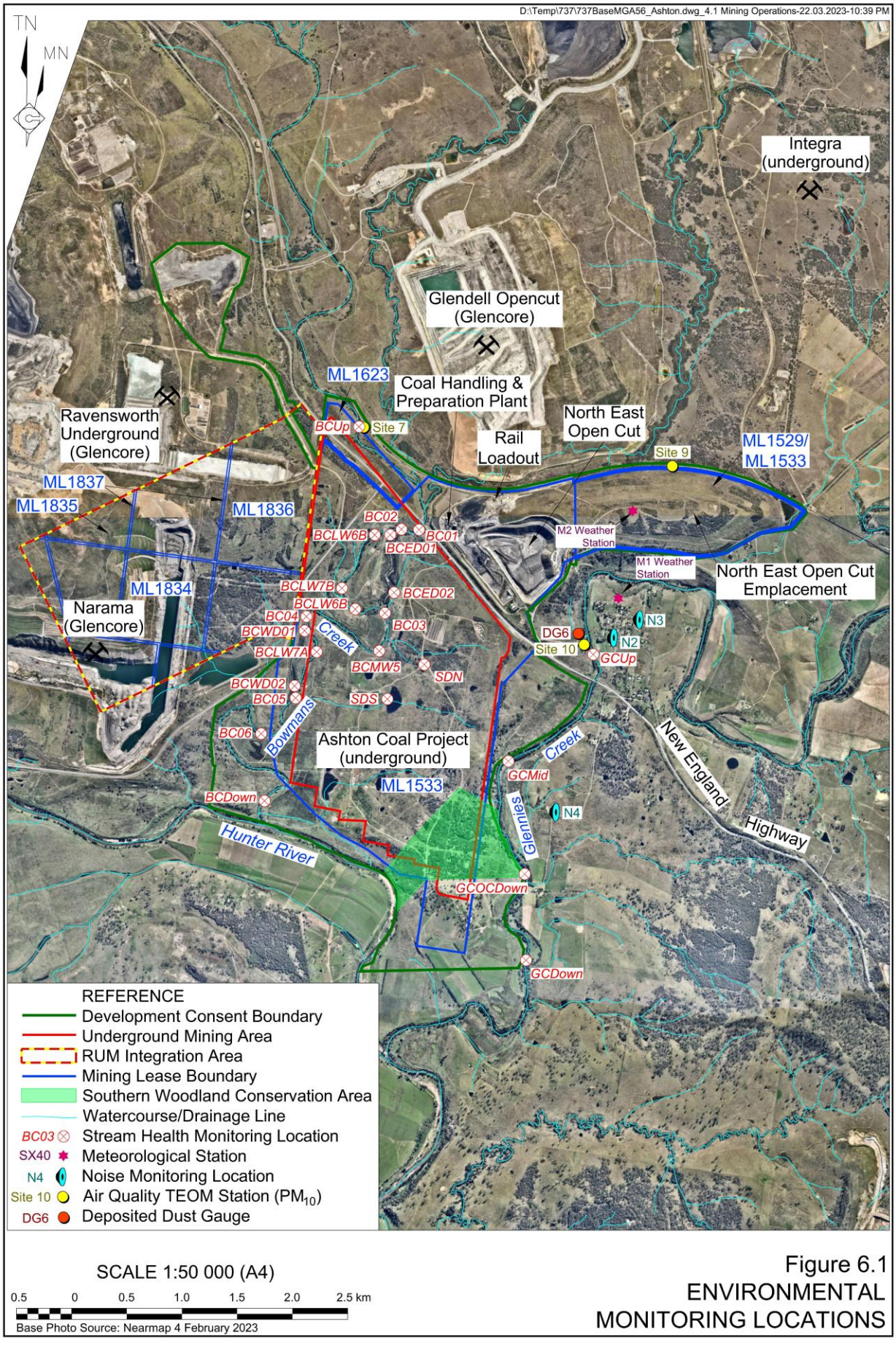


Figure 6.1
ENVIRONMENTAL MONITORING LOCATIONS

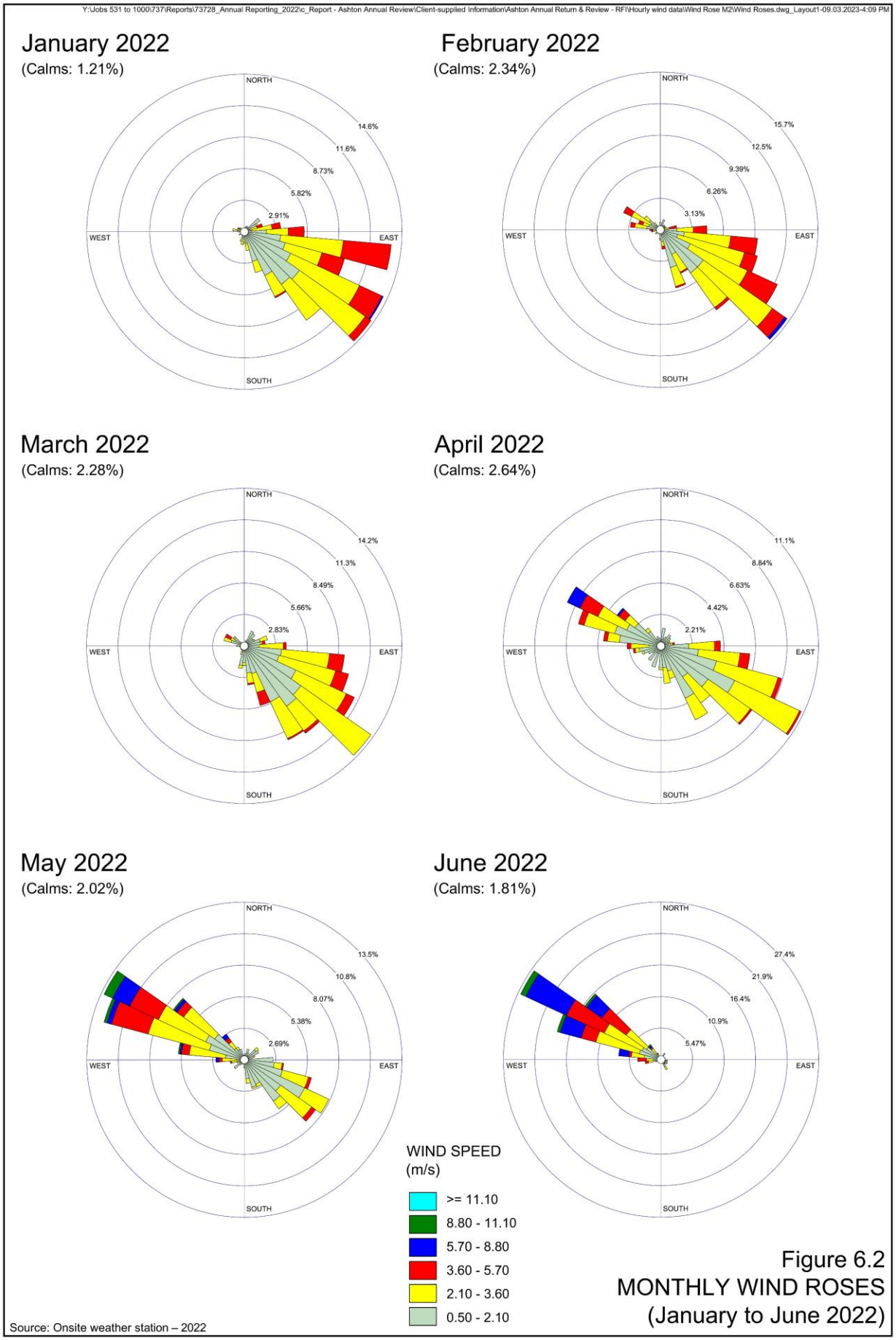


Figure 6.2
MONTHLY WIND ROSES
(January to June 2022)

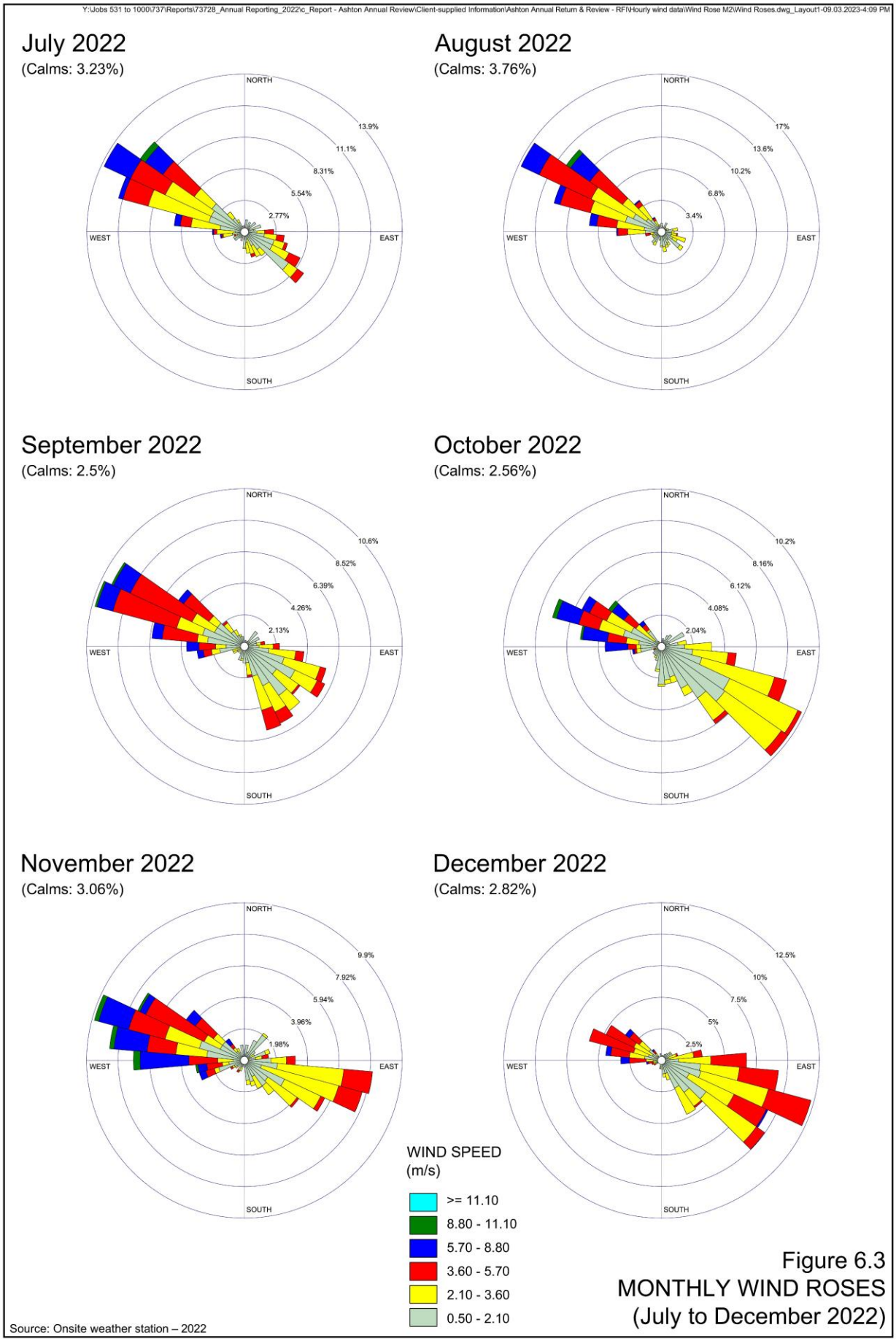


Figure 6.3
MONTHLY WIND ROSES
(July to December 2022)

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, April, May, September, and October monitoring. Operations were also inaudible at location N4 during the November monitoring and at locations N2 and N3 during the March 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 – 2022

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	26	No
	LA1 (1 min)	-	-	46	IA	IA	33	No
February	LAeq (15 min)	38	38	36	IA	IA	IA	No
	LA1 (1 min)	-	-	46	IA	IA	IA	No
March[2]	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	IA	IA	No
	LA1 (1 min)	-	-	46	IA	IA	IA	No
June[2]	LAeq (15 min)	38	38	36	34	33	<30	No
	LA1 (1 min)	-	-	46	36	36	<30	No
July	LAeq (15 min)	38	38	36	36	34	28	No
	LA1 (1 min)	-	-	46	45	42	34	No
August[2]	LAeq (15 min)	38	38	36	<35	<33	<34	No
	LA1 (1 min)	-	-	46	38	36	38	No
September	LAeq (15 min)	38	38	36	IA	IA	IA	No
	LA1 (1 min)	-	-	46	IA	IA	IA	No
October	LAeq (15 min)	38	38	36	IA	IA	IA	No
	LA1 (1 min)	-	-	46	IA	IA	IA	No
November[2]	LAeq (15 min)	38	38	36	<30	<34	IA	No
	LA1 (1 min)	-	-	46	33	37	IA	No
December	LAeq (15 min)	38	38	36	<34	NM (<36)	<30	No
	LA1 (1 min)	-	-	46	35	37	34	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 – 2022.

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 from a non-contaminated sample was 3.9g/m^2/month in May 2022.

The rolling annual average deposited dust levels recorded throughout the reporting period ranged from 2.13g/m^2/month to 2.47g/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 – 2022

Month	Sampling Period		Dust Deposition Rate (g/m²/month)			Comments
	Start Date	End Date	Insoluble	Rolling Annual Average	Ash	
January	30/12/2021	31/01/2022	1.80	2.28	1.00	-
February	31/01/2022	1/03/2022	1.50	2.21	0.90	-
March	1/03/2022	1/04/2022	3.30	2.32	1.50	-
April	1/04/2022	2/05/2022	2.70	2.47	1.60	-
May	2/05/2022	1/06/2022	3.90	2.26	2.30	-
June	1/06/2022	1/07/2022	1.90	2.24	1.40	-
July	1/07/2022	1/08/2022	0.80	2.14	0.50	-
August	1/08/2022	1/09/2022	2.60	2.18	1.60	-
September	1/09/2022	29/09/2022	1.60	2.13	1.20	-
October	29/09/2022	31/10/2022	3.00	2.18	0.80	-
November	31/10/2022	1/12/2022	3.50	2.33	1.60	-
December	1/12/2022	30/12/2022	1.80	2.37	1.40	-
Minimum			***0.8***	***2.1***	***0.5***	**-**
Maximum			***3.9***	***2.5***	***2.3***	**-**

Source: Ashton Coal Operations Pty Limited.

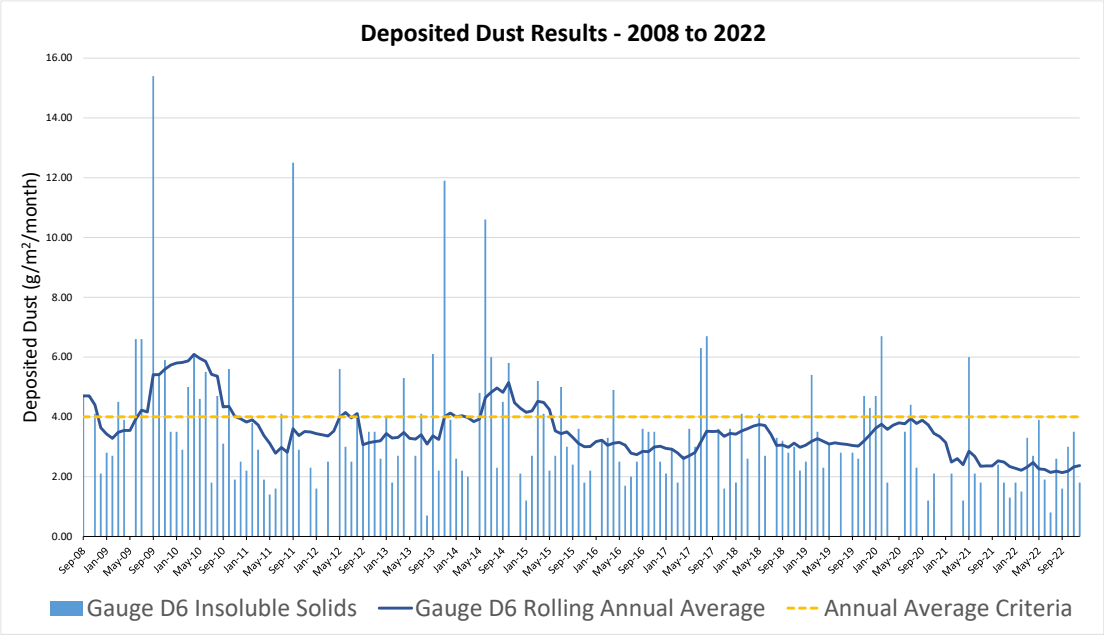


Figure 6.4
DEPOSITED MONITORING RESULTS

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 38.8µg/m^3 and 46.6µg/m^3, with the highest value measured on 20 November 2022 at monitoring Site 10. No monitoring locations recorded maximum suspended particulate concentrations above the 50µg/m^3 24-hour development consent criteria during the reporting period and no Upper Hunter Declared Extraordinary days occurred during the reporting period. These concentrations are generally consistent with PM_{10} levels recorded at the Upper Hunter Air Quality Monitoring Network (UHAQMN) station at Camberwell.

Table 6.5
Summary of PM_{10} Monitoring Results – 2022

Monitoring Site	Minimum 24-hr µg/m^3	Maximum 24-hr µg/m^3	Short-Term Criteria µg/m^3	Annual Average 2022 µg/m^3	Annual Average Criteria µg/m^3
Site 7^	2.7	46.6	50	14.7	30
Site 9^	2.3	38.8		17.0	
Site 10^	2.9	41.0		15.7	
UHAQMN*	2.4	42.4		16.0	

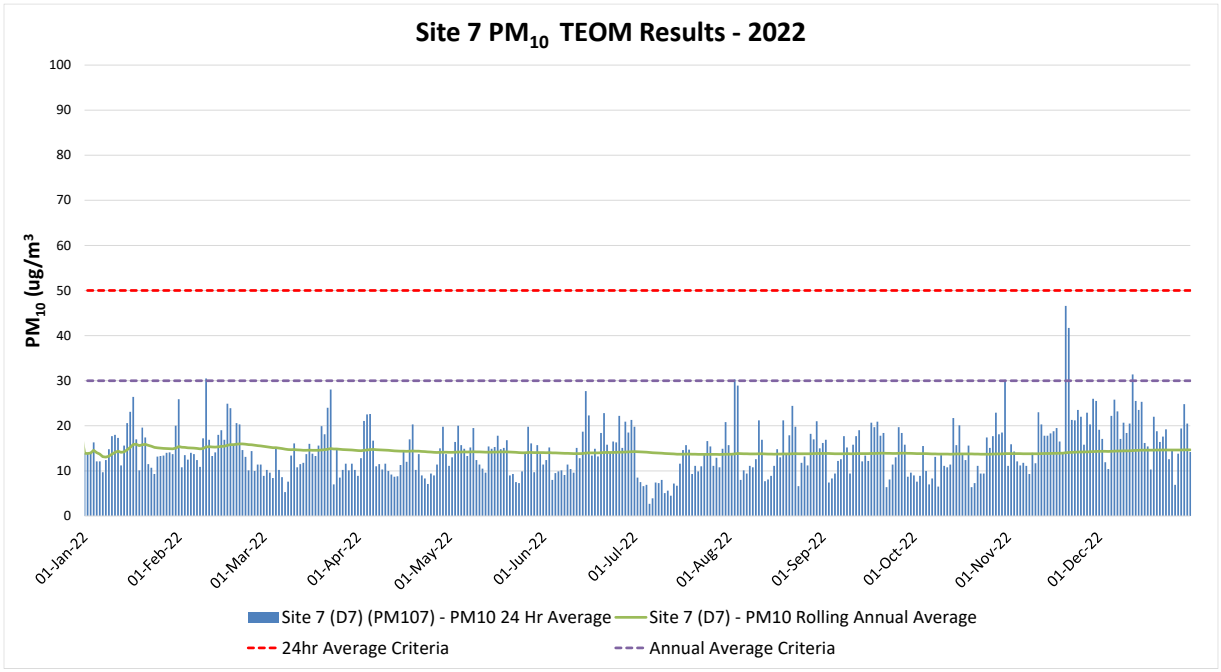
* Provided as reference (includes all days)

^ Ashton results exclude extraordinary events as defined in DA 309-11-2001-i (note: there were no extraordinary events declared by DPE during the reporting period)

Source: Ashton Coal Operations Pty Limited.

The rolling annual average PM_{10} concentrations for each monitoring location ranged between 11.2µg/m^3 and 17.8µg/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 DPE-operated Upper Hunter Air Quality Monitoring Station at Camberwell, which recorded an annual average PM_{10} of 16.0µg/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.



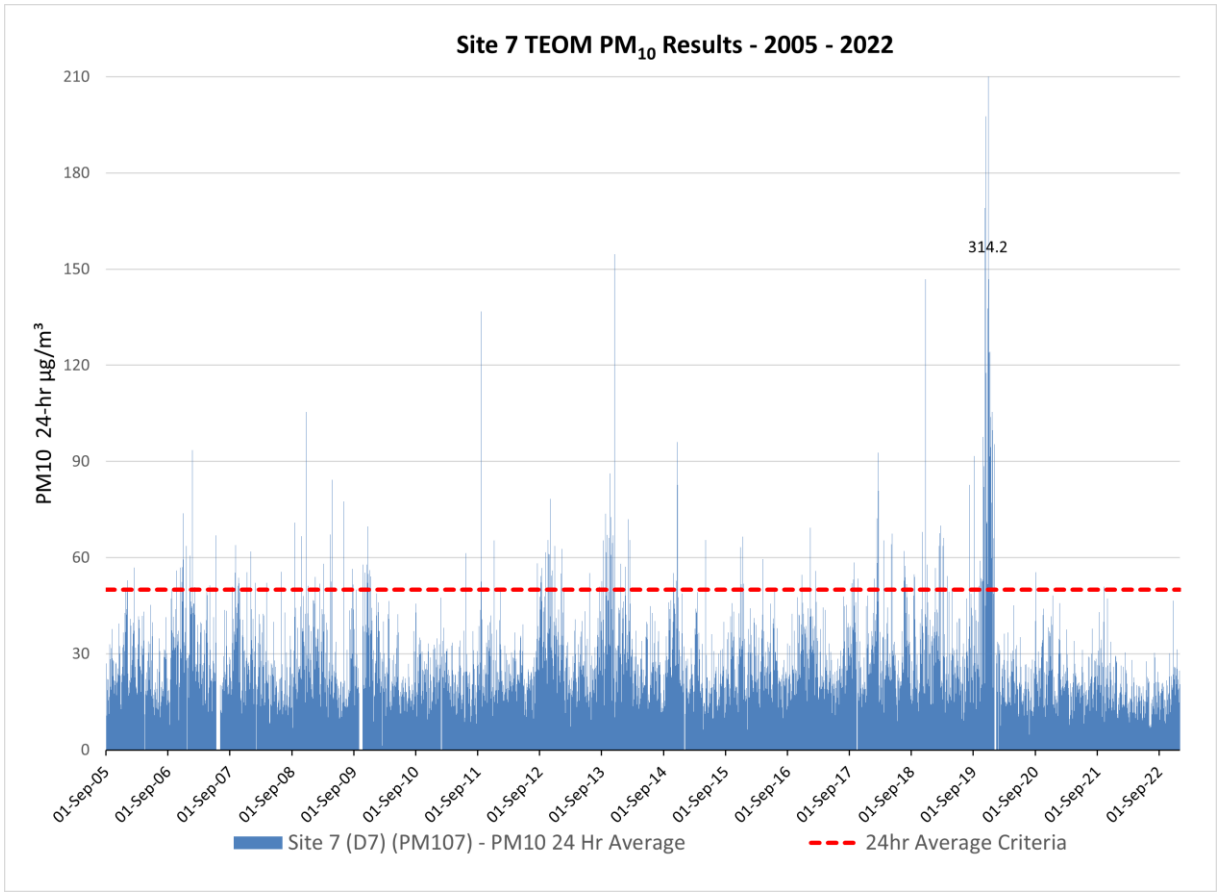
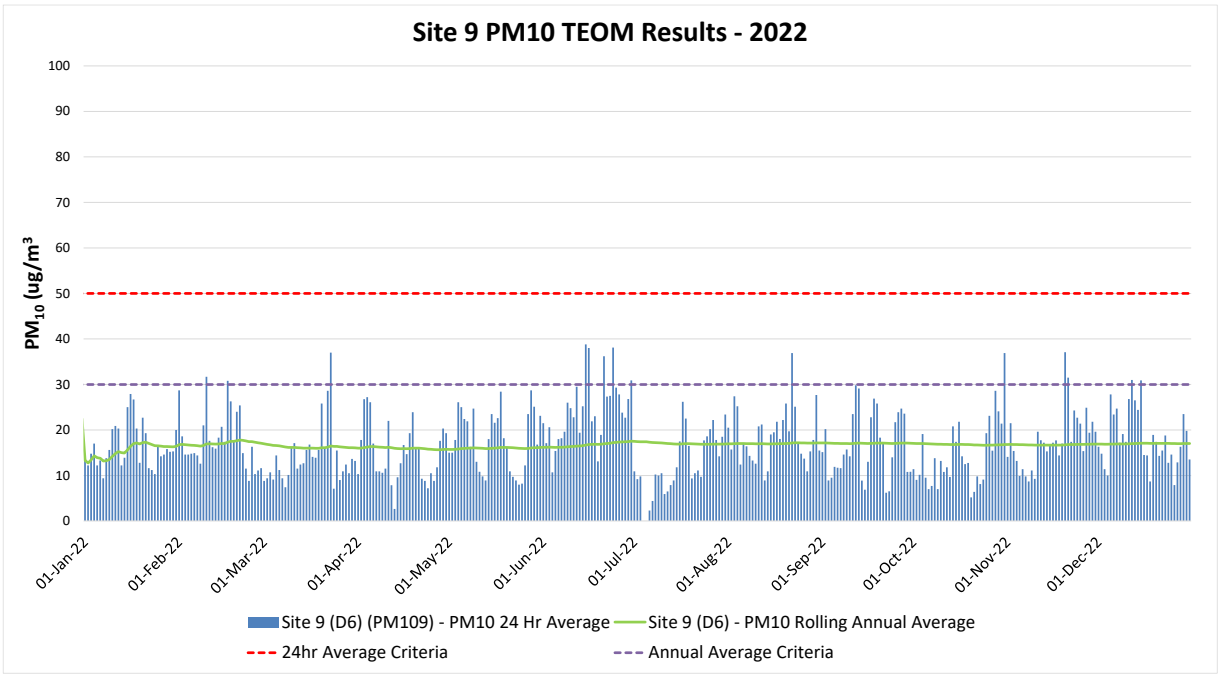


Figure 6.5
PM_{10} MONITORING RESULTS – SITE 7



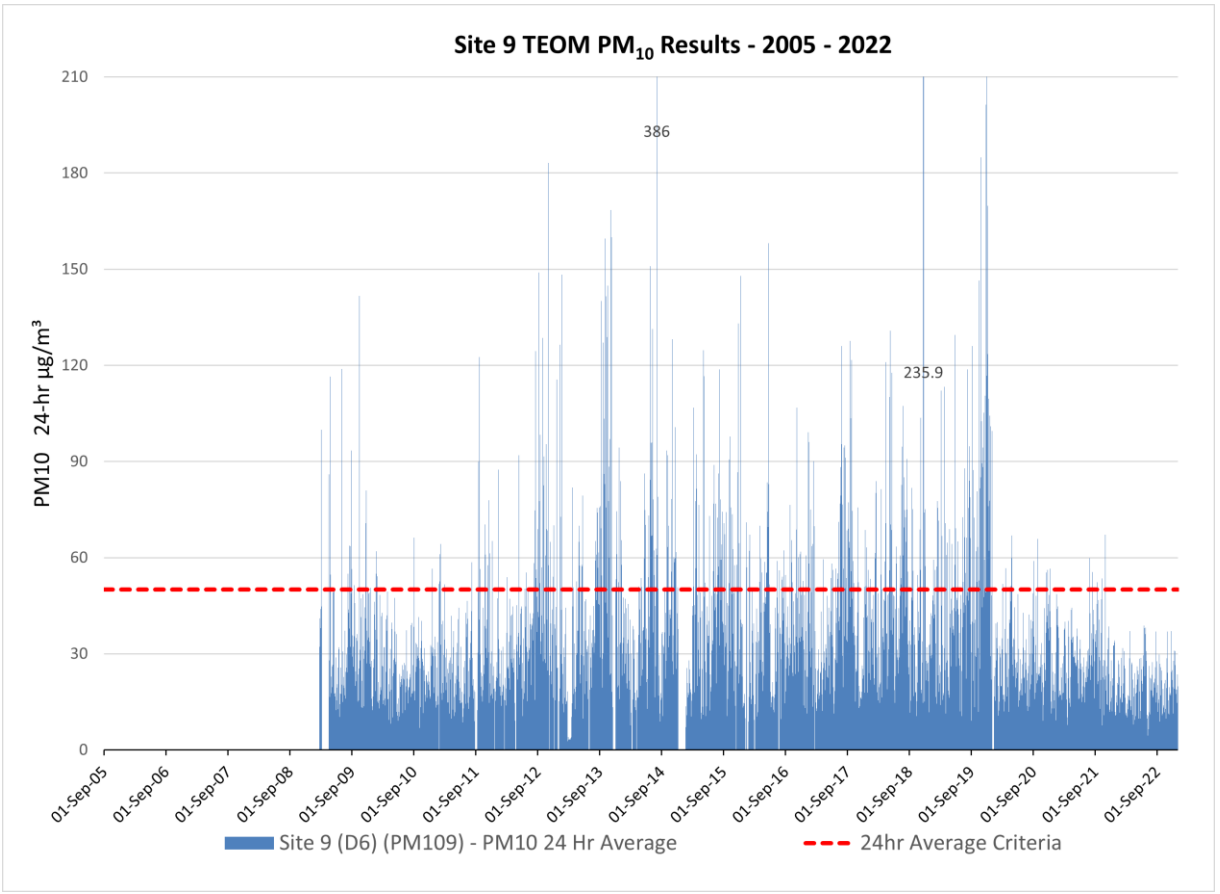
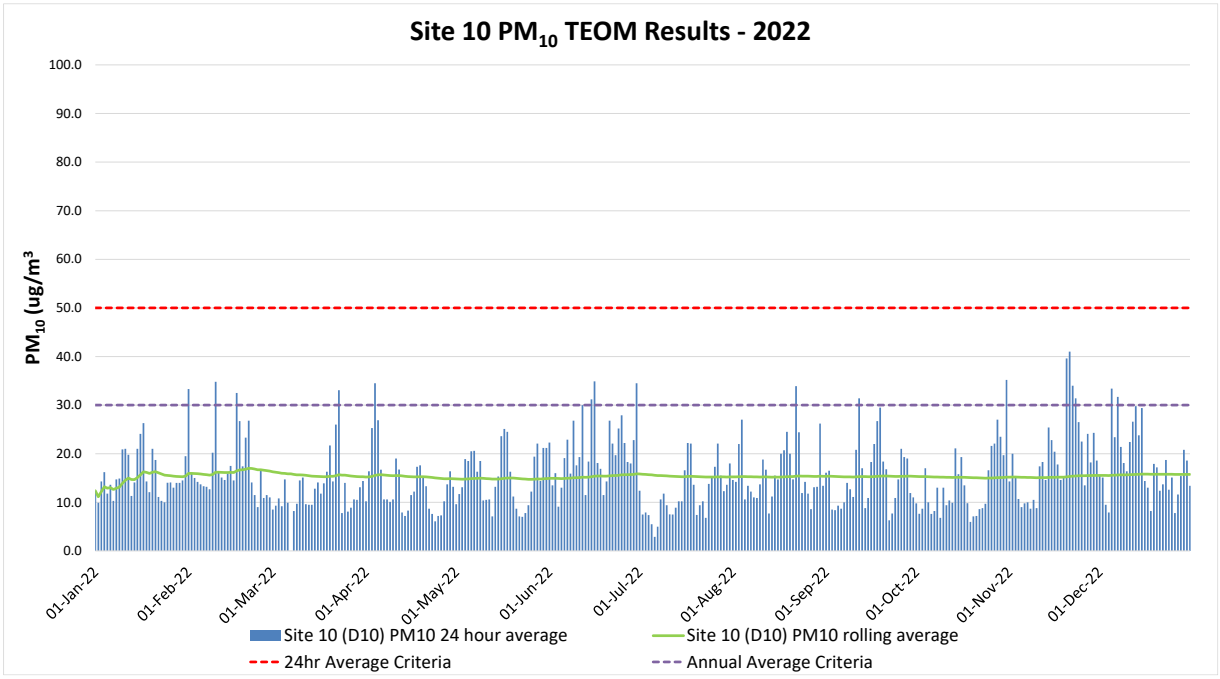


Figure 6.6
PM_{10} MONITORING RESULTS – SITE 9



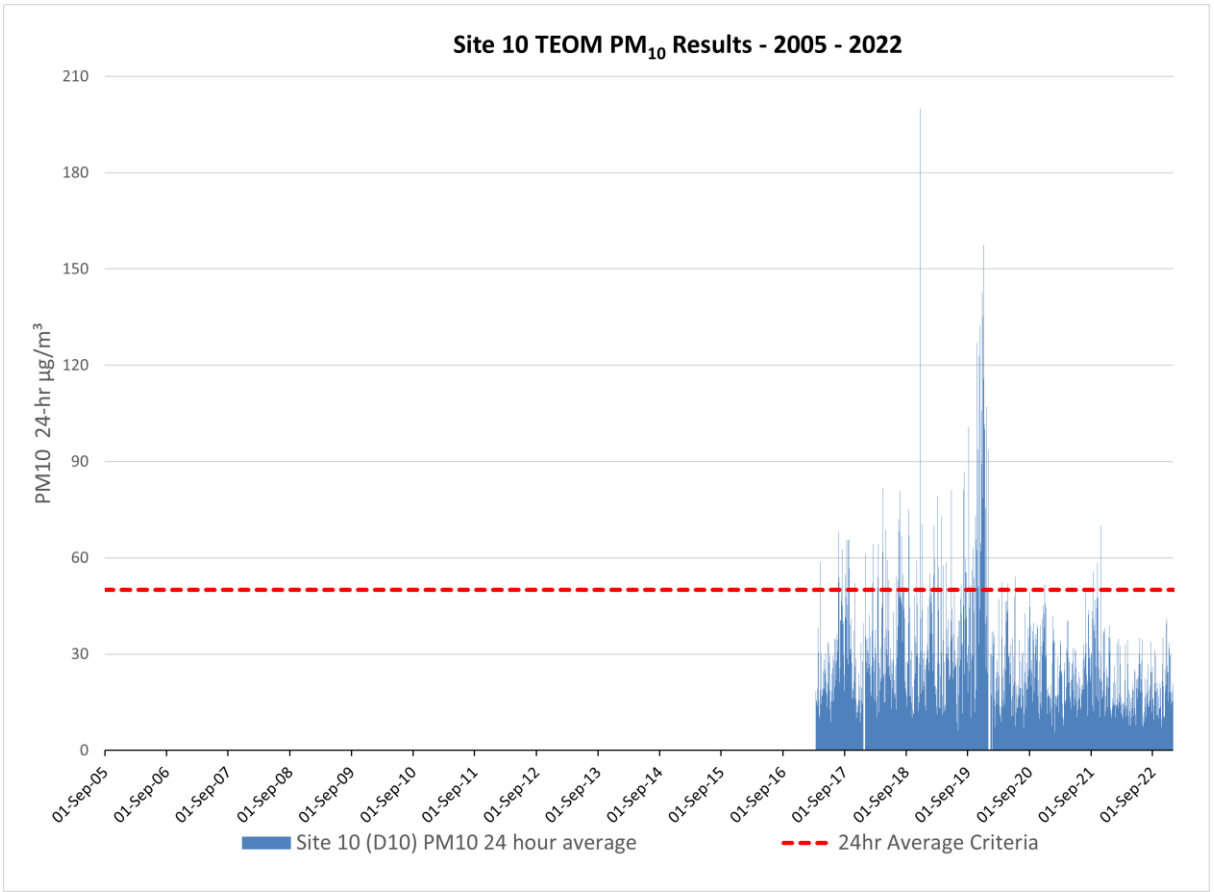


Figure 6.7
PM_{10} MONITORING RESULTS – SITE 10

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 2021-2022 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 6.6 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 596,235t$CO_{2\text{-}e}$ (tonnes CO_2 equivalent) compared to 411,570t$CO_{2\text{-}e}$ for the previous 2020-2021 reporting period. This increase in Scope 1 emissions was a result of fugitive emissions linked to the natural variability in coal seams intersected during the underground mining process. Scope 2 emissions associated with the ACP during the 2021-2022 reporting period totalled 35,442t$CO_{2\text{-}e}$ compared to 39,761t$CO_{2\text{-}e}$ during the previous 2020-2021 reporting period.

Table 6.6
ACP Greenhouse Gas Emissions – 2016/2017 to 2021/2022

Greenhouse Gas Emission Type	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022
Scope 1 (t$CO_{2\text{-}e}$)	339,443	259,148	216,181	196,641	411,570	596,235
Scope 2 (t$CO_{2\text{-}e}$)	43,076	35,506	35,738	32,982	39,761	35,442
Total (t$CO_{2\text{-}e}$)	382,519	294,654	251,919	229,623	451,331	631,677
Source: Yancoal Australia Limited – National Greenhouse and Energy Reporting Scheme Results 2021/2022.						

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. It is noted that, during the 2021/2022 reporting year the gas drainage was of insufficient purity (i.e. insufficient concentration of methane) to capture and safely flare resulting in a significantly lower volume of gas flared compared to the 2020/2021 reporting year. As discussed in Section 4.2, during the 2022 reporting period, the burner nozzles and control system for one of the flares was changed to allow flaring at flows as low as 60 litres per second of gas. In some cases, buffering allows flows below 60l/s to still be flared. This has allowed a significantly greater proportion of captured gas to be flared even at low flows. It is noted that, as these improvements occurred after the 2021/2022 emissions reporting period, emission reductions are expected to be reflected in future reporting periods.

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 6.7** presents a summary of the key modelling results from all air quality and greenhouse gas assessments undertaken over the life of the Mine.

Table 6.7
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 the 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 Flora and Fauna (Biodiversity) Management Plan (FFMP) and the Southern Woodland Conservation Area (SWCA). Management measures include: establishment of the SWCA, targeted rehabilitation to improve habitat linkages across the landscape, placement of nesting boxes, stock exclusion from selected areas, weed and feral pest control, and ongoing monitoring.

Biodiversity Offsets

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

Biodiversity monitoring of these areas is provided as follows whilst Section 8.1 provides further discission 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. These updated completion / performance criteria are to be included in the RMP to be submitted during the next reporting period.

Flora and Fauna Monitoring

Bi-annual fauna monitoring was undertaken during the reporting period by Umwelt Environmental and Social Consultants in June and November 2022. 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 areas for bi-annual fauna monitoring include ten survey transect sites, including four sites consisting of remnant vegetation ('control' sites), four sites located over previously undermined areas ('impact' sites) and two sites within rehabilitated areas.

A total of 122 fauna species were recorded as a result of the bi-annual fauna monitoring program, including 24 mammals, 83 birds, 7 amphibians and eight reptiles. The following six threatened species were recorded during the fauna monitoring surveys.

- Grey-crowned babbler (*Pomatostomus temporalis temporalis*)
- Speckled warbler (*Pyrrholaemus sagittatus*)
- White-bellied sea-eagle (*Haliaeetus leucogaster*)
- Square-tailed kite (*Lophoictinia isura*)
- Brush-tailed phascogale (*Phascogale tapoatafa*)
- Little bentwinged-bat (*Miniopterus australis*)
- Large bentwinged-bat (*Miniopterus orianae oceansis*)

All six of the above species are listed as vulnerable under the NSW *Biodiversity Conservation Act 2016* and 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 2022 reporting period, the following seven introduced species were recorded during the fauna monitoring surveys.

- European rabbit (*Oryctolagus cuniculus*)
- Brown hare (*Lepus capensis*)
- Red fox (*Vulpes vulpes*)
- Black rat (*Rattus rattus*)
- House mouse (*Mus Musculus*)
- Spotted dove (*Streptopelia chinensis*)
- Feral cat (*Felis catus*)

Analysis of the fauna monitoring results indicated that species diversity was similar between the control (98 species) and impact (97 species) monitoring sites. Long-term species diversity is shown on **Figure 6.8**. Comparisons among species groups indicated a slight decrease in species diversity for birds, reptiles and amphibians compared to previous monitoring results across all impact and control sites. Mammal diversity also decreased statistically significantly within woodland and combined habitat type impact sites compared to control sites; however, no significant difference was detected at riparian habitat impact sites compared to control sites. These trends are generally consistent across both control and impact monitoring sites and are most likely explained by local environmental and ecological factors outside of the influence of mining activity. The general consistency in amphibian diversity observed between 2020 and 2022 compared to previous monitoring periods is likely a result of increased habitat availability following periods of increased rainfall.

Nest box inspections indicated that 36 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. Two species were observed to be using nest boxes during the fauna surveys; the common brushtail possum, with 16 possums found to be occupying seven boxes on two occasions, and the brush-tailed phascogale, with one individual observed on one occasion during Spring 2022.

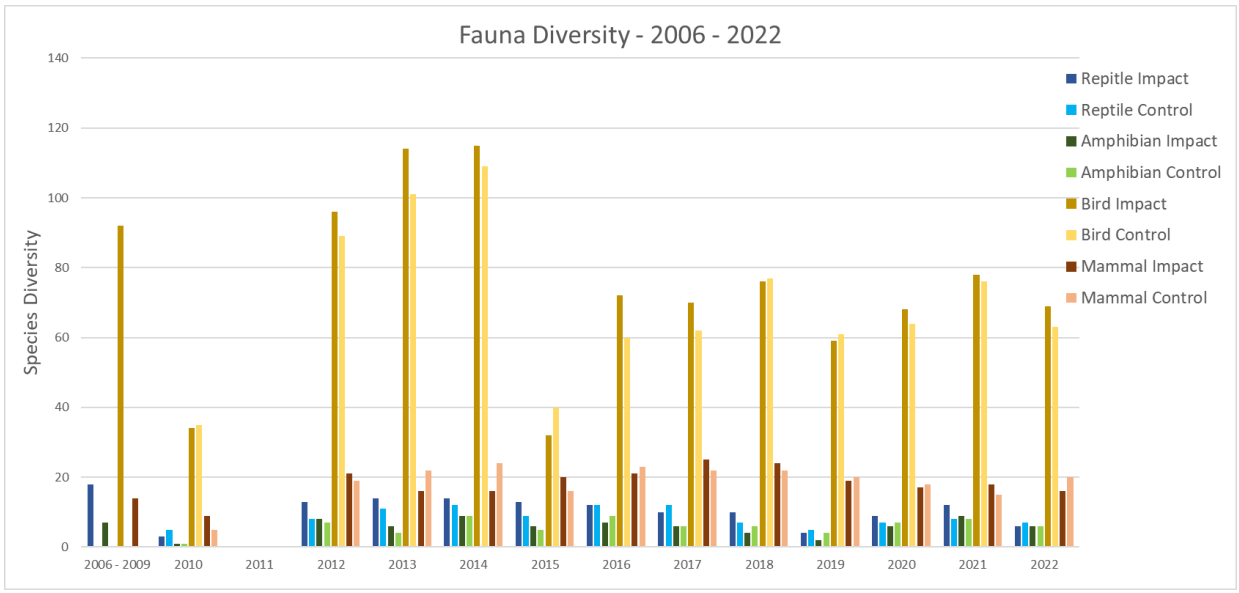


Figure 6.8
FAUNA DIVERSITY 2006 - 2022

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 FFMP and no further actions are required to address FFMP compliance.

Aquatic Ecology – Bowmans Creek and Glennies Creek

Biannual monitoring of aquatic ecology was undertaken by Marine Pollution Research Pty Ltd in autumn (17 to 19 May 2022) and spring (13 to 23 November 2022).

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 tenth 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, monitoring of site BCMW5 was discontinued following the autumn survey, and three existing and two additional monitoring locations were included in the monitoring program, as follows.

Construction on the lower EDC block bank was completed in November 2022 and the lower WDC block bank construction is forecasted to commence in 2023. Accordingly, there were three additional Bowmans Creek monitoring sites brought online for the spring 2022 survey to provide baseline data for the block bank works and the current progression of longwalls, as follows:

- A creek monitoring site overlying LW7B, within the section of creek that was bypassed by the eastern diversion channel (BCLW7B).
- A monitoring site in the upstream half of the constructed WDC (BCWD2).
- An inline creek monitoring site immediately downstream of the lower WDC block bank (BC5).

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 LW203 (SDN).
- A subsidence depression overlying LW204 (SDS).

Monitoring locations currently include a total of 19 sites where monitoring may occur, as follows.

- Eighteen sites within Bowmans Creek, of which 13 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.
- Two sites within waterbodies established within subsidence depressions, which for reporting purposes are included with Bowmans Creek.

Habitat Condition

Aquatic habitat conditions during the 2022 sampling period were generally consistent with the previous reporting period, with instream and riparian vegetation showing an as-predicted proliferation in response to sustained water levels since mid-2020.

Aquatic habitat conditions for each active monitoring site, measured using the Riparian Channel Environment habitat scoring system (RCE index), are presented in **Table 6.8**.

For those sites which were sampled, all sites were found to be in 'good' condition (i.e. >70%) with the exception of BCDown (57.7%). There were minor score increases in the BCDown RCE score compared to the previous reporting period to due to improvements in sediment and detrital composition, and while there were further improvements to the sediments (reduction in the proportions of mud compared to cobbles) in autumn 2022, the spring 2022 survey noted a reduction in 'channel sediment accumulations' category due to further mud deposition, likely resulting from the July 2022 flood event. This was however, mitigated by an increase in category score for 'aquatic vegetation' which resulted in no change to the overall spring 2022 RCE score.

Relatively high scores recorded for sites BCED1, BCED2 and BCWD2 are largely reflective of factors including a more continuous and denser riparian corridor adjacent to these sites, minimal bank undercutting and minimal fine sediment accumulation. With the exception of site BCDown, 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.

The new ponded sample sites SDN and SDS recorded relatively low scores (at 42% and 41% respectively). Catchment areas surrounding both sites are cleared for pasture and livestock practises, land which has been subjected to subsidence impacts, and therefore, lacks a definitive riparian corridor or channel structure that accompanying fluvial processes can act upon. 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.

Table 6.8
Monitoring Site RCE Index Score – 2014 to 2022

Year	Period	Site RCE Index Score (% Condition)[1]																	
		BCUp	BC1	BCLW7B	BCLW6B[2]	BCED1[3]	BCED2[3]	BC3	BCMW5	BCLW7A[2]	BCWD1	BCWD2[3]	BC5	BC6	BCDown	SDN	SDS	GCUp	GCMid
2014	Autumn	78.8	77.9		72.1	74		78.8		72.1		76.9		76.9	76			73.1	73.1
	Spring	78.8	77.9		73.1	75		76.9		71.2		76.9		75	74			73.1	73.1
2015	Autumn	78.8	76.9		71.2	78.8		77.9		76		79.8		74	73.1			74	73.1
	Spring	77.9	75		69.2	75		77.9		73.1		76.9		74	71.2			74	74
2016	Autumn	77.9	75		69.2	75		77.9		73.1		76.9		74	71.2			74	74
	Spring	77.9	75		69.2	75		77.9		73.1		76.9		74	70.2			74	74
2017	Autumn	76.9	74		68.3	74		77.9		73.1		75		74	70.2			72.1	71.2
	Spring	74	74		69.2	74		77.9		73.1		75		72.1	70.2			73.1	73.1
2018	Autumn	76	76.9		71.2	Dry		77.9		75		Dry		72.1	70.2			73.1	73.1
	Spring	76	76.9		Dry	Dry		Dry		75		Dry		Dry	70.2			71.2	71.2
2019	Autumn	Dry	73.1		Dry	Dry		Dry		Dry		Dry		Dry	49			71.2	71.2
	Spring	Dry	76		Dry	Dry		Dry		Dry		Dry		Dry	52.9			71.2	71.2
2020	Autumn	76.9	74		74	77.9	78.8	76.9	74	74		Dry		76.9	52.9			73.1	73.1
	Spring	76.9	75		73.1	80.8	79.8	77.9	74	74		80.8		76	52.9			73.1	73.1
2021	Autumn	76.9	76		73.1	81.7	78.8	76	74	72.1		80.8		76	53.8			73.1	73.1
	Spring	75	76		73.1	79.8	78.8	76	74	72.1		80.8		74	53.8			73.1	73.1
2022	Autumn	77.9	74		73.1	81.7	79.8	75	77.9	74.0		81.7		73.1	57.7			73.1	73.1
	Spring	77.9	74	74	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
Minimum		74	73.1	-	68.3	74	78.8	75	74	71.2	-	75	-	72.1	49	-	-	71.2	7
Maximum		78.8	77.9	-	74	81.7	79.8	77.5	77.9	76	-	81.7	-	76.9	76	-	-	74	74
Mean		77.1	75.6	-	71.2	76.8	79.1	77.5	74.0	73.4	-	77.9	-	74.5	64.5	-	-	72.9	72.8

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 3 of Marine Pollution Research Pty Ltd (2023).

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.

Stream Health – Aquatic Fauna

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

Macroinvertebrate diversities recorded for Bowmans Creek during the reporting period were low for one of the 11 sites sampled in autumn (BCDown), and for two sites sampled in spring (BCED1 and BCWD2). Low values likely reflect the delayed recovery of macroinvertebrate assemblages following prolonged dry conditions prior to the reporting period. Regional drought conditions during the 2018 and 2019 reporting periods resulted in reduced water quality (increased salinity and sediments) and habitat condition due to drought induced pool contraction and associated dieback of exposed plants. Notwithstanding, macroinvertebrate diversity levels during the autumn sampling round for all sites were either consistent with or higher than those reported during the previous reporting period. Higher diversity levels recorded during the spring sampling round display the recovery of macroinvertebrate assemblages during the reporting period in response to increased rainfall and water availability.

Site SIGNAL scores recorded for Bowmans Creek were either In or High at all sites sampled during both autumn and spring. For Glennies Creek, all macroinvertebrate diversities and SIGNAL scores were either within one standard deviation from the long term mean or higher during both seasonal sampling periods, except for GCUp during spring 2022 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, 'low' trigger values recorded for monitoring sites within Bowmans Creek during the reporting period are attributable to natural variation and natural environmental responses to prevailing climatic conditions. As such, no further action was required under the FFMP TARP.

In addition to aquatic macroinvertebrates, three native fish species, flathead gudgeons (*Phylipnodon grandiceps*), firetail gudgeons (*Hypseleotris galii*), Australian smelt (*Retropinna semmoni*), and three pest species, plague minnow (*Gambusia holbrooki*), goldfish (*Carassius auratus*), and carp (*Cyprinus carpio*), were also recorded at sites within both Bowmans Creek and Glennies Creek during the reporting period. Tadpoles were observed within Bowmans Creek during spring, and a large eastern long-necked turtle (*Chelodina longicollis*) was observed within Bowmans Creek during autumn.

Table 6.9
Stream Health Monitoring – Macroinvertebrate Diversity

Year	Period	Diversity (No. Taxa)																										
		Bowmans Creek Sites^													Summary		Subsidence Depression Sites^		Summary		Glennies Creek Sites^					Summary	
		BC Up	BC1	BCLW7B	BCLW6B	BCED1	BCED2	BC3	BC4.5	BCLW7A	BCWD1	BCWD2	BC5	BC6	BC Down	*Total*	*Mean Site*	SDN	SDE	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	-	-	-	-	-	-	-	-	22	12	***39***	***19.2***	-	-	-	-	9	-	30	22	-	***34***	***20.3***
2011	Autumn	20	-	19	19	-	-	-	-	-	-	-	-	18	21	***33***	***20.0***	-	-	-	-	-	-	27	23	-	***34***	***25.0***
	Spring	22	-	21	21	-	-	-	-	-	-	-	-	17	19	***37***	***19.8***	-	-	-	-	20	-	27	22	-	***35***	***23.0***
2012	Autumn	26	-	19	19	-	-	-	-	-	-	-	-	24	17	***39***	***22.2***	-	-	-	-	14	-	17	18	-	***26***	***16.3***
	Spring	35	22	17	17	-	-	-	-	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	-	Dry	9	***18***	***11.0***	-	-	-	-	20	-	19	-	-	***25***	***19.5***
2020	Autumn	15	20	-	16	21	22	20	17	7	-	Dry	-	15	9	***28***	***16.2***	-	-	-	-	22	-	25	-	-	***31***	***23.5***
	Spring	25	23	-	20	22	21	21	22	21	-	21	-	20	20	***39***	***21.5***	-	-	-	-	26	-	32	-	-	***36***	***29.0***
2021	Autumn	18	23	-	18	20	18	19	20	10	-	19	-	21	13	***40***	***18.1***	-	-	-	-	23		20			***35***	***21.5***
	Spring	24	19	-	18	26	29	20	23	15	-	23	-	20	19	***44***	***20.5***	-	-	-	-	20		29			***32***	***24.5***
2022	Autumn	19	22	-	17	23	21	25	20	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	26	***47***	***20.8***	28	21	-	-	27		27			***34***	***27.0***
LTM[1]		***23.2***	***18.3***	***18.6***	***17.5***	***22.6***	***20.0***	***21.7***	***18.3***	***21.4***	***-[4]***	***21.7***	***-[4]***	***21.4***	***19.0***	***39.8***	***20.0***	***-[4]***	***-[4]***	***-[4]***	***-[4]***	***20.5***	***-[4]***	***22.3***	***-[4]***	***-[4]***	***31.0***	***21.5***
SD LTM[2]		***5.4***	***3.8***	***3.7***	***4.6***	***3.3***	***0.7***	***4.1***	***3.8***	***6.5***	***-[4]***	***2.1***	***-[4]***	***4.7***	***5.1***	***8.6***	***3.5***	***-[4]***	***-[4]***	***-[4]***	***-[4]***	***3.9***	***-[4]***	***4.4***	***-[4]***	***-[4]***	***6.0***	***3.1***
2021 Status[3]	Autumn	In	in	-	In	In	In	In	In	-	-	-	-	In	Low	High	-	-	-	-	-	In	-	In	-	-	***In***	***In***
	Spring	In	High	High	In	Low	In	High	-	-	-	-	-	In	In	***In***	-	-	-	-	-	High	-	High	-	-	***In***	***High***

^ 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 4, 5, 7 and 8 of Marine Pollution Research Pty Ltd (2023).

Table 6.10
Stream Health Monitoring – SIGNAL Scores

Year	Period	Signal Score																										
		Bowmans Creek Sites^													*Summary*		Subsidence Depression Sites^		Summary		Glennies Creek Sites^					*Summary*	
		BC Up	BC1	BCLW7B	BCLW6B	BCED1	BCED2	BC3	BC4.5	BCLW7A	BCWD1	BCWD2	BC5	BC6	BC Down	*Creek Score*	*Mean Site*	SDN	SDE			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	-	-	-	-	-	-	-	-	3.52	3.67	***3.58***	***3.59***	-	-	-	-	3.22	-	3.61	3.55	-	***3.53***	***3.46***
2011	Autumn	3.60	-	3.47	3.47	-	-	-	-	-	-	-	-	3.44	3.60	***3.58***	***3.57***	-	-	-	-	-	-	3.81	3.74	-	***3.78***	***3.78***
	Spring	3.86	-	3.35	3.35	-	-	-	-	-	-	-	-	4.06	3.68	***3.79***	***3.80***	-	-	-	-	4.10	-	3.80	4.05	-	***3.97***	***3.98***
2012	Autumn	3.85	-	3.33	3.33	-	-	-	-	-	-	-	-	3.57	3.44	***3.55***	***3.53***	-	-	-	-	3.71	-	3.53	3.50	-	***3.57***	***3.58***
	Spring	3.77	3.68	4.00	4.00	-	-	-	-	3.85	-	-	-	3.62	3.75	***3.82***	***3.83***	-	-	-	-	3.92	-	3.79	4.50	-	***4.05***	***4.07***
2013	Autumn	3.77	3.73	3.45	3.45	-	-	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	3.00	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	3.42	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	4.11	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	3.41	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	3.50	3.61	-	3.65	-	3.47	3.67	***3.73***	***3.71***	2.83	2.85	-	-	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***
LTM[1]		3.63	3.59	3.55	3.31	3.58	3.56	3.60	3.68	3.42	***-[4]***	3.70	***-[4]***	3.60	3.58	***3.57***	***3.56***	***-[4]***	***-[4]***	***-[4]***	***-[4]***	3.84	***-[4]***	3.87	***-[4]***	***-[4]***	***3.85***	***3.85***
SD LTM[2]		0.39	0.29	0.35	0.33	0.21	0.45	0.37	0.51	0.44	***-[4]***	0.28	***-[4]***	0.30	0.38	***0.26***	***0.26***	***-[4]***	***-[4]***	***-[4]***	***-[4]***	0.28	***-[4]***	0.26	***-[4]***	***-[4]***	***0.20***	***0.21***
2022 Status[3]	Autumn	In	In	-	In	High	High	In	In	In	-	In	-	In	In	***In***	***In***	-	-	-	-	In	-	In	-	-	In	In
	Spring	High	High	In	In	High	In	High	-	In	-	High	-	High	High	***High***	***High***	-	-	-	-	Low	-	In	-	-	Low	Low

^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 6, 7 and 9 of Marine Pollution Research Pty Ltd (2022).

Vegetation - Bowmans Creek Riparian Zone

Monitoring of the Bowman Creek riparian vegetation was undertaken during the reporting period between 9 May to 18 May 2022 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 6.11 presents an overview of the performance of each monitoring site against the relevant completion criteria. In summary, rehabilitated casuarina and eucalypt woodland sites have generally formed functional and stable ecosystems comparable to conditions recorded in reference sites not subject to mining-related impacts, 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 and Q10 which were slightly lower than the casuarina reference sites this year.

The stability of the Casuarina reference sites has demonstrated a declining trend since 2019, as a direct result of the extreme flood events over the past few years. This year there has been a further decline in stability with the stability ranging from 60.4 – 63.3. In general, Casuarina monitoring sites were observed to have been less impacted from flooding events compared to reference locations. Consequently, Casuarina monitoring sites within both the diversion and natural creek channels displayed higher stability compared to reference sites during the reporting period.

Stability within the woodland reference sites compared to Casuarina reference sites is generally more stable in the long term, and less impacted from extreme weather events such as flooding.

Ecosystem function was generally higher at all Casuarina monitoring sites when compared to reference sites except for at Q4 and Q3; however, Q4 and Q3 displayed higher ecosystem functioning compared to ¾ and ¼ of monitoring sites, respectively. For river red gum, reference sites RWood02 and RRG01had the highest (187) and lowest (155) levels of ecosystem function, respectively. For river red gum monitoring sites, ecosystem function ranges from 184 at R6 to 167 at R5.

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, on average, most of the remnant River Red Gum population was in moderate health, with a viable reproductive population present and high numbers of saplings reflecting previous regeneration and recruitment events. 2022 monitoring indicated an increase in overall health condition, when compared to the significant decline in the health of the old growth and mature trees observed during 2020 and 2021. Observation of negative impacts from insect damage on both mature and sapling specimens. Saplings were observed to have been more negatively impacted from flooding compared to mature specimens.

Table 6.11
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 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	18	15	3	15	15	14	3	3	1	18	2	22
	Areas of active erosion are limited	No. Rills/Gullies	No.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phase 3: Growth medium development	Soil properties are suitable for the establishment and maintenance of selected vegetation species	pH	pH (5.6-7.3)	6.6	6.0	6.3	6.7	NA	7.0	NA	6.7	6.9	6.5	6.1	6.9	6.0	7.1
		Organic Matter	% (>4.5)	4.4	4.2	4.0	4.8	NA	5.4	NA	5.2	4.6	3.1	3.1	4.3	5.3	7.1
		Phosphorous	mg/ kg (50)	26.9	25.3	30.2	23.6	NA	17.7	NA	24.9	15.1	21.0	53.8	22.3	17.1	50.5
Phase 4: Ecosystem & Landuse Establishment	Landform is stable and performing as it was designed to do	LFA Stability	%	71.1	70.6	66.6	66.6	63.1	64.4	63.9	71.8	64	70.6	65	71.7	74.5	72.5
		LFA Landscape organisation	%	100	100	100	100	90	88	90	88	100	100	100	89	100	76
	Vegetation contains a diversity of species comparable to that of the local remnant vegetation	Diversity of shrubs and juvenile trees	% population	100	97	100	100	NA	0	NA	0	0	100	100	100	100	100
		Total species richness	No./ area	28	24	30	17	NA	44	NA	40	40	32	44	39	43	34
		Native species richness	>No./ area	4	4	10	3	NA	10	NA	33	11	7	14	15	27	11
		Exotic species richness	<No./ area	24	20	20	14	NA	34	NA	7	29	25	30	24	26	33
	Vegetation contains a density of species comparable to that of the local remnant vegetation	Density of shrubs and juvenile trees	No./ area	3	35	33	35	NA	0	NA	0	0	12	3	7	31	2
	The vegetation is comprised by a range of growth forms comparable to that of the local remnant vegetation	Trees	No./ area	1	2	5	1	NA	1	NA	1	1	3	3	3	6	2
		Shrubs	No./ area	0	1	2	0	NA	0	NA	0	0	2	1	0	1	1
		Herbs	No./ area	19	12	14	10	NA	29	NA	25	27	16	20	27	22	23
		Grasses	No./ area	4	4	6	4	NA	7	NA	9	10	7	16	3	9	3
Phase 5: Ecosystem & Landuse Sustainability	Landform is ecologically functional and performing as it was designed to do	LFA Infiltration	%	51.7	54.3	51.6	50.4	39.1	41.3	45.4	49.1	36.2	53.9	54.3	45.7	53.1	41.3
		LFA Nutrient recycling	%	50.6	51.7	51.5	48.1	33.8	38.3	42.2	46.6	33.2	52.3	55.4	49.4	46.4	41.2
	Ground layer contains protective ground cover and habitat structure comparable with the local remnant vegetation	Perennial plant cover (< 0.5m)	%	21.5	24.5	27.9	17.5	58	80.9	13.7	46	31.5	32.5	34.5	18	39.5	66
		Total Ground Cover	%	95	100	96.5	98	70	97	73.5	97	87	98	97	99.5	95	97
	Vegetation contains a diversity of species per square meter comparable to that of the local remnant vegetation	Native understorey abundance	> species/ m^2	0.4	0.6	0.6	1.4	2.4	0.2	1.2	0.2	1.8	0.8	1.8	1	3	0.4
		Exotic understorey abundance	< species /m^2	5.4	3.6	5.8	2.4	5.4	5.8	4.6	7.4	4.8	8	6.6	5.6	5.8	4.8
	Native ground cover abundance is comparable to that of the local remnant vegetation	Percent ground cover provided by native vegetation <0.5m tall	%	4.3	9.1	7.5	34.3	37.3	1.6	25	2.6	25.4	6.6	23.4	11.9	25	5.6
	The vegetation is maturing and/or natural recruitment is occurring at rates similar to those of the local remnant vegetation	Shrubs and juvenile trees 0 - 0.5m in height	No./ area	0	1	3	0	NA	0	NA	0	0	2	0	0	0	0
		Shrubs and juvenile trees >2m in height	No./ area	3	33	20	34	NA	0	NA	0	0	6	1	5	6	2
	The vegetation is developing in structure and complexity comparable to that of the local remnant vegetation	Foliage cover 0.5 - 2 m	% cover	14.6	9.6	11.5	8	0	4	0.5	4.5	0	5	1.8	11.6	6.8	0
		Foliage cover >6m	% cover	9.5	18	12	39	8	17.5	10	0	3.5	9.5	17	0	3	17
	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 6.11 (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 & Landuse 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	30	91	50	102	NA	7	NA	2	2	14	25	5	32	7
	The vegetation is in a condition comparable to that of the local remnant vegetation.	Healthy trees	% population	76.5	25.3	40.4	35.8	NA	42.9	NA	25	20	50	38.5	20	25	44.4
		Medium health	% population	23.3	64.2	46.2	47.7	NA	28.6	NA	25	0	42.9	42.3	80	65.6	22.2
		Advanced dieback	% population	0	6.3	9.6	10.1	NA	28.6	NA	0	0	7.1	15.4	0	9.4	11.1
		Dead Trees	% population	0	4.2	3.8	6.4	NA	0	NA	0	80	0	4	0	0	22
		Flowers/fruit: Trees	% population	30	5.3	25	10.1	NA	0	NA	50	0	35.7	11.5	0	15.6	44.4

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 (2022).

River red gum population size has increased overall since 2017 from 80 to 157 individual specimens being identified. A reduction in total numbers compared to the previous monitoring period (164) was attributed to loss of young saplings/seedlings from flooding, and reduced detectability due to increased growth of groundcover species. A relatively good degree of reproductive capacity was recorded during 2022 with 50% to 67% of all specimens bearing buds and/or old fruits. This represents a decrease from the previous reporting period, where 83% of specimens were observed as bearing reproductive material.

Approximately 71% of the population consists of saplings, of which approximately 42% are naturally occurring, suggesting passive recruitment and seedling survivability. The absence of both river red gum and eucalypt seedlings was observed; however, detectability of these specimens is considered to be low due to observed growth of understory and groundcover species, and historic grazing pressure has been identified as a potential cause of low seedling survivability.

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. Observed damage to and deaths of native tree species in direct proximity to weed control areas (i.e. areas of dead weeds) suggest non-target impacts from current weed control practices are occurring.

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 avoiding overgrazing.

Exotic species richness was higher than that of native species at all sites except for Q9, and the understory for all sites was dominated by exotic species. Fifteen 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 9 May and 18 May 2022. 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 6.12 presents an overview of the performance of each monitoring site within the SWCA against the relevant completion criteria. In summary, woodland sites SVCA01, SVCA02 and 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 also low for both SVCA01 and SVCA02, with SVCA02 again only meeting the minimum observed stability value. Low values were recorded for SCVA03 for diversity of shrubs and trees, total species richness, and native species richness. Most relevant completion criteria were also met at site SVCA04 with the exception of observed incidences of subsidence cracking.

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 minimum observed values within woodland ecosystem sites, yet relatively similar to other monitoring locations. 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 were moderately high in SVCA05. Testing also identified that locally occurring soils (i.e., in-situ material) may have elevated levels of salinity and sodicity, which may require additional testing and/or amelioration prior to use in rehabilitation.

Twelve 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.

In addition to the monitoring undertaken by DnA Environmental, a site audit inspection of the SWCA was undertaken by the Biodiversity Conservation Trust (BCT) on 25 May 2021. In follow up correspondence dated 19 August 2021, the BCT noted that the conservation area "*is in a moderate to good condition with much of the remnant vegetation exhibiting a diverse native cover within the lower stratums as a result of recent rainfall in the Hunter Valley.*" It was also noted that "*Areas that generally lacked woody cover were observed to have a high exotic groundcover present limiting the opportunity for native canopy and shrubs to establish.*"

Table 6.12
Southern Woodland Conservation Area – Completion Criteria Status

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Primary Performance Indicators	Unit of measure	Woodland ecosystem range 2022		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	2	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	1.80	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	5.7	6.2	6.1	5.8	6.3	6.1
			Organic Matter	Organic Matter levels are typical of the surrounding landscape, increasing or fall within desirable ranges provided by the agricultural industry	% (>4.5)	2.9	5.4	6.6	7.5	4.6	4.3	5.4	4.6
			Phosphorous	Available Phosphorus is typical of the surrounding landscape or fall within desirable ranges provided by the agricultural industry	mg/kg (50)	4.6	9.8	5.9	14.4	11.8	11.2	11.8	14.1
Phase 4: Ecosystem & Landuse Establishment	Landscape Function Analysis (LFA): Landform stability and organisation	Landform is stable and performing as it was designed to do	LFA Stability	The LFA stability index is comparable to or trending towards the local remnant vegetation	%	74.5	78.0	74.5	70.8	77.9	83.8	70.2	70.8
			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	%	93	100	100	100	100	100	91	87
	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	4	6	4	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	83	100	99	97	0	NA	NA	NA
			Total species richness	The total number of live plant species is comparable to the local remnant vegetation	No./area	55	72	56	60	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	38	47	33	38	15	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	14	25	23	22	17	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	1	177	138	79	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	10	152	136	76	0	NA	NA	NA
	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	3	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	25	43	30	30	16	NA	NA	NA
			Grasses	The number of grass species comprising the vegetation community is comparable to the local remnant vegetation	No./area	16	16	10	14	11	NA	NA	NA

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

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Primary Performance Indicators	Unit of measure	Woodland ecosystem range 2022		SVCA01	SVCA02	SVCA03	SVCA04	SVCA05	SVCA06
						Lower	Upper						
Phase 5: Ecosystem & Landuse Sustainability	Landscape Function Analysis (LFA): Landform function and ecological performance	Landform is ecologically functional and performing as it was designed to do	LFA Infiltration	LFA infiltration index is comparable to or trending towards the local remnant vegetation	%	43.4	56.3	50.3	61	59.6	63.4	48.5	46.1
			LFA Nutrient recycling	LFA nutrient recycling index is comparable to or trending towards the local remnant vegetation	%	47.9	53.3	51.8	58.1	55.3	60.4	47.2	45.2
	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	%	46	79	50	19.1	39.5	70.5	48	51
			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	%	95	100	100	100	100	100	99	97
	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	8.8	6.4	4.2	6	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	3.2	1.6	3	3	3.4	3.2
	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	%	69	86	79.2	82	60.3	75.3	75	65.9
	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	6	25	97	42	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	6	24	22	22	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	3	20	3	3	0	NA	NA	NA
	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	1	4	0.5	1.5	0	3	0	0
			Foliage cover 2 - 4m	Projected foliage cover provided by perennial plants in the 2 - 4m vertical height stratum indicates the community structure is comparable to the local remnant vegetation	% cover	1	6	3	0.5	0	6	0	0
			Foliage cover >6m	Projected foliage cover provided by perennial plants >6m vertical height stratum indicates the community structure is comparable to the local remnant vegetation	% cover	2	29	21	32	0	17.5	15	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

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

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Primary Performance Indicators	Unit of measure	Woodland ecosystem range 2022		SVCA01	SVCA02	SVCA03	SVCA04	SVCA05	SVCA06
						Lower	Upper						
Phase 5: Ecosystem & Landuse Sustainability (Cont'd)	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	6	86	26	22	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	0	13	7	38	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	8	11	14	21	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 (2022)

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 across. 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 17 and 26 May 2021.

Three eucalypt woodland and three native grassland reference sites were used to develop benchmark ecological values and inform ecological performance targets and completion criteria for woodland and grassland areas within the underground mining affected areas.

Table 6.13 presents an overview of the performance of each monitoring site against the relevant completion criteria. In summary, 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 UGWood02 and SVCA06 being more functional than the RWood01 reference site this year which had a score of 165. With scores of 162-163 sites UGWood02 and SVCA06 were however only negligibly lower. For grasslands, the

most ecologically functional site continued to be the native grassland reference sites RGrass03 with a total sum of LFA indices of 202. There was little overall difference between the remaining sites, and all underground monitoring sites were more functional than RGrass01 this year, which had the lowest score of 178. The historical data indicated that the ecological capacity of three pasture sites affected by underground mining had improved since 2007.

Floristic diversity remained low in all sites except SVCA01 compared to reference sites this year. Exotic species abundance increased compared to the previous reporting period, with all sites apart from UGPast04 having a higher abundance of exotic species compared to native. Native species were more abundant than exotic species at all reference sites. Notwithstanding the above, all sites had an acceptable level of exotic species abundance. Perennial groundcover was above criteria at all sites except UGWood02 (32%); however, the lowest recorded perennial groundcover was recorded at reference site SVCA02 (19.1%).

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 were strongly acidic. The woodland reference sites had soils close to or exceeding the 5% threshold for "desirable" sodicity, indicating the soils can be naturally sodic, with underground sites UGWood02, SVCA01, and SVCA05 also being sodic. Some of the pasture sites may have had elevated P and low N and were also sodic in UGPast03 and UGPast06. 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 however moderately high concentrations were recorded in SVCA05, UGPast01, UGPast02 and UGWood02.

No subsidence cracks were recorded in the range of pasture monitoring sites in 2019, however some small sinkholes however had developed in remediation sites UGPast01 and UGPast04. In UGPast04, a large sink hole had appeared in 2020 and since 2021 has had a diameter of 1.2m. This year a large linear depression approximately 2.0m wide had formed along the vegetation transect in UGPast06 as a result of subsidence. While no other subsidence cracks occurred along the vegetation transect, numerous sites had increased numbers of sinkholes, slumping and/or cracks in the general areas. There was also a noticeable increase in the extent of ponding, which typically occurred upslope of the some of the longwall panels.

Eleven 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.

Table 6.13
Farmland – Completion Criteria Status

Rehabilitation Phase	Completion criteria	Performance Indicators	Unit of measure	Pasture						Woodland		
				UGPast01	UGPast02	UGPast03	UGPast04	UGPast05	UGPast06	UGWood01	UGWood02	UGWood03
Phase 2: Landform establishment and stability	Landform suitable for final landuse and generally compatible with surrounding topography and final landform design	Slope	< Degrees (18°)	2	2	3	5	2	2	2	1	4
	No visible subsidence cracking	No. Subsidence Cracks	No.	0	0	0	1	0	1	0	1	0
		Sum of subsidence cracks width	m	0	0	0	1.20	0	2	0	1.3	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)	6.1	6.4	6.1	6.2	6.4	6.3	5.4	5.6	5.9
		Organic Matter	% (>4.5)	6.9	5.1	5.4	4.9	9.1	4.5	4.0	3.7	7.1
		Phosphorous	mg/kg (50)	40	68.6	14.4	23	144.6	27.9	17.7	13.1	15.1
Phase 4: Ecosystem & Landuse Establishment	Landform is stable and performing as it was designed to do	LFA Stability	%	79	76.5	77	78.8	76.9	78	75.3	71.8	81.5
		LFA Landscape organisation	%	100	100	100	100	100	100	97	94	100
	Pasture productivity is comparable to analogue sites.	Green Dry Matter Biomass	kg/ha	>3000	>3000	>3000	>3000	440	>3000	NA	NA	NA
Phase 5: Ecosystem & Landuse Sustainability	Landform is ecologically functional and performing as it was designed to do	LFA Infiltration	%	56	53.2	58.4	48.5	57.7	54.3	44.3	44.3	45.3
		LFA Nutrient recycling	%	54	50.3	54.3	53.3	60.5	56.6	48	47.1	51.6
	Ground layer contains protective ground cover and habitat structure comparable with the local remnant vegetation	Perennial plant cover (< 0.5m)	%	55.5	49.5	50.5	60	51.5	48.5	46.5	32.5	47
		Total Ground Cover	%	100	98	100	97	98	99.5	95	91.5	99
	Vegetation contains a diversity of species per square meter comparable to that of the local remnant vegetation	Native understorey abundance	> species/m2	3.2	2.0	4.0	5.4	2.0	3.8	4.4	5.6	7.2
		Exotic understorey abundance	< species/m2	5	4.6	5.4	4.8	6.4	4.8	3.8	3	3
	Native ground cover abundance is comparable to that of the local remnant vegetation	Percent ground cover provided by native vegetation <0.5m tall	%	37.6	33.3	44.1	49.4	22.4	39.8	47.7	66.7	73
	The vegetation is developing in structure and complexity comparable to that of the local remnant vegetation	Foliage cover 0.5 - 2 m	% cover	4	15.5	7.2	0	35.5	1.1	3.1	17.5	4.6
		Foliage cover 2 - 4m	% cover	0	0	0	0	0	0	9.6	12	5
		Foliage cover 4 - 6m	% cover	0	0	0	0	0	0	3.5	10.5	4.5
		Foliage cover >6m	% cover	0	0	0	0	0	0	0	6	2

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 (2022)

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 BCT recommendations relating to fencing and revegetation will also be reviewed and a plan of action and timeline developed for implementation.

Further investigation into elevated soil sulfur and iron levels at a number of monitoring sites and the casuarina and eucalypt reference sites is also planned.

6.7 HERITAGE

Management of heritage was undertaken in accordance with the September 2020 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.

- ULLD Seam subsidence crack zone ACH salvage works

  LW207A salvage works were undertaken in October 2022 including surface walkover of the predicted subsidence crack sone zone and surface.

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 gas wells etc.

Ongoing consultation with the Aboriginal community also continued through the Aboriginal Community Consultative Forums (ACCF), of which two were held during the reporting period in June and December 2022. 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.

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

6.8 SUBSIDENCE

Environmental Management

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

Environmental Performance

Underground longwall mining operations commenced in February 2007, with mining of the PG seam (LW1 to LW8) and ULD seam (LW101 to LW106A) since completed. Second workings during the reporting period were undertaken in LW206A and LW206B, with longwall extraction of LW206A commencing 13 January 2022 and was completed 16 October 2022. Longwall extraction of LW206B commenced 11 November 2022 and is yet to be completed.

Subsidence monitoring was undertaken in accordance with the *Ashton Coal Mine Longwalls 201 to 204 Extraction Plan – November 2016* and *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 6.14** summarises the maximum incremental and cumulative subsidence parameters for each of the monitoring locations relevant during the reporting period.

Table 6.14
Subsidence Monitoring Results

Location	Maximum Subsidence (m)	Maximum Tilt (mm/m)	Subsidence Attributable to Longwall (m)	Results Consistent with Extraction Plan Predictions
LW 206A				
132kV Poles (CN80018)	1.75	29	1.51	Yes
132kV Poles (CN80019)	2.3	37	0.64	Yes
LW106-Cl1	4.31	-138	2.87	Yes
LW6 CL1	4.98	-91	2.54	Yes
XL5	5.6	83	2.78	Yes
LW 206B				
Lemington Road	0.09	-2.1	0	Yes
LW6 CL3	3.3	-49.8	1.91	Yes
LW6 CL4	1.5	-43.5	0	Yes
XL12	3.2	-62.6	1.75	Yes
XL13	1.35	31.7	0.05	Yes
Source: Ashton Coal Operations Pty Limited (2022) – bi-monthly subsidence monitoring reports.				

Subsidence monitoring indicated that no exceedance of the incremental and cumulative subsidence predictions occurred at the locations monitored during the reporting period.

Minor to moderate cracking was observed at the start of LW206B in areas affected by ULLD seam extraction. All observed cracking was in accordance with modelling/expectations and was on Ashton owned land, and therefore was not a public safety issue.

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

Ponding of water has also been observed as a consequence of subsidence in areas which were typically flat prior to mining operations. Remediation of areas which display ponding is planned to occur following the completion of multi-seam mining operations below the surface. Ponding is considered low risk and has served to provide temporary water sources for stock and wildlife at the surface. In cases where flooding and water across roads occurred during the reporting period, traffic was diverted until adverse weather passed and repairs could be undertaken.

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

Reportable Incidents and Further Improvements

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

6.9 WASTE MANAGEMENT

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

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

- Hazardous (Recycled) – sludge, 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 6.15** together with the proportion of waste recycled. The proportion of waste recycled increased from 42.53% in 2021 to 54.01% in 2022, whilst the total volume of waste increased by approximately 30%. It is considered that the increase in waste volume is likely a result of the increased number of longwall moves during the reporting period resulting in greater waste and lower coal production.

Table 6.15
Approximate Waste Volumes 2018 to 2022

Waste Class	Waste Stream	Total Volume (kg)[1]				
		2018	2019	2020	2021	2022
Hazardous (Recycled)	Sludge	3,078	10,071	11,944	13,158	17,646
	Effluent (Off Site)	-	-	16,000	-	-
	Empty Drums	3,562	2,060	914	3,759	3,527
	Lead Acid Batteries	438	1,032	408	696	1,038
	Oil Filters	5,325	1,345	2,202	2,500	2,011
	Oily Water (Off Site)	19,258	66,942	59,167	72,284	96,987
	Waste Coolant	-	1,370	-	3,506	-
	Waste Grease	624	286	290	346	326
	Waste Oil	23,662	21,100	37,802	32,900	43,100
	Coagulant	-	1,936	-	-	-
	Activated Carbon	150	-	-	-	-
	Recycled (%)	**9.36%**	**15.76%**	**17.90%**	**14.93%**	**10.94%**
Non-Hazardous (Recycled)	Paper and Cardboard	6,685	6,710	7,605	11,481	9,537
	Confidential Documents	605	288	418	187	165
	Scrap Steel	145,760	149,440	157,380	214,080	271,210
	Timber (Uncontaminated)	12,200	9,340	920	13,060	3,340
	Recycled (%)	**27.58%**	**24.62%**	**23.13%**	**27.60%**	**29.38%**
Hazardous (Disposal)	Medical and Sanitary Waste	261	465	293	270	477
	Hydraulic Hose	1,282	-	2,006	794	-
	Asbestos	-	2,200	-	-	-
	Oily Rags	499	580	378	466	246
	Chemical Anchors	1,039	1,050	669	585	1,239
	Recycled (%)	**0.51%**	**0.64%**	**0.47%**	**0.24%**	**0.13%**
Non-Hazardous (Disposal)	Diesel Particulate Filters	10,563	17,145	22,321	28,857	43,721
	Mixed Solid Waste	364,132	379,920	398,252	466,169	455,211
	Recycled (%)	**62.54%**	**58.97%**	**58.50%**	**57.22%**	**34.21%**
Total Waste		**599,123**	**673,280**	**718,969**	**865,098**	**1,124,461**
Recycled Waste		**221,347**	**271,920**	**295,050**	**367,957**	**607,287**
Recycled Waste (%)		**36.95%**	**40.39%**	**41.04%**	**42.53%**	**54.01%**

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.

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

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 2021/2022 water year (i.e. 1 July 2021 to 30 June 2022).

Table 7.1
Water Take – 2021/2022 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	27.49	220.12	247.61
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	10.29	1.32	11.61
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	30.97	0	30.97
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	32.76	0	32.76
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	0	0	0
41552	20AL219014		511	497.71	0	497.71
41553	20AL219015		81	0	0	0
		Total 2021/2022		**599.22**	**221.44**	**820.66**
		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.

Note: WAL41529 (20AL818991) was not held by ACOL during the 2021/2022 water year. WAL41529 and associated allocation and water take will be reported by ACOL during the 2022/2023 water year.

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 – 2022 Calendar Year

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Input / Output	Component	Sub – Component	Water Volume (ML)[1]
2022 Inputs	Surface Water	Precipitation and Runoff	1,581.0
		Rivers and Creeks	308.0
		External Surface Water Storages	0.0
	Groundwater	Aquifer Interception	539.5
		Bore Fields	0.0
		Entrainment	137.1
	Third Party Water	Contract / Municipal	0.9
		Waste Water	0.0
		Total Inputs	**2,566.5**

Table 7.2 (Cont'd)
Input / Output Water Balance – 2022 Calendar Year

Input / Output	Component	Sub–Component	Water Volume (ML)[1]
2022 Outputs	Surface Water	Discharge	0.0
		Environmental Flows	0.0
	Groundwater	Seepage	412.2
		Reinjection	0.0
	Supply to Third Party		
	Other	Evaporation	233.0
		Entrainment	471.3
		Other (e.g. ventilation moisture loss)	217.2
		Total Outputs	**1,333.6**
		Total Inputs minus Total Outputs	**1,232.9**
		Storage at the Start of 2022	**1,919**
		Storage at the End of 2022	**3,228**
		Overall Water Imbalance	**76**

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 fourteen (14) approved monitoring sites (see **Figure 7.1**) with sample analysis by a NATA accredited laboratory. Surface water quality (SWQ) monitoring data for the reporting period is summarised in **Table 7.3** 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.

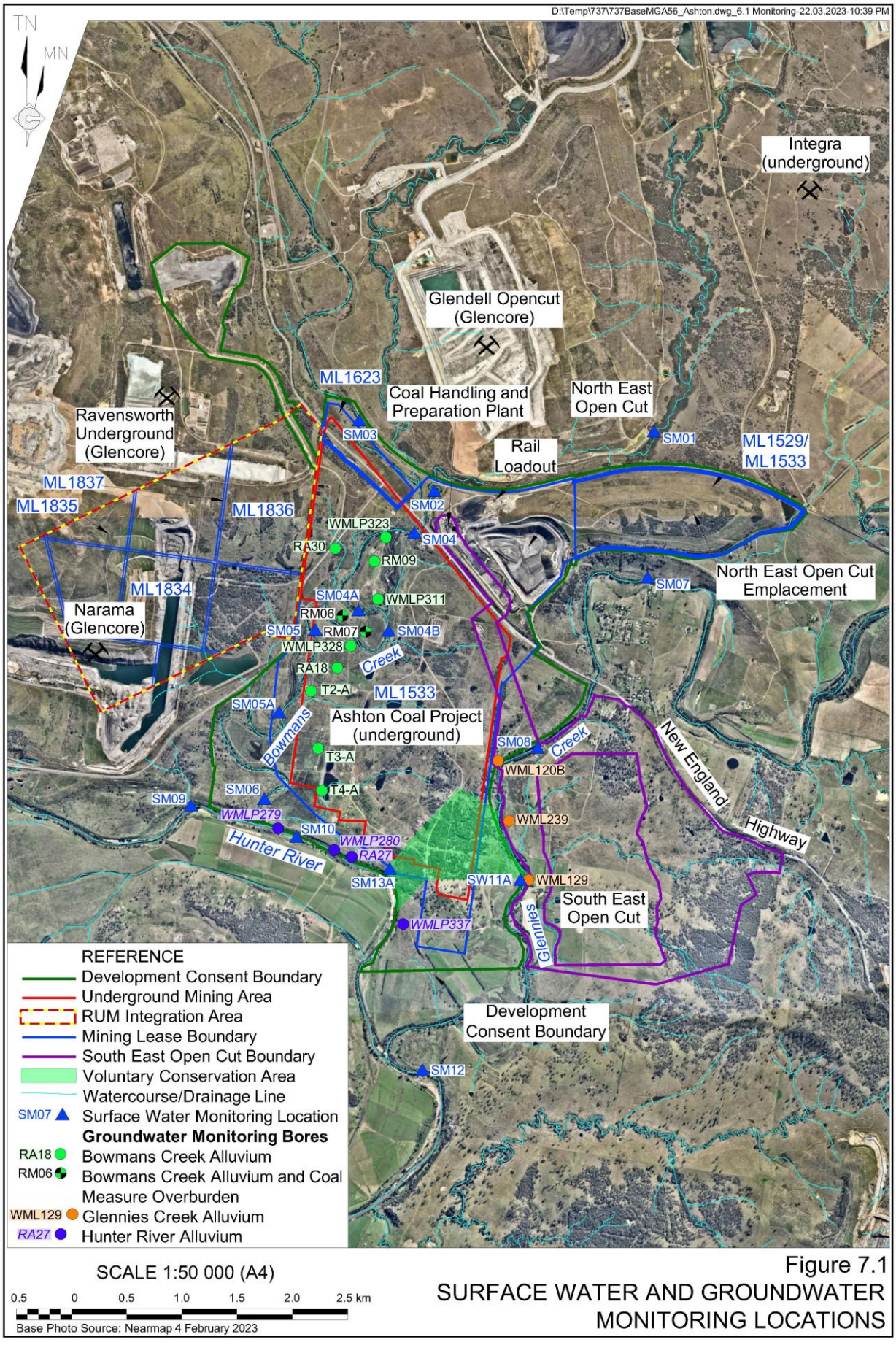


Figure 7.1
SURFACE WATER AND GROUNDWATER MONITORING LOCATIONS

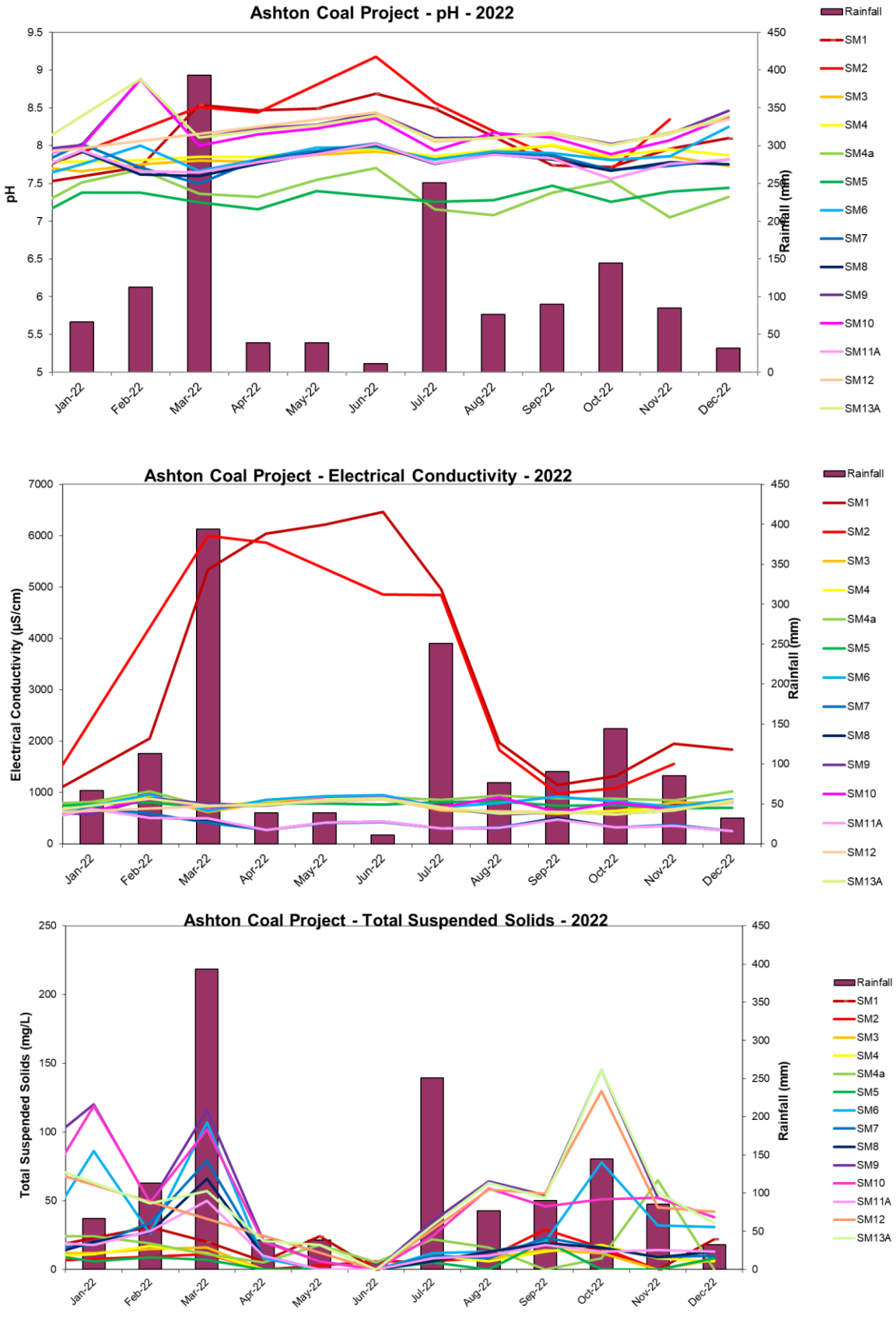


Figure 7.2
SURFACE WATER QUALITY MONITORING RESULTS – 2022

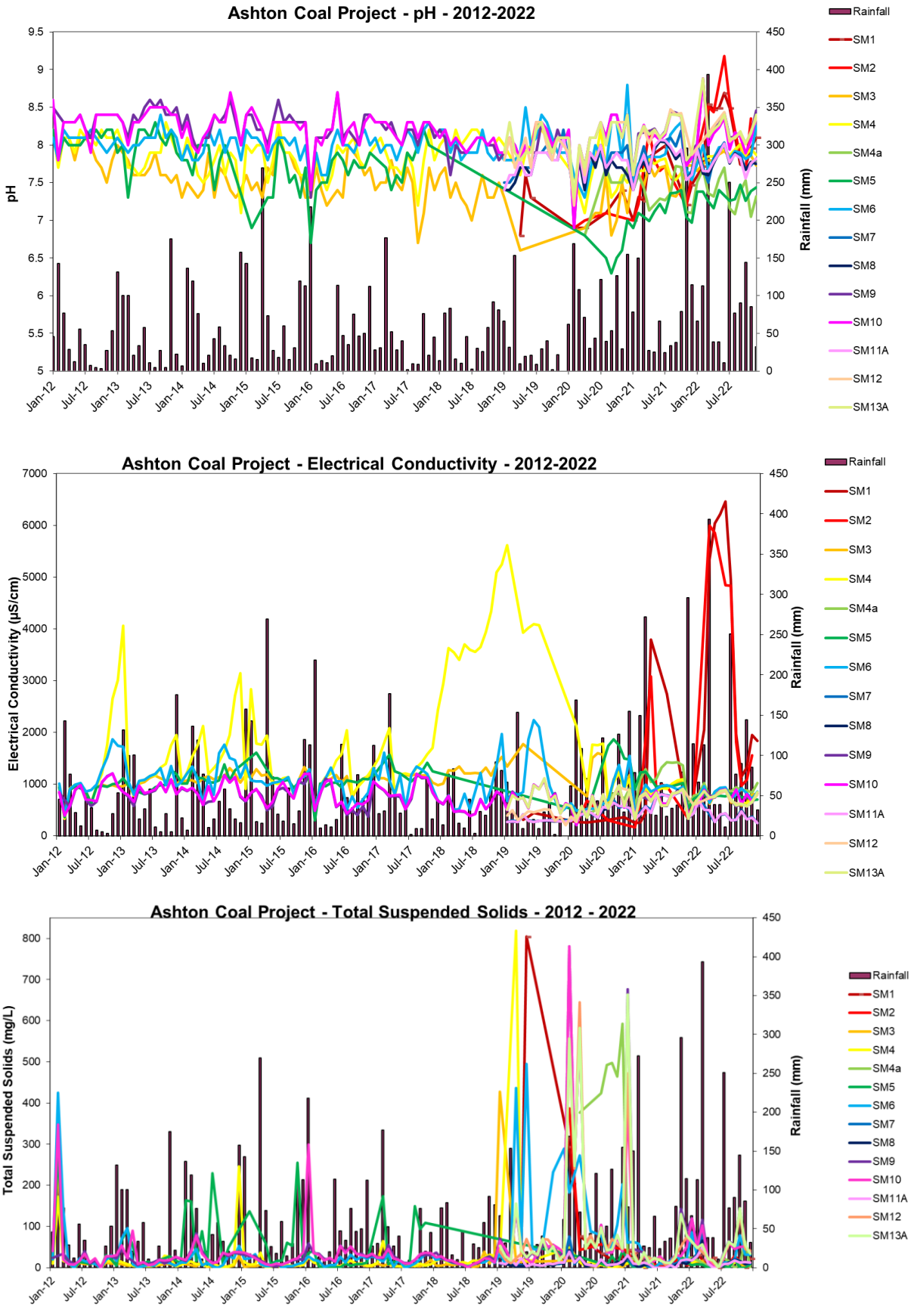


Figure 7.3
SURFACE WATER QUALITY MONITORING RESULTS – 2012 TO 2022

Table 7.3
Surface Water Monitoring Summary - 2022

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	7.7 – **8.7** (**8.2**)	<6.97 - >7.70 [<6.6 - >8.0]	1,150 – **6,460** **(3,572)**	>1,198 [>1,811]	659 – **4,570** **(2,453)**	>794 [>1,193]	<5 – 31 (15)	>122 [>273]
SM2	**7.7** – **9.2** (**8.3**)	<6.87 - >7.63 [<6.6 - >7.6]	975 – **6,000** (**3,373**)	>1,144 [>1,803]	563 – **4,370** (**2,290**)	>732 [>1,105]	<5 – 29 (11)	>116 [>116]
Bowmans Creek								
SM3	7.7 – **8.0** (7.8)	<7.42 - >7.88 [<7.2 - >8.1]	593 – 913 (755)	>1,440 [>1,620]	336 – 536 (439)	>878 [>965]	<5 – 16 (9)	>20 [>62]
SM4	7.8 - 8.0 (7.9)	<7.71 - >8.09 [<7.4 - > 8.3]	595 – 928 (762)	>3,656 [>10,790]	335 – 550 (444)	>2,270 [>6,331]	<5 – 18 (10)	>37 [>104]
SM4A	**7.1** – 7.7 (**7.4**)	<7.60 - >8.10 [<7.4 - >8.3]	716 – 1,020 (873)	>1,140 [>1,796]	427 – 648 (505)	>653 [>1,067]	<5 – 65 (17)	>19 [>44]
SM5	**7.2** – 7.5 (**7.3**)	<7.66 - >7.97 [<7.5 - > 8.1]	688 – 826 (762)	>1,542 [>1,796]	368 – 485 (429)	>891 [>1,031]	<5 – 21 (7)	>20 [>31]
SM6	7.7 – 8.3 (7.9)	<7.84 - >8.23 [<7.6 - >8.4]	636 – 961 (825)	>1,108 [>1,831]	358 – 573 (466)	>642 [>810]	<5 – **107** (**35**)	>26 [>60]
Glennies Creek								
SM7	7.5 – 8.0 (7.8)	<7.66 - >8.03	252 – 709 (406)	>577	135 – 424 (242)	>342	<5 – 79 (19)	>19
SM8	7.6 – 7.8 (8.0)	<7.62 - >7.96	250 – 685 (400)	>562	148 – 385 (237)	>334	<5 – 66 (17)	>22
SM11A	7.6 – 8.0 (7.8)	<7.74 - >8.02	250 – 684 (401)	>564	135 – 385 (237)	>332	<5 – 50 (17)	>20
Hunter River								
SM9	8.0 – 8.9 (8.2)	<8.00 - >8.32	571 – 892 (727)	>942	328 – 536 (420)	>541	<5 – **145** (**59**)	>34
SM10	7.9 – 8.9 (8.2)	<8.00 - >8.32	616 – 903 (777)	>942	356 – 506 (439)	>526	<5 – **119** (**48**)	>42
SM12	8.0 – 8.4 (8.2)	<7.84 - >8.24	569 – 865 (689)	>728	350 – 461 (392)	>415	<5 – **130** (**52**)	>36
SM13A	8.0 – 8.9 (8.3)	<8.02 - >8.32	582 – 892 (738)	>927	314 – 491 (422)	>516	<5 – **145** (**48**)	>41

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

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

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

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

Source: Ashton Coal Operations Pty Limited.

Table 7.4
Consecutive Surface Water Trigger Level Exceedances

Parameter	Monitoring Location[1]	Period
pH	SM1	Feb - Dec
	SM2	Mar - Sep
	SM3	May - Sep
	SM4A	Mar – May, Jul - Sep
	SM5	Jan - Dec
	SM10	Oct (21) – Feb (22)
	SM13A	Oct (21) – Feb (22)
EC	SM1	Feb – Dec (ex. Sep)
	SM2	Mar – Aug
TDS	SM1	Feb – Dec (ex. Sep)
	SM2	Mar - Aug
TSS	SM6	Oct - Dec
	SM9	Jan – Mar, Jul - Dec
	SM10	Jan – Mar, Aug - Nov
	SM12	Aug – Dec
	SM13A	Aug - Nov
Note 1: see **Figure 7.1**.		

In summary, three (or more) consecutive exceedances of pH, EC or TDS trigger values were recorded across ten monitoring sites on nineteen occasions during the reporting period. For the monitoring sites SM1 and SM5, the period of exceeding pH levels in exceedance of trigger levels extended for the entire reporting period. At site SM1 the EC and TDS samples were also exceeding trigger values for the entire reporting period excepting September. 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 ant 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 period of low and high flows. No data indicates mining-related effects.
- Exceedances of the pH (upper limit), TDS and EC trigger levels at the Bettys Creek monitoring sites reflect a trend at both upstream and downstream sites since December 2021 and correspond with high flow events in Bowmans Creek[3] in November and December 2021 and again in March 2022. Increases in pH, TDS and EC initially occurred upstream with a lagged rise in downstream levels. Further monitoring and assessment is required, however, given that levels initially rose upstream of all Ashton operations, this indicates the increases are not due to mining-related effects.

[3] Flow monitoring is not undertaken within Bettys Creek –flow events in Bowmans Creek may indicate flow events in Bettys Creek.

- Exceedances of the pH impact criteria for Bowmans Creek at:
  - SM3 are likely due to upstream influences given it is located upstream of ACP activities;
  - SM4a and SM5 are likely related to the location of these sites within diverted sections of Bowmans Creek in combination with regional drought conditions and low rainfall between 2017 to 2020, leading to oxidation of sulphides in surficial sediment, followed by periods of increased rainfall and high flow commencing in 2020 and continuing during the 2022 reporting period. Notably, the lowest pH recorded at these sites during the reporting period was 7.05 (i.e. neutral). Given that the applicable default ANZECC trigger values are 6.5 to 8.0 (compared with the narrow site-specific trigger level range) it is unlikely that the pH levels recorded at SM4a and SM5 have had any adverse effects.
- The cause for the period of exceedance of the TSS impact criteria for Bowmans Creek at SM6 between October and December 2022 remains under investigation. However, based on the proximity of the Hunter River (which also recorded elevated TSS during this period) and SM6, there exists potential for influence of backwater from the Hunter River.

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 for approval. 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 DPE.

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, except for an increase in March, August and November 2022, groundwater levels were stable throughout the reporting period and remained above established trigger levels.

Monitoring results for GCA bores also indicated that groundwater levels were relatively stable during the reporting period excluding increases in groundwater levels occurring in March and August 2022 following higher than average rainfall. Groundwater levels at all GCA bores remained above the relevant groundwater level trigger values during the reporting period.

Similarly, groundwater levels recorded for HRA bores remained relatively stable, with the exception of increases in groundwater levels in March, June and October following above average rainfall. Groundwater levels at all HRA bores remained above the relevant groundwater level trigger values during the reporting period.

Monitoring results for Coal Measures Overburden (CMOB) bores were also stable throughout the reporting period with increases recorded in correlation with the cumulative rainfall data trend.

Groundwater results recorded during the reporting period for longwall specific monitoring bores indicated that water levels remained relatively stable for bores adjacent panels LW206A/206B. In particular, vibrating wire piezometer (VWP) readings in sensors at 30m and 59m remained

relatively stable in bore WMLP269 throughout the reporting period. However, the deeper sensors recorded erroneous data since July 2022, likely due to fracturing of strata in which the deeper sensors are located.

Groundwater Quality

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

- BCA – pH 6.38 (T5) to pH 7.19 (WMLP326).
- GCA – pH 6.18 (WMLP358) to pH 7.45 (WML129).
- HRA – pH 6.21 (WMLP336) to pH 7.26 (WMLP337).
- Coal Measure – pH 6.19 (WMLP302) to pH 7.99 (WML262).
- CMOB - pH 6.4 (T2P) to pH 7.4 (WMLP324).

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

- BCA – 507µS/cm (WMLP323) to 3,561µS/cm (T3A).
- GCA – 323µS/cm (WMLP358) to 1,363µS/cm (WML120B).
- HRA – 444µS/cm (WMLP280) to 3,124µS/cm (WMLP337).
- Coal Measure – 322.7µS/cm (WML120A) to 5,648µS/cm (RSGM1).
- CMOB – 672.2µS/cm (WMLP324) to 4,490µS/cm (T3P).

EC levels recorded for GCA and HRA bores were steady overall throughout the reporting period, with the exception of GCA bores WML120B, WMLP346 and WMLP358 in which EC increased throughout the monitoring period and HRA bores WMLP337 and WMLP278 in which EC steadily decreased throughout the year while EC values in WMLP338 increased. EC levels within BCA bores were overall stable throughout the reporting period, except for bore YAP016 which recorded steadily increasing EC values throughout 2022 until December, where EC sharply decreased.

Two bores exceeded trigger levels during the reporting period (WMLP279 - HRA and WMLP358 - GCA), however, only WMLP358 exceeded the trigger levels on three consecutive occasions, triggering the response plan outlined in the WMP. The investigation 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.

Coal measure and CMOB EC levels were variable during the year, except for WML183 in which EC decreased throughout the year, whilst RSGM1 EC decreased from the beginning of the year until May, then increasing until November. EC in WML115B increased from the start of the year until August, where it continued to decrease at a lower rate. EC in T3P also increased from the beginning of the year, declining after August. 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.

Generally, the site has experienced no mining impacts to the BCA, 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 elevated EC results in one alluvial bore, subsequent investigation concluded that these trigger events were attributable to heavy rainfall raising water levels and naturally mobilising salts with no further action (except continued monitoring) required.

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 DPE. Review of trigger levels WMLP358 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) 2021 (ha)	This Reporting Period (Actual) 2022 (ha)	Next Reporting Period (Forecast)[3] 2023 (ha)
Total mine footprint[1]	921.8	1,326.4[4]	1,326.4[4]
Total active disturbance[1]	184.0	189.0	189.0
Land being prepared for rehabilitation	0	0	0
Land under active rehabilitation[1]	737.8	737.8	737.8
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 no specific rehabilitation works were undertaken in relation to the underground mining operations. Rehabilitation of 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.

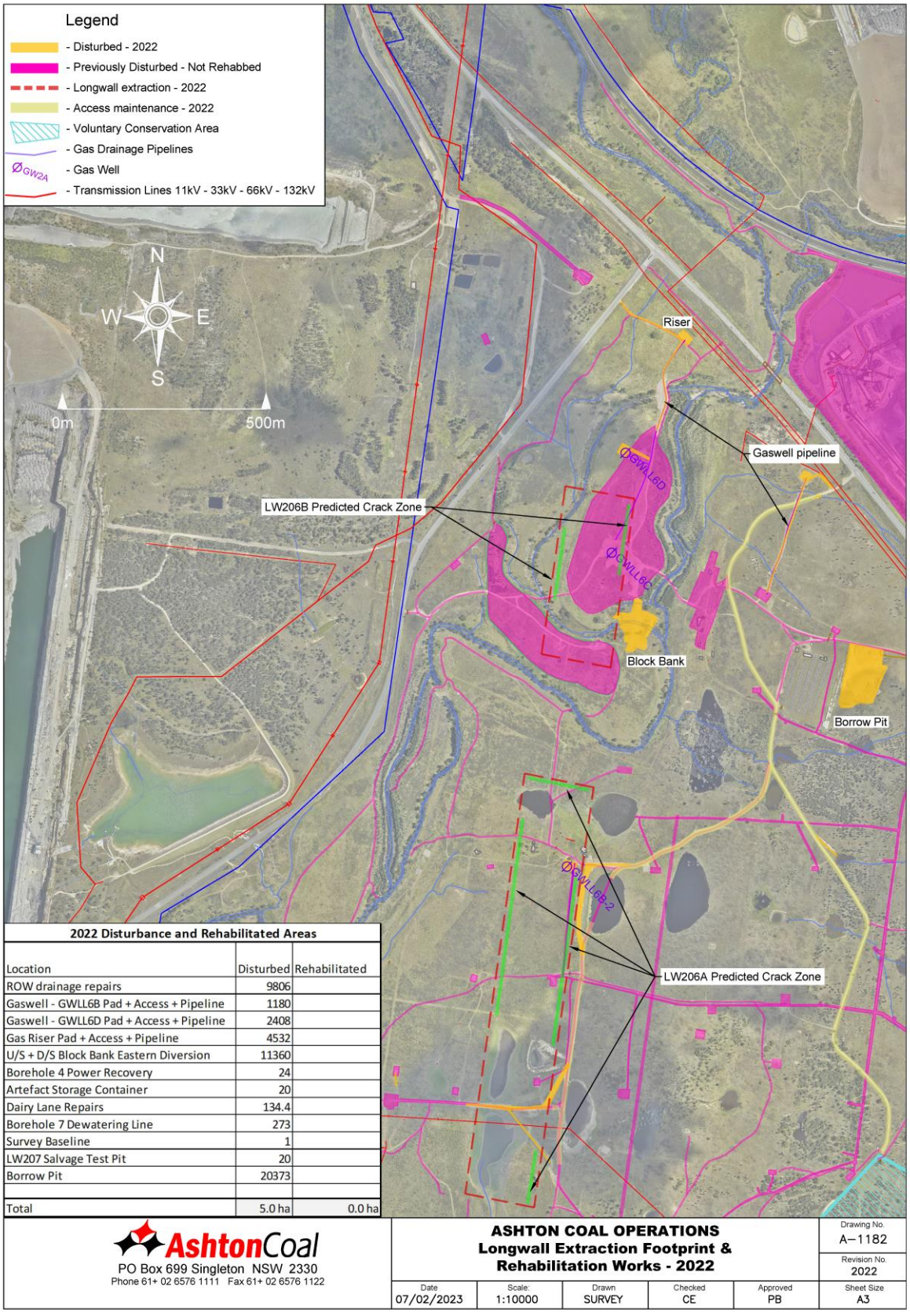
No permanent buildings were structurally altered, renovated or removed during the reporting period and no rehabilitation trials or research was undertaken during the reporting period. A summary of rehabilitation monitoring and activities is provided as follows.

North-east Open Cut Rehabilitation

Monitoring of NEOC rehabilitation was undertaken between 9 to 13 May 2021 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*.



2022 Disturbance and Rehabilitated Areas

Location	Disturbed	Rehabilitated
ROW drainage repairs	9806	
Gaswell - GWLL6B Pad + Access + Pipeline	1180	
Gaswell - GWLL6D Pad + Access + Pipeline	2408	
Gas Riser Pad + Access + Pipeline	4532	
U/S + D/S Block Bank Eastern Diversion	11360	
Borehole 4 Power Recovery	24	
Artefact Storage Container	20	
Dairy Lane Repairs	134.4	
Borehole 7 Dewatering Line	273	
Survey Baseline	1	
LW207 Salvage Test Pit	20	
Borrow Pit	20373	
Total	5.0 ha	0.0 ha

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ASHTON COAL OPERATIONS
Longwall Extraction Footprint & Rehabilitation Works - 2022

Date	Scale:	Drawn	Checked	Approved	Sheet Size
07/02/2023	1:10000	SURVEY	CE	PB	A3

Drawing No. A–1182
Revision No. 2022

Figure 8.1
REHABILITATION ACTIVITIES – UNDERGROUND AREA (1 JANUARY – 31 DECEMBER 2022)

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 v's transect) being undertaken during Autumn in alternating years. During the 2022 reporting period, transect based methodologies were employed.

It is intended to convert approximately 15ha of exotic pasture areas into areas of eucalypt woodland habitat over the next five years (subject to suitable meteorological conditions). This updated rehabilitation strategy has been reflected within the RMP developed within the 2022 reporting period.

Rehabilitation monitoring continued to assess the performance of both the existing mixed woodland habitat and exotic perennial pastures, with three woodland rehabilitation sites and four exotic pasture rehabilitation sites being monitored in 2022. Rehabilitation performance is compared against a range of ecological performance targets and completion criteria 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 2022 monitoring demonstrate that many completion targets have been met, with some exceptions. Ecological performance indicators for the mixed eucalypt woodland habitat and exotic pastures demonstrate these rehabilitated areas have generally developed into highly functional and stable communities, functionally comparable to the local woodlands and native grasslands. It was also noted that the extreme seasonal conditions experienced over the past 15 years, combined with simultaneous changes in total grazing pressure (both livestock and macropods), has had a significant impact on the composition and diversity of both the NEOC vegetation and the reference sites. 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 tree, logs, rock piles and nest boxes would likely increase available habitat within the NEOC.

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.

Table 8.2
North East Open Cut Rehabilitation Area – Rehabilitation Sites Completion Criteria Status 2022

Rehabilitation Phase	Completion criteria	Performance Indicators	Unit of measure	Exotic Pasture Sites				Woodland Sites		
				M2008 01	M2008 02	M2009 01	M2010 01	M2008 03	M2012 03	M2012 04
Phase 2: Landform establishment and stability	Landform suitable for final landuse and generally compatible with surrounding topography and final landform design	Slope	< Degrees (18°)	14	14	14	14	4	2	1
	Areas of active erosion are limited	No. Rills/Gullies	No.	0	0	0	0	0	0	0
		Cross-sectional areas of rills	M^2	0	0	0	0	0	0	0
Phase 3: Growth medium development	Soil properties are suitable for the establishment and maintenance of selected vegetation species	pH	pH (5.6-7.3)	7.0	7.1	8.05	7.3	8.4	9.2	8.2
		EC	dS/m (<0.150)	0.055	0.098	0.130	0.135	0.132	0.205	0.119
		Organic Matter	% (>4.5)	3.6	8.5	9.2	11.8	5.7	4.6	6.7
		Phosphorous	mg/kg (50)	13.8	498.6	92.8	102.0	42.6	7.5	4.9
		Nitrate	mg/kg (>12.5)	2.8	7.5	2.8	2.9	1.3	1.9	3.4
		Cation Exchange Capacity (CEC)	Cmol+/kg (>14)	14.2	16.1	23.1	20.7	20.7	17.6	14.5
		Exchangeable Sodium Percentage (ESP)	% (<5)	1.7	1.1	2.8	0.8	1.0	6.7	1.2
Phase 4: Ecosystem & Landuse Establishment	Landform is stable and performing as it was designed to do.	LFA Stability	%	76.8	68	75	83.6	72.7	68.3	64.3
		LFA Landscape organisation	%	99	100	100	100	88	98	100
	Pasture productivity is comparable to analogue sites.	Green Dry Matter Biomass	kg/ha	>3000	>3000	>3000	>3000	NA	NA	NA
Phase 5: Ecosystem & Landuse Sustainability	Landform is ecologically functional and performing as it was designed to do	LFA Infiltration	%	48.9	48.6	53.5	63.1	51	45.6	53.8
		LFA Nutrient recycling	%	50.6	45.5	50.8	63.3	49.4	45.9	53.8
	Ground layer contains protective ground cover and habitat structure comparable with the local remnant vegetation.	Litter cover	%	47.5	45	20	21.5	34	65	79.5
		Annual plants	<%	2	9	0	0	0	0	11.5
		Cryptogram cover	%	1.5	0	0	0	0	0	0
		Rock	%	0	0.5	0	0	1	0	3.5
		Log	%	0	0	0	0	0	0	0

Table 8.2 (Cont'd)
North East Open Cut Rehabilitation Area – Rehabilitation Sites Completion Criteria Status 2022

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 & Landuse Sustainability (Cont'd)		Bare ground	<%	0.5	5	1	0	0.5	1.5	3.5
		Perennial plant cover (< 0.5m)	%	48.5	40.5	79	78.5	64.5	33.5	2
		Total Ground Cover	%	99.5	95	99	100	99.5	98.5	96.5
	Vegetation contains a diversity of species per square meter comparable to that of the local remnant vegetation.	Native understorey abundance	>species/m^2	1.2	0.6	0.0	0.4	0.0	0.2	1.2
		Exotic understorey abundance	<species/m^2	8	4.4	2.2	3.4	3.6	1.8	3
	Native groundcover abundance is comparable to that of the local remnant vegetation.	Percent groundcover provided by native vegetation <0.5m tall.	%	11.0	10.5	0.0	6.8	0.0	3.6	19.4
	The vegetation is developing in structure and complexity comparable to that of the local remnant vegetation.	Foliage cover 0.5m – 2m	% cover	NA	NA	19.5	NA	10.5	9.1	1.5
		Foliage cover 2m – 4m	% cover	NA	NA	NA	NA	20	3.5	11.5
		Foliage cover 4m – 6m	% cover	NA	NA	NA	NA	15	4	11
		Foliage cover >6m	% cover	NA	NA	NA	NA	6	2	4

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 (2022)

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 2022. The baiting program accounted for a total of 25 wild dogs and 43 foxes. A feral pig management program involving trapping was implemented throughout 2022 in response to observed feral pigs and feral pig wallows on site. A total of 19 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.

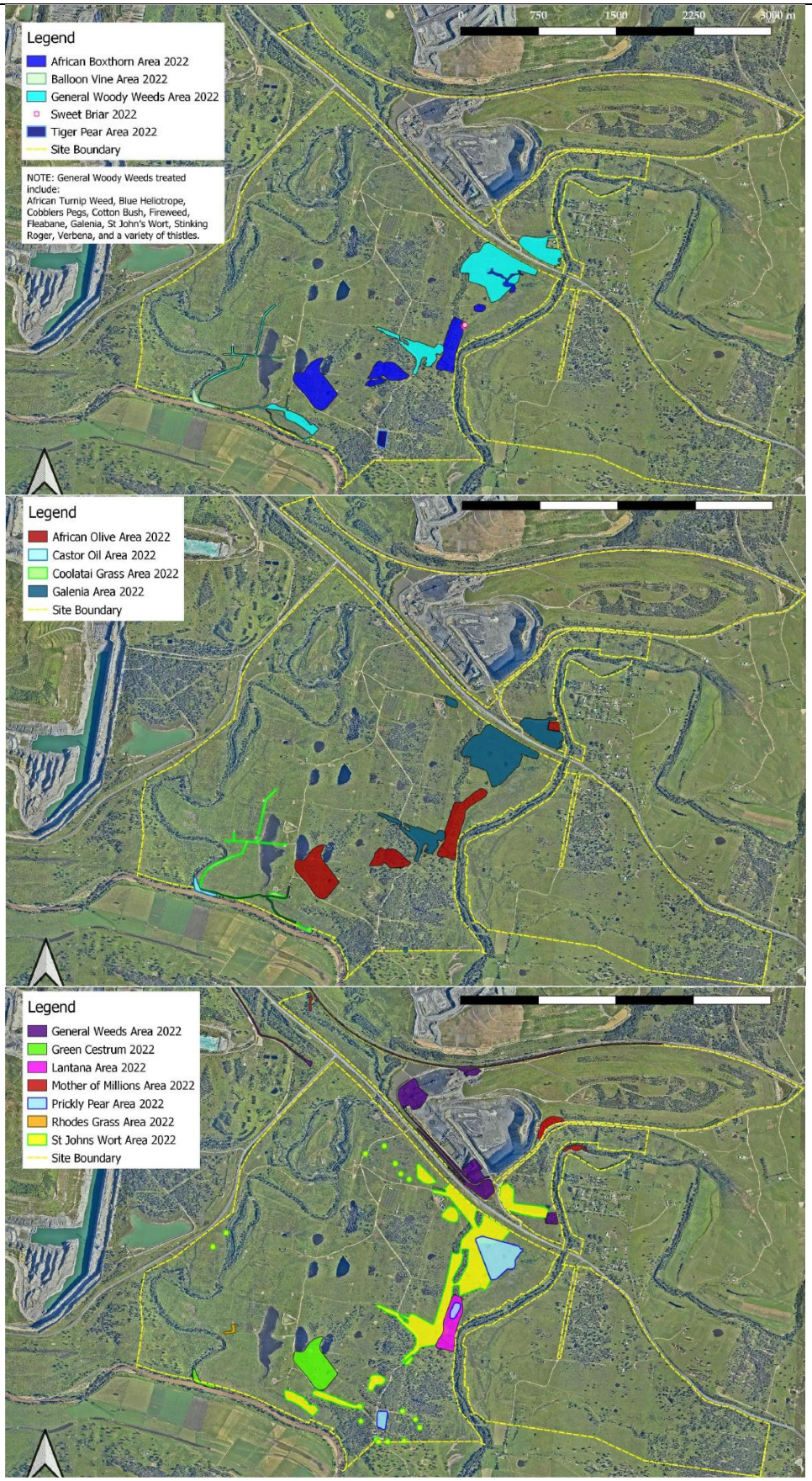
Active weed control treatment was also completed across land owned by ACOL, targeting African boxthorn (*Lycium ferocissimum*) (27ha), African olive (*Olea europaea* subsp. *cuspidata*) (26ha), African Love Grass (*Eragrostis Curvula*), Balloon vine *(Cardiospermum grandiflorum)* (1ha), Castor Oil (*Ricinus communis*) (1ha), Coolatai grass (*Hyparrhenia hirta*) (10ha), galenia (*Galenia pubescens*) (36ha), Green Cestrum (*Cestrum parqui*) (13ha) lantana (*Lantana camara*) (7ha), mother of millions (*Kalanchoe daigremontiana*) (<2ha), prickly pear (*Opuntia stricata*) (13ha), Rhodes Grass (*Chloris gayna*) (<1ha), St John's wort (*Hypercum perforatum*) (>54ha), sweet briar (*Rosa rubiginosa*) (isolated infestations), tiger pear *(Opuntia aurantiaca*) (2ha), general woody weeds (39ha), and general weeds (27ha). **Figure 8.2** displays the areas treated for weeds during the reporting period.

8.2 ACTIONS FOR THE NEXT REPORTING PERIOD

Rehabilitation during the next reporting period will principally relate to rehabilitation of disturbance associated with gas drainage network development 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.



Source: ENRIGHT Land Management (2023) – Maps 1, 2 and 3

figure 8.2
WEED TREATMENT AREAS – 2022

9. COMMUNITY

9.1 COMMUNITY COMPLAINTS

No complaints were received during the 2022 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.

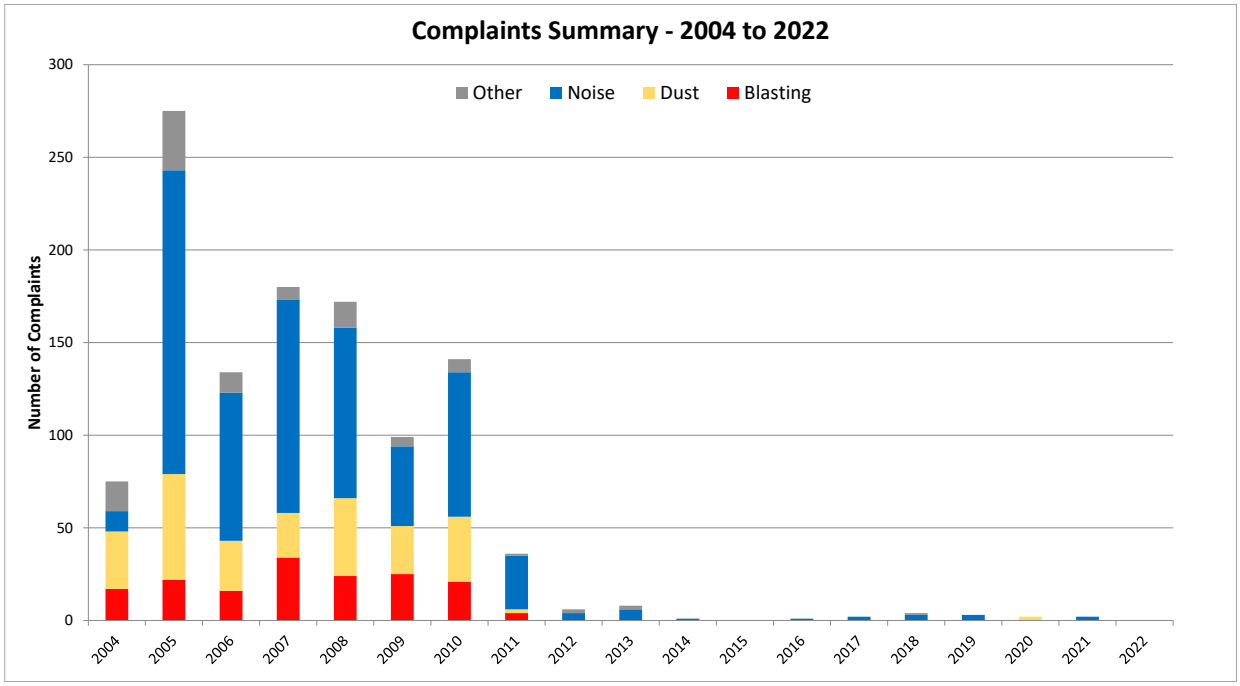


Figure 9.1
COMMUNITY COMPLAINTS – MINE LIFE

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 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, DPE.

The committee held a total of three meetings during the reporting period (24 February, 26 June and 1 December 2022). 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 are available on the Ashton Coal website at www.ashtoncoal.com.au.

ACOL also undertakes engagement through the Aboriginal Community Consultation Forum (ACCF). The ACCF is a community engagement process in place to ensure ongoing dialogue between the Aboriginal Community and Ashton Coal. ACCF meetings regularly discuss planned mining operations, potential impacts to Country, upcoming projects and salvage works. Two meetings were held during the reporting period in June and December 2022 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 $48,000 was allocated directly by ACOL to the following community groups and causes.

- Singleton Heights Preschool – expansion to the sandpit.
- Singleton Police Citizens Youth Club – building upgrades.
- Singleton Theatrical Society – 2023 production.
- Australian Christian College – new outdoor fitness stations.
- Singleton Fire Station - engine rebuild for the 444 Lolly Run.
- Cessnock Minor Rugby League Club - new equipment.

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 reporting period with a site inspection undertaken on 18 January 2023. At the time of preparing this Annual Review, the audit report had yet to be finalised. The audit covers the period from 31 September 2019 to 18 January 2023. The final audit report will be submitted to the Planning Secretary along with ACOL's response to any recommendations contained in the audit report during the 2023 reporting period.

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

Table 10.1 provides a summary of the previous 2019 Independent Audit recommendations. The recommendations of the 2022 Independent Environmental Audit will be reflected in the 2023 Annual Review.

Table 10.1
2019 Independent Audit – Action Response Plan Status

Ref	Audit Observation	Auditor Recommendation	ACOL Response	Proposed Action	Timeline	Status Update
EPL Cond M2.2	In 2016 PM_{10} data was not able to be captured for a period of 19 days at Site 2 due to equipment failure. In 2017 PM_{10} data was not captured on multiple occasions from Points 7, 9 and 10, due to equipment failures and supply delays in replacement of the faulty equipment. Air monitoring stations are inspected regularly.	There is no recommendation related to this non-compliance. Ashton's existing equipment monitoring program is appropriate.	In 2016, the 19 days of non-captured data represents 5% of total annual data. 2017 non-captured data represented 1.8% of total annual data. ACOL has an existing monitoring and maintenance regime for the three onsite AQ monitors (TEOM), including daily checks of TEOM function and data receipt, monthly field audit and servicing, and quarterly calibration	Introduction of automated alarm that notifies ACOL staff and contracted environmental monitoring database managers upon nonreceipt of monitoring data. Incorporate this requirement into the ACOL Air Quality and Greenhouse Gas Management Plan (AQGGMP).	Complete	The AQGGMP was further updated during the 2022 reporting period (version dated November 2022). Alerts are now received by ACOL personnel upon nonreceipt of monitoring data.
EPL Cond M2.3	In 2017 groundwater samples were not collected from all piezometers associated with Point 8. It is noted that failure to collect water from a dry piezometer does not trigger a non-compliance against this condition. However, if piezometers have been destroyed by the mining operations, then, in consultation with the EPA, those piezometers should be either replaced (relocated) or removed from the groundwater monitoring plan (refer to EPL Condition P1.3).	Consult with the EPA regarding the modification of the groundwater monitoring requirements for Point 8.	Selection of replacement EPL groundwater monitoring sites in consultation with EPA has been completed. EPA have incorporated new groundwater monitoring sites into latest version of EPL11879 (21 November 2019) as Sites 20 to 31.	New EPL groundwater monitoring sites to be documented in groundwater monitoring program, as part of Water Management Plan (WMP) review.	Complete	The WMP was further updated during the 2022 reporting period (version dated November 2022). Additional EPL bores YAP016 (EPL site 20) and WMLP320 (EPL site 21) have been incorporated into the WMP.

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

Ref	Audit Observation	Auditor Recommendation	ACOL Response	Proposed Action	Timeline	Status Update
EPL Cond M6.1	Ashton's website provides both email and telephone enquiries and complaints lines. In 2017 the telephone complaints line was found to be inactive by DPE on 1 February 2017.	Schedule checks of the complaints line (monthly) to ensure that it is operational.	Following the February 2017 incident, complaints handling protocols were revised to ensure notification of ACOL staff following community complaints, and the requirement for a monthly test of the Community Enquiries Line was introduced.	Requirement for monthly test of the Community Enquiries Line to be documented in the Complaints Handling Procedure (Doc No: 4.3.1.1.2).	Complete	The update of the Complaints Handling Procedure has been completed and monthly tests are undertaken.
EPL Cond R5.1	No evidence was sighted by the Auditor to confirm that annual noise compliance assessment reports were prepared and issued to the EPA.	Prepare annual Noise Compliance Assessment Reports and issue those reports to the EPA	Annual Noise Compliance Assessment Reports (NCAR) were submitted to NSW EPA subsequent to IEA, with no further action required by EPA. 2019 NCAR submitted to NSW EPA with 2019 EPL Annual Return.	Requirement to check for, and include, supporting reports as part of EPL Annual Return to be documented in the Environmental Management Strategy	Complete	Environmental Management Strategy further updated during the 2022 reporting period (version dated November 2022).
ML1533 Cond 2.1/ ML1623 Cond 3(a)	An inspection by DRE inspectors on 29 May 2018 identified several instances where the requirements of the MOP were not being fully implemented. The DRE recommendations were fully implemented.	Ensure that all commitments in the MOP (and other management plans) are fully implemented. Ensure that all Annual Reviews are submitted with the required time frames.	Non-compliance resulted from (a) lack of clarity regarding topsoil management for minor disturbance projects, and (b) inconsistency between MOP and Fauna and Flora Management Plan commitments regarding handling of cleared vegetation. Both issues were rectified during the drafting of the latest MOP (September 2018)	No additional action proposed	Not Applicable	No further actions required.

11. INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

During the reporting period there were no:

- non-compliances with Development Consent 309-11-2001-i, the mining leases or water access licences; or
- official cautions, warning letters, penalty notices or prosecution proceedings.

During the reporting period one incident was reported to DPE, Resources Regulator, EPA, Singleton Council and other authorities/organisations. The incident related to a 14t excavator accidently tramming off a causeway resulting in the excavator tipping forward and the operator needing to drop the bucket to steady the excavator. The diesel fuel point, hydraulic oil fill point and dipstick area all remained above water and no pollution or environmental harm occurred. The causeway has been delineated to avoid potential reoccurrence.

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. Investigate controlled grazing within the Bowmans Creek Riparian area to manage weeds and fuel loads and implemented as appropriate.	31.12.23
2. Continue planning towards (and subject to improved meteorological conditions, implementation of) program to convert areas of NEOC pasture rehabilitation to mixed eucalypt woodland.	31.12.23 (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.	31.12.23
4. Plan for and, subject to improved meteorological conditions) undertaken habitat enhancement plantings, particularly within the narrow casuarina woodland areas.	31.12.23 (subject to meteorological conditions)
5. Commence of sulphate monitoring in Bowmans Creek and inspections following elevated TSS results.	Ongoing
6. Review BCT recommendations and prepare implementation plan with timeframes.	30.06.23
7. Complete review and update of the Biodiversity Management Plan and Heritage Management Plan and submit to DPE for approval	Q2 2023

Appendices

(No. of pages including blank pages = 497)

Appendix 1 Noise Compliance Assessment Report 2022

Appendix 2 Annual Groundwater Monitoring Review 2022

Appendix 1

Noise Compliance

Assessment Report 2022

(No. of pages including blank pages = 382)

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Newcastle NSW 2300
02 4907 4800
www.emmconsulting.com.au

24 January 2023

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

Re: EPL 11879 - Noise compliance assessment report 2022

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 2022 to 31 December 2022. 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.

2 EPL amendments

EPL 11879 was varied once during the 2022 reporting period. One condition relating to noise was updated on 3 November 2022 and is summarised as follows:

- Condition M8.2 - References regarding noise definitions (sound pressure levels) have been updated to the correct conditions.

3 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 periods when noise limits were applicable.

4 Conclusion

Monthly attended noise monitoring undertaken during the relevant reporting period (1 January 2022 to 31 December 2022) 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

Robert Kirwan
Associate Acoustic Consultant
rkirwan@emmconsulting.com.au

Review: Katie Teyhan (19/01/2023)

Appendix A

Monthly attended noise monitoring report – January 2022

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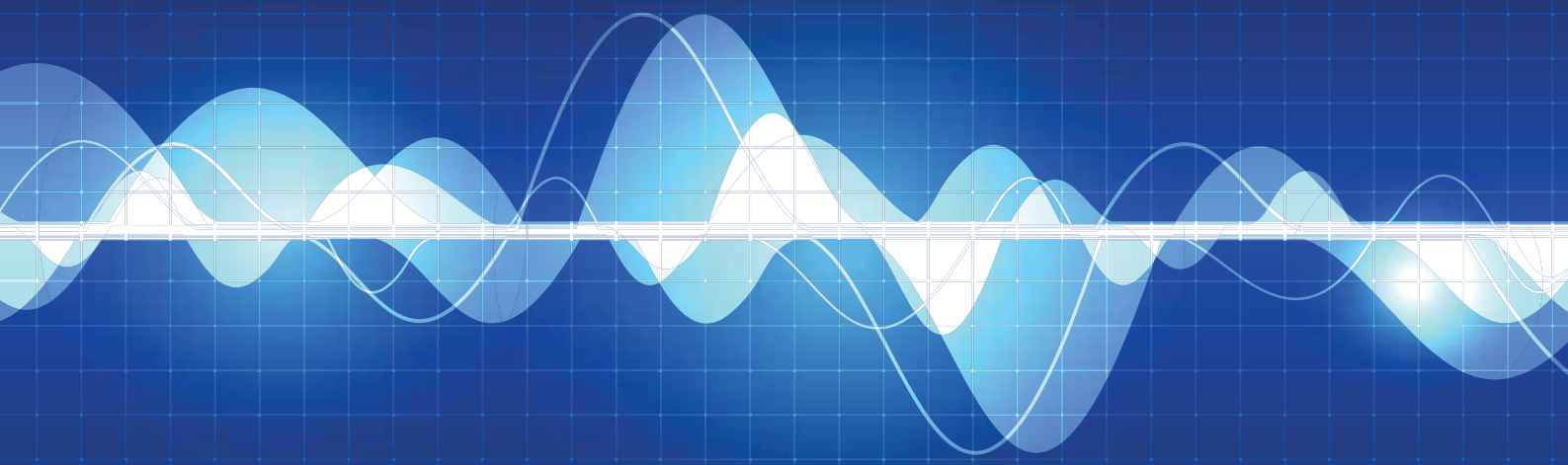
Ashton Coal

Monthly attended noise monitoring
January 2022

Prepared for Ashton Coal Operations Pty Ltd
February 2022



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Ashton Coal

Monthly attended noise monitoring - January 2022

Prepared for Ashton Coal Operations Pty Ltd
February 2022

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Ashton Coal

Monthly attended noise monitoring - January 2022

Report Number

E211129 RP1

Client

Ashton Coal Operations Pty Ltd

Date

7 February 2022

Version

v1 Final

Prepared by

Lucas Adamson
Senior Acoustic Consultant
7 February 2022

Approved by

Katie Teyhan
Associate
7 February 2022

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 purpose of the monitoring was to address requirements of the approved Ashton Coal Noise Management Plan (NMP), prepared to satisfy the requirements of the 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 27 January 2022.

The following material was referenced as part of this assessment:

- Department of Planning, Industry and Environment (DPIE), Development Consent 309-11-2001-I, as modified on 20 June 2016 (current as of 27 January 2022);
- Environment Protection Authority (EPA), Environment Protection License 11879, as varied on 3 February 2020 (current as of 27 January 2022);
- Ashton Coal Project Noise Management Plan (NMP), approved by DPIE on 23 September 2020 (current as of 27 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 what an average person perceives about 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

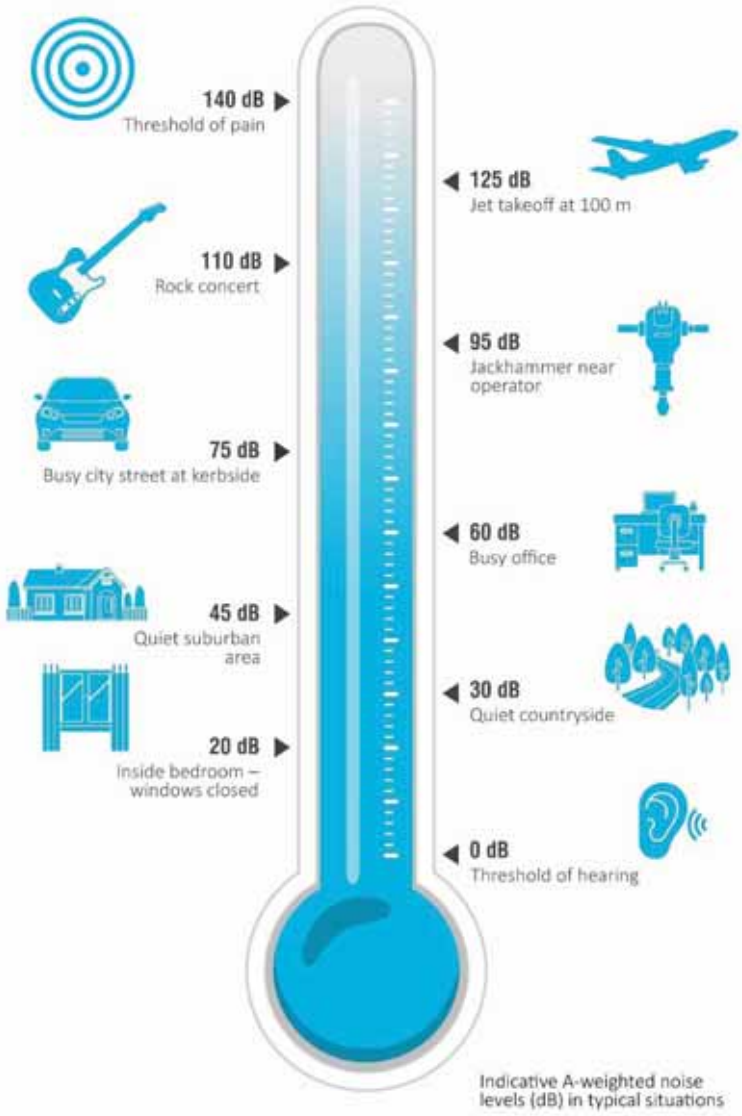


Figure 2.1 Common noise levels

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 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/100m.

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 (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 factors.

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 ion 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 Low frequency noise criteria

Condition 3 of Appendix 8 of the DC states that noise generated by Ashton Coal is to be measured in accordance with the relevant requirements of the INP. The INP application notes state that Section 4 of the INP has been withdrawn and the modifying factor adjustments outlined in Fact Sheet C of the NPfI are to be used when assessing the characteristics of a noise source.

Fact sheet C of the NPfI (EPA 2017) provides guidelines for applying modifying factor corrections to account for low frequency noise emissions. The NPfI specifies that a difference of 15 dB or more between site 'C-weighted' and site 'A-weighted' noise emission levels identifies the potential for an unbalanced spectrum and potential increased annoyance.

Where a difference of 15 dB or more between site 'C-weighted' and site 'A-weighted' noise emission levels is identified, the one-third octave noise levels recorded should be compared to the values in Table C2 of the NPfI (EPA 2017), which has been reproduced in Table 3.2 below.

Table 3.2 One-third octave low-frequency noise thresholds

	One-third octave $L_{Zeq,15\ minute}$ threshold level												
Frequency (Hz)	**10**	**12.5**	**16**	**20**	**25**	**31.5**	**40**	**50**	**63**	**80**	**100**	**125**	**160**
dB (Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

The following modifying factor correction is to be applied where the site 'C-weighted' and site 'A-weighted' noise emission level is 15 dB or more and:

- where any of the one-third octave noise levels in Table 3.2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2 dB positive adjustment to measured/predicted A-weighted levels applies for the evening/night period; or

- where any of the one-third octave noise levels in Table 3.2 are exceeded by more than 5 dB and cannot be mitigated, a 5 dB positive adjustment to measured/predicted A-weighted levels applies for the evening/night period.

Hence, where relevant throughout each survey the operator has estimated the difference between site 'C-weighted' and site 'A-weighted' noise emission levels by matching audible sounds with the response of the analyser (L_{Ceq}-L_{Aeq}). Where this was deemed to be 15 dB or greater, the measured one-third octave frequencies have been compared to the values in Table 3.2 to identify the relevant modifying factor correction (if applicable). This method has been applied to this assessment as presented in Section 5.

It is of note that the NPfI (EPA 2017) states that low-frequency noise corrections only apply under the standard or noise-enhancing meteorological conditions.

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

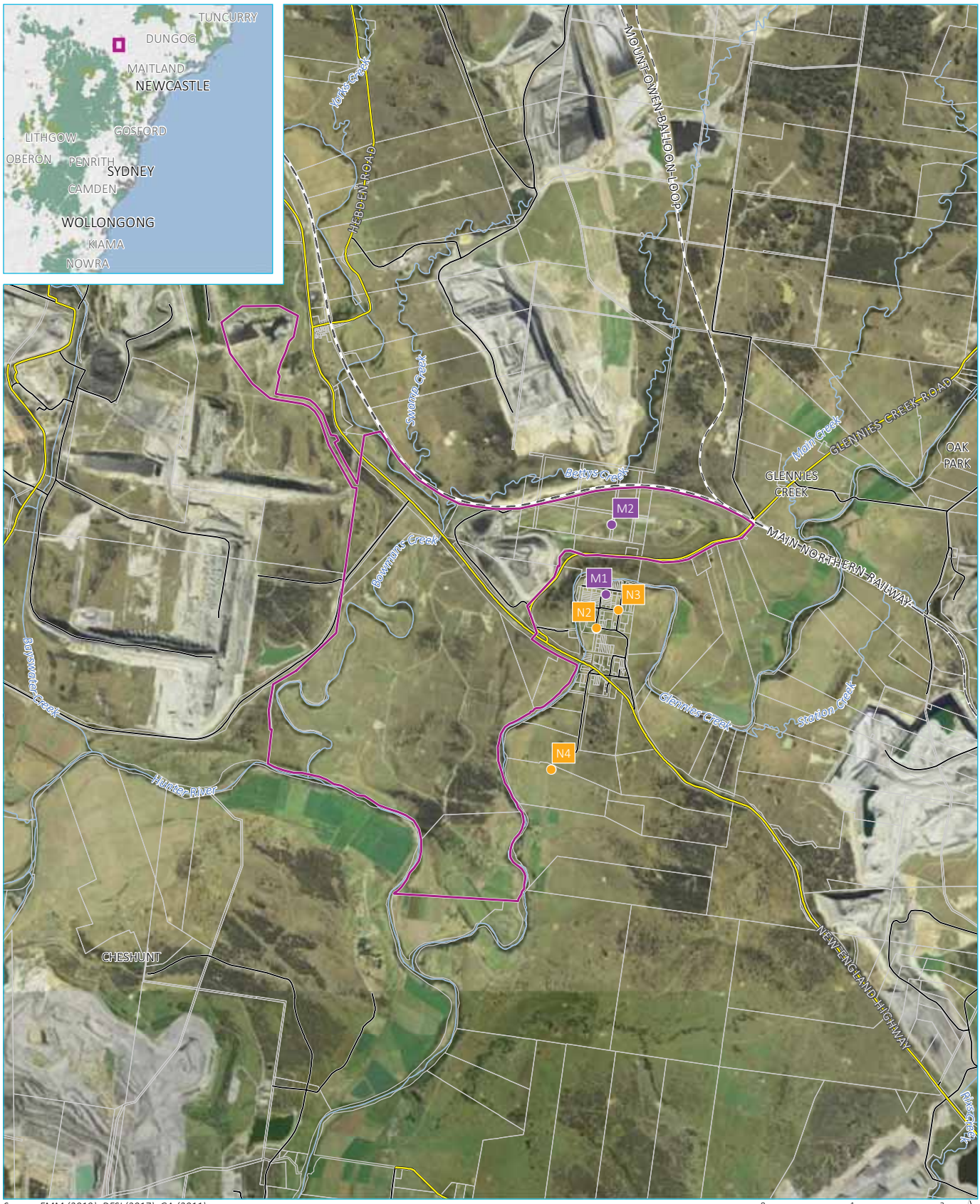
Monitoring location	Description	MGA56	
		Easting	Northing
N2	Camberwell Village (west)	320297	6405670
N3	Camberwell Village (north east)	320554	6405839
N4	South of New England Highway	319776	6404101

Attended noise monitoring is scheduled to be "unannounced" and, to EMM's knowledge, Ashton Coal were not aware of the monitoring prior to its commencing. 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 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 79952). The instrumentation's calibration certificates are provided in Appendix C.



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

0 1 2 km

GDA 1994 MGA Zone 56

N

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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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creating opportunities

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 the relevant noise criteria. This response plan is implemented if site noise levels are determined to be above the relevant noise criteria and when noise limits are 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 the relevant noise criteria 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. An additional monitoring test should be scheduled to be undertaken at the same location within one week and move on to the next monitoring location.
- If the follow up measurement indicates that site noise levels are below the relevant noise criteria and that noise limits are applicable, the consultant will record the result, note the site has passed, schedule an additional monitoring test to be undertaken at the location within one week and move on to the next monitoring location.

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 Appendix E2 of the INP (EPA 2000).

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 E1 of the INP (EPA 2000) 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: INP (EPA 2000).

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.

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, ie above 630 Hz). Attended monitoring was completed on 27 January 2022. Noise from Ashton Coal operations was inaudible during all three operator-attended noise surveys.

The 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.

Low frequency noise is typically conservatively assessed by comparison of the total measured one-third octave L_{Aeq} noise levels to the NPfI one-third octave low-frequency noise thresholds, where site is audible.

Given that Ashton Coal was not audible during any of the three measurements, LFN modifying factors were not applied to site noise levels at any of the locations. Notwithstanding the preceding, it is noted that total measured noise levels did not exceed the relevant LFN thresholds during any of the three measurements. Therefore, in accordance with the NPfI, LFN modifying factors were not applied to estimated cumulative noise levels at any of the locations.

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}	LFN mod. factor[1]	L_{Aeq}	L_{Amax}[2]	L_{Aeq}	L_{Amax}[2]			
N2	27/1	22:19	39	41	46	48	54	58	53	Nil	IA	IA	36	46	2.4 m/s @ 115° E class stability 0.5°C/100m VTG Y	Nil	Ashton Coal inaudible. Other mines in the vicinity (32 dB $L_{Aeq,15\ minute}$), insects, frogs and traffic on the New England Highway consistently audible. Bird noise occasionally audible.
N3	27/1	22:37	33	35	37	38	40	60	52	Nil	IA	IA	36	46	2.1 m/s @ 119° E class stability 0.5°C/100m VTG Y	Nil	Ashton Coal inaudible. Other mines in the vicinity (32 dB $L_{Aeq,15\ minute}$), insects, frogs and traffic on the New England Highway consistently audible.
N4	27/1	22:58	39	42	45	45	52	66	56	Nil	IA	IA	36	46	1.7 m/s @ 149° E class stability 0.7°C/100m VTG Y	Nil	Ashton Coal inaudible. Other mines in the vicinity (30 dB $L_{Aeq,15\ minute}$), traffic on the New England Highway, insects and frogs consistently audible. Dogs barking and traffic passby occasionally audible.

Notes:
1. Modifying factor correction for low frequency noise in accordance with Fact Sheet C of the NPfI (refer Section 3.3).
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. N/A = not applicable.

5.2 N2 - Camberwell Village (west)

Ashton Coal operations were inaudible during the entire operator-attended noise survey. Typically, when a particular source is not audible above local ambient noise levels, the likely contribution 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 $L_{Aeq,15\ minute}$ mine noise contribution 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. Other ambient noise sources included other mines in the vicinity, insects, frogs, traffic on the New England Highway and bird noise. A graph of the total linear noise levels measured in each one-third octave frequency bands is shown in Figure 5.1.

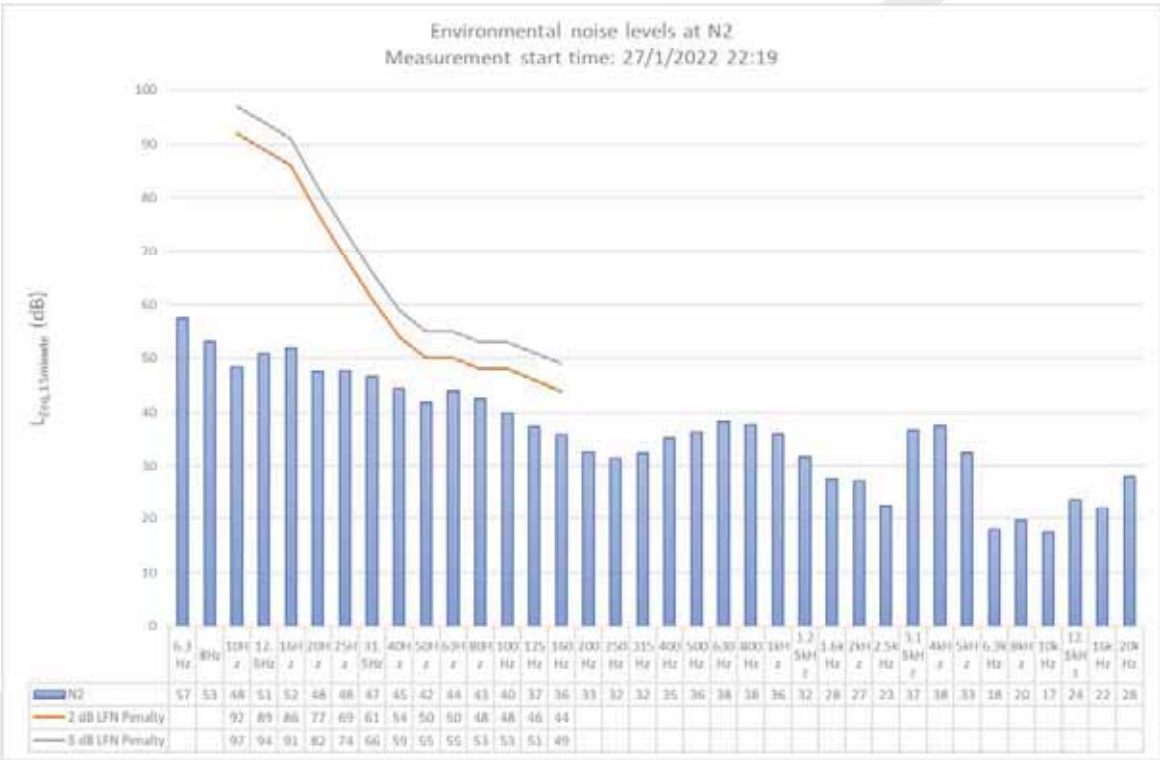

Figure 5.1 N2 total measured one-third octave band frequencies

Other mining operations in the vicinity were consistently audible during the operator-attended noise survey at monitoring location N2. The total cumulative mine noise contribution was estimated to be 29 dB $L_{Aeq,night}$ (ie Other mine noise of 32 dB $L_{Aeq,15\ minute}$ - 3 dB). This is below the cumulative mine noise night-time criterion (ie $L_{Aeq,night}$ 40 dB). Therefore, the total cumulative mine $L_{Aeq,night}$ noise contribution was below the cumulative mine noise criterion.

5.3 N3 - Camberwell Village (north east)

Ashton Coal operations were inaudible during the entire operator-attended noise survey. Given this and the measured background noise level of 35 dB L_{A90}, the Ashton Coal $L_{Aeq,15\ minute}$ mine noise contribution was estimated to be ≤25 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 ambient noise sources included other mines in the vicinity, insects, frogs and traffic on the New England Highway. A graph of the total linear noise levels measured in the one-third octave frequency bands is shown in Figure 5.2.

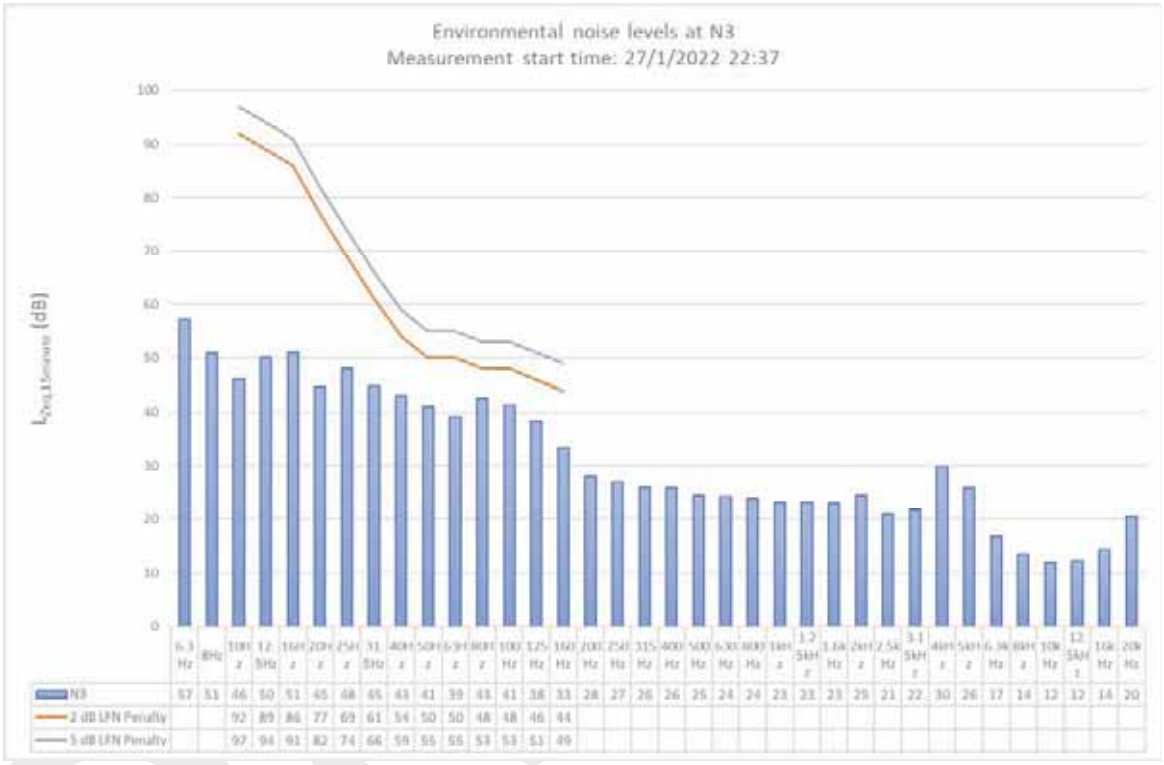

Figure 5.2 N3 total measured one-third octave band frequencies

Other mining operations in the vicinity were consistently audible during the operator-attended noise survey at monitoring location N3. The total cumulative mine noise contribution was estimated to be 29 dB $L_{Aeq,night}$ (ie Other mine noise of 32 dB $L_{Aeq,15\ minute}$ - 3 dB as per NPfI methodology). This is below the cumulative mine noise night-time criterion (ie $L_{Aeq,night}$ 40 dB). Therefore, the total cumulative mine $L_{Aeq,night}$ noise contribution was below the cumulative mine noise criterion.

5.4 N4 - South of New England Highway

Ashton Coal operations were inaudible during the entire operator-attended noise survey. Given this and the measured background noise level of 42 dB L_{A90}, the Ashton Coal $L_{Aeq,15\ minute}$ mine noise contribution was estimated to be ≤32 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 ambient noise sources included other mines in the vicinity, insects, frogs, traffic on the New England Highway, dogs barking and a traffic passby. A graph of the total linear noise levels measured in one-third octave frequency bands is shown below in Figure 5.3.

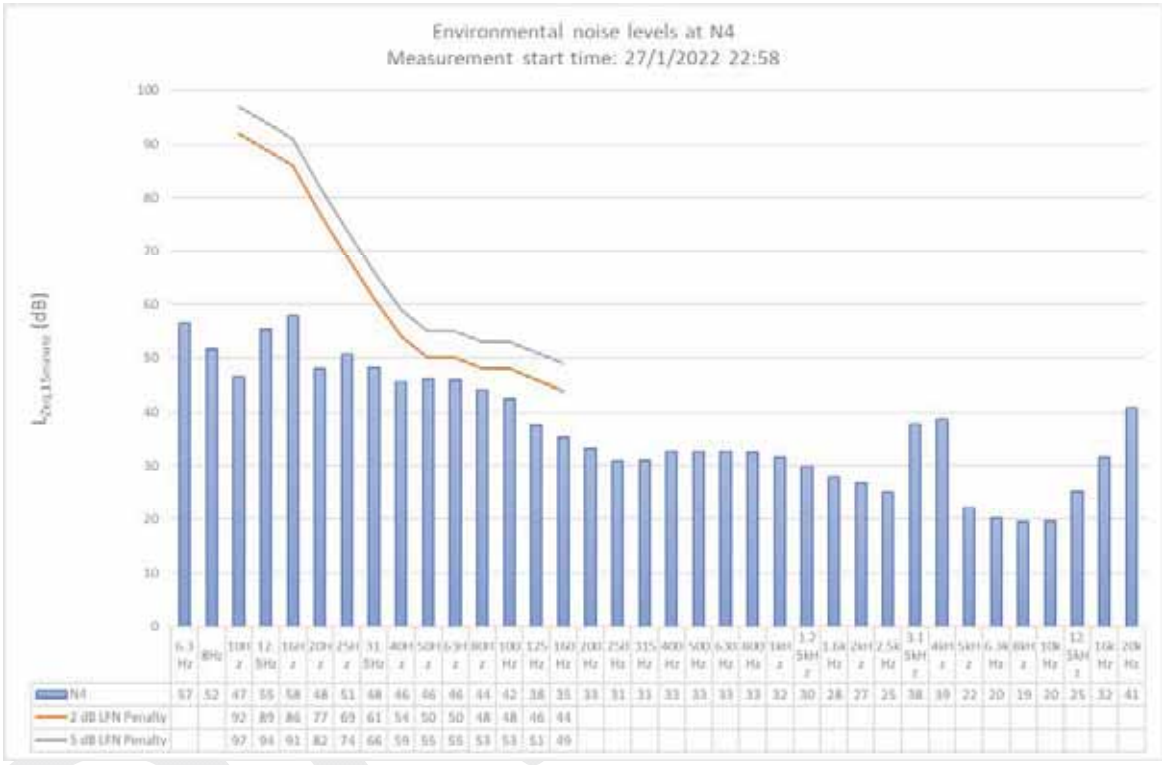

Figure 5.3 N4 total measured one-third octave band frequencies

Other mining operations in the vicinity were consistently audible during the operator-attended noise survey at monitoring location N4. The total cumulative mine noise contribution was estimated to be 27 dB $L_{Aeq,night}$ (ie other mine noise of 30 dB $L_{Aeq,15\ minute}$ - 3 dB as per NPfI methodology). This is below the cumulative mine noise night-time criterion (ie $L_{Aeq,night}$ 40 dB). Therefore, the total cumulative mine $L_{Aeq,night}$ noise contribution was below the cumulative mine noise criterion.

6 Conclusion

EMM has completed a review of mine noise from Ashton Coal within the surrounding community based on attended measurements conducted on 27 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 the site. Noise limits were found to be applicable during all three measurements.

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

Ashton Coal noise contributions and cumulative mine noise contributions were at or below (satisfied) the relevant noise limits at all monitoring locations for 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

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 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 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 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 shall 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

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

Appendix C

Calibration certificates

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C30591

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	94.12 dB	999.99 Hz	1.58 %
Level2:	NA	N	114.05 dB	999.99 Hz	1.12 %
Uncertainty			±0.11 dB	±0.05%	±0.20 %
Uncertainty (at 95% c.l.) k=2					

CONDITION OF TEST:

Ambient Pressure	1007	hPa ±1 hPa	**Date of Receipt :**	16/09/2021
Temperature	21	°C ±1° C	**Date of Calibration :**	16/09/2021
Relative Humidity	43	% ±5%	**Date of Issue :**	16/09/2021

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

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

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
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HBK HOTTINGER BRÜEL & KJÆR
The Calibration Laboratory
Skodsborgvej 307, DK-2850 Nærum, Denmark

ilac-MRA DANAK
CAL Reg.No. 307
Member of EA MLA

CERTIFICATE OF CALIBRATION

No: CDK2007931 Page 1 of 12

CALIBRATION OF

Sound Level Meter:	Brüel & Kjær Type 2250	No: 3029363	Id: -
Microphone:	Brüel & Kjær Type 4189	No: 3260501	
PreAmplifier:	Brüel & Kjær Type ZC-0032	No: 30109	
Supplied Calibrator:	None		
Software version:	BZ7222 Version 4.7.6	Pattern Approval:	-
Instruction manual:	BE1712-22		

CUSTOMER

EMM Consulting
Ground Floor, Suite 1
20 Chandos Street
2065 St Leonards
New South Wales, Australia

CALIBRATION CONDITIONS

Preconditioning: 4 hours at 23°C ± 3°C
Environment conditions: *See actual values in sections.*

SPECIFICATIONS

The Sound Level Meter Brüel & Kjær Type 2250 has been calibrated in accordance with the requirements as specified in IEC 61672-1:2013 class 1. Procedures from IEC 61672-3:2013 were used to perform the periodic tests. The accreditation assures the traceability to the international units system SI.

PROCEDURE

The measurements have been performed with the assistance of Brüel & Kjær Sound Level Meter Calibration System 3630 with application software type 7763 (version 8.2 - DB: 8.20) by using procedure B&K proc 2250, 4189 (IEC 61672:2013).

RESULTS

Calibration Mode: **Calibration as received.**

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ providing a level of confidence of approximately 95 %. The uncertainty evaluation has been carried out in accordance with EA-4/02 from elements originating from the standards, calibration method, effect of environmental conditions and any short time contribution from the device under calibration.

Date of calibration: 2020-11-26

Date of issue: 2020-11-26

Lene Petersen
Calibration Technician

Erik Bruus
Approved Signatory

Appendix B

Monthly attended noise monitoring report – February 2022

EMM
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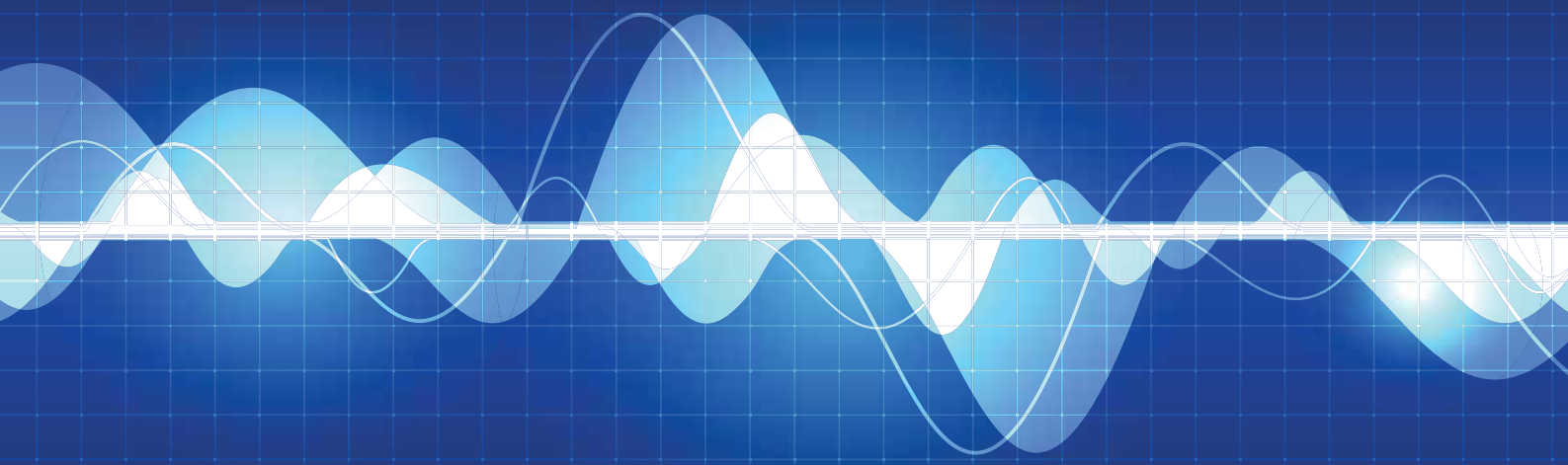
Ashton Coal

Monthly attended noise monitoring
February 2022

Prepared for Ashton Coal Operations Pty Ltd
March 2022



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187 Coventry Street
South Melbourne VIC 3205

PERTH
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Fremantle WA 6160

CANBERRA
PO Box 9148
Deakin ACT 2600

Ashton Coal

Monthly attended noise monitoring - February 2022

Prepared for Ashton Coal Operations Pty Ltd
March 2022

EMM Newcastle
Level 3, 175 Scott Street
Newcastle NSW 2300

T 02 4907 4800
E info@emmconsulting.com.au

www.emmconsulting.com.au

Ashton Coal

Monthly attended noise monitoring - February 2022

Report Number

E211129 RP2

Client

Ashton Coal Operations Pty Ltd

Date

4 March 2022

Version

v1-0 Final

Prepared by

Lucas Adamson
Senior Acoustic Consultant
4 March 2022

Approved by

Katie Teyhan
Associate
4 March 2022

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 purpose of the monitoring was to address requirements of the approved Ashton Coal Noise Management Plan (NMP), prepared to satisfy the requirements of the 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 23 February 2022.

The following material was referenced as part of this assessment:

- Department of Planning, Industry and Environment (DPIE), Development Consent 309-11-2001-I, as modified on 20 June 2016 (current as of 23 February 2022);
- Environment Protection Authority (EPA), Environment Protection License 11879, as varied on 3 February 2020 (current as of 23 February 2022);
- Ashton Coal Project Noise Management Plan (NMP), approved by DPIE on 23 September 2020 (current as of 23 February 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 what an average person perceives about 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

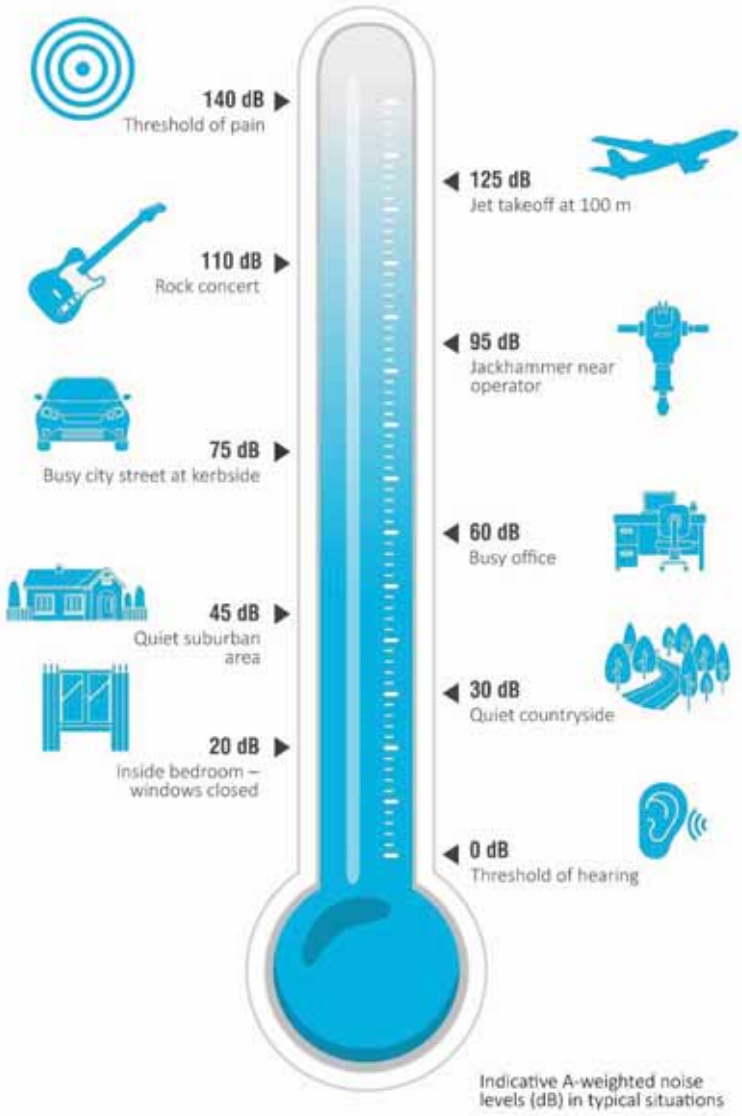


Figure 2.1 Common noise levels

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 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/100m.

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 (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 factors.

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 ion 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 Low frequency noise criteria

Condition 3 of Appendix 8 of the DC states that noise generated by Ashton Coal is to be measured in accordance with the relevant requirements of the INP. The INP application notes state that Section 4 of the INP has been withdrawn and the modifying factor adjustments outlined in Fact Sheet C of the NPfI are to be used when assessing the characteristics of a noise source.

Fact sheet C of the NPfI (EPA 2017) provides guidelines for applying modifying factor corrections to account for low frequency noise emissions. The NPfI specifies that a difference of 15 dB or more between site 'C-weighted' and site 'A-weighted' noise emission levels identifies the potential for an unbalanced spectrum and potential increased annoyance.

Where a difference of 15 dB or more between site 'C-weighted' and site 'A-weighted' noise emission levels is identified, the one-third octave noise levels recorded should be compared to the values in Table C2 of the NPfI (EPA 2017), which has been reproduced in Table 3.2 below.

Table 3.2 One-third octave low-frequency noise thresholds

	One-third octave $L_{Zeq,15\ minute}$ threshold level												
Frequency (Hz)	**10**	**12.5**	**16**	**20**	**25**	**31.5**	**40**	**50**	**63**	**80**	**100**	**125**	**160**
dB (Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

The following modifying factor correction is to be applied where the site 'C-weighted' and site 'A-weighted' noise emission level is 15 dB or more and:

- where any of the one-third octave noise levels in Table 3.2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2 dB positive adjustment to measured/predicted A-weighted levels applies for the evening/night period; or

- where any of the one-third octave noise levels in Table 3.2 are exceeded by more than 5 dB and cannot be mitigated, a 5 dB positive adjustment to measured/predicted A-weighted levels applies for the evening/night period.

Hence, where relevant throughout each survey the operator has estimated the difference between site 'C-weighted' and site 'A-weighted' noise emission levels by matching audible sounds with the response of the analyser (L_{Ceq}-L_{Aeq}). Where this was deemed to be 15 dB or greater, the measured one-third octave frequencies have been compared to the values in Table 3.2 to identify the relevant modifying factor correction (if applicable). This method has been applied to this assessment as presented in Section 5.

It is of note that the NPfI (EPA 2017) states that low-frequency noise corrections only apply under the standard or noise-enhancing meteorological conditions.

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

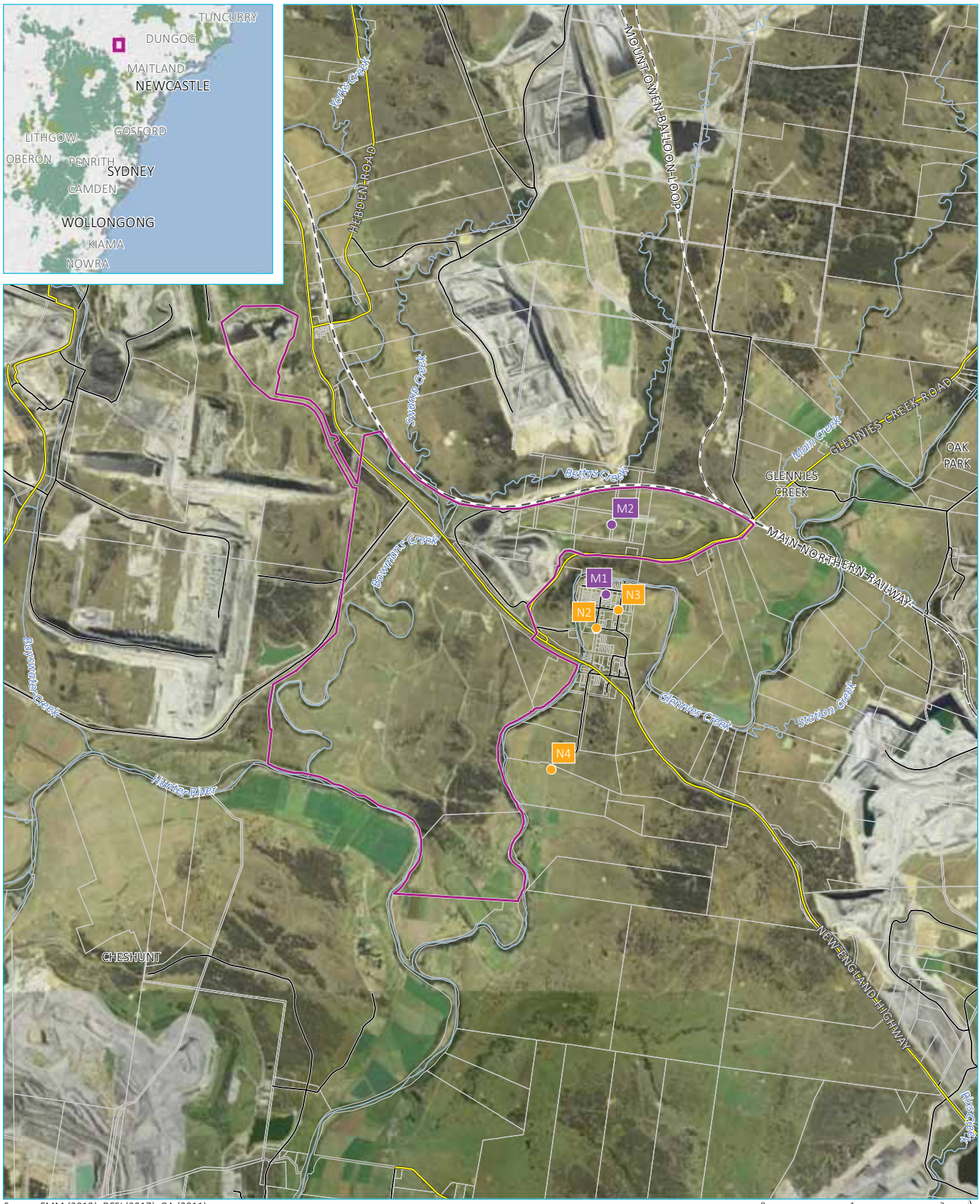
Monitoring location	Description	MGA56	
		Easting	Northing
N2	Camberwell Village (west)	320297	6405670
N3	Camberwell Village (north east)	320554	6405839
N4	South of New England Highway	319776	6404101

Attended noise monitoring is scheduled to be "unannounced" and, to EMM's knowledge, Ashton Coal were not aware of the monitoring prior to its commencing. 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 filtering).

4.2 Instrumentation

A Brüel & Kjær 2250 Type 1 sound analyser (s/n 2759405) 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). The instrumentation's calibration certificates are provided in Appendix C.



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

0 1 2 km

GDA 1994 MGA Zone 56

N

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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

EMM
creating opportunities

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 the relevant noise criteria. This response plan is implemented if site noise levels are determined to be above the relevant noise criteria and when noise limits are 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 the relevant noise criteria 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. An additional monitoring test should be scheduled to be undertaken at the same location within one week and move on to the next monitoring location.
- If the follow up measurement indicates that site noise levels are below the relevant noise criteria and that noise limits are applicable, the consultant will record the result, note the site has passed, schedule an additional monitoring test to be undertaken at the location within one week and move on to the next monitoring location.

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 Appendix E2 of the INP (EPA 2000).

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 E1 of the INP (EPA 2000) 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: INP (EPA 2000).

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.

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, ie above 630 Hz). Attended monitoring was completed on 23 February 2022. Noise from Ashton Coal operations was inaudible during all three operator-attended noise surveys.

The 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.

Low frequency noise is typically conservatively assessed by comparison of the total measured one-third octave L_{Aeq} noise levels to the NPfI one-third octave low-frequency noise thresholds, where site is audible.

Given that Ashton Coal was not audible during any of the three measurements, LFN modifying factors were not applied to site noise levels at any of the locations. Notwithstanding the preceding, it is noted that total measured noise levels exceeded the relevant LFN thresholds during one of the three measurements (at N2). Therefore, in accordance with the NPfI, LFN modifying factors were applied to estimated cumulative noise levels at location N2.

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 –February 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}	LFN mod. factor[1]	L_{Aeq}	L_{Amax}[2]	L_{Aeq}	L_{Amax}[2]			
N2	23/2	22:06	35	38	48	53	58	61	58	Nil	IA	IA	36	46	2.7 m/s @ 134° E class stability 0.5°C/100m VTG Y	Nil	Ashton Coal inaudible. Other mines in the vicinity (30 dB $L_{Aeq,15\ minute}$), insects, frogs and traffic on the New England Highway consistently audible. Livestock, birds and noise from nearby residences occasionally audible.
N3	23/2	22:24	35	37	39	40	43	61	52	Nil	IA	IA	36	46	2.2 m/s @ 131° E class stability 0.4°C/100m VTG Y	Nil	Ashton Coal inaudible. Other mines in the vicinity (31 dB $L_{Aeq,15\ minute}$), insects, frogs and traffic on the New England Highway consistently audible. Dogs barking occasionally audible.
N4	23/2	22:47	44	50	56	58	59	60	57	Nil	IA	IA	36	46	2.3 m/s @ 130° E class stability 0.1°C/100m VTG Y	Nil	Ashton Coal inaudible. Other mines in the vicinity (30 dB $L_{Aeq,15\ minute}$), traffic on the New England Highway, insects and frogs consistently audible.

Notes:
1. Modifying factor correction for low frequency noise in accordance with Fact Sheet C of the NPfI (refer Section 3.3).
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. N/A = not applicable.

5.2 N2 - Camberwell Village (west)

Ashton Coal operations were inaudible during the entire operator-attended noise survey. Typically, when a particular source is not audible above local ambient noise levels, the likely contribution of that source is at least 10 dB below the measured background (L_{A90}) level. Given this and the measured background noise level of 38 dB L_{A90}, the Ashton Coal $L_{Aeq,15\ minute}$ mine noise contribution was estimated to be ≤28 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 ambient noise sources included other mines in the vicinity, insects, frogs, traffic on the New England Highway and livestock and noise from nearby residences. A graph of the total linear noise levels measured in each one-third octave frequency bands is shown in Figure 5.1.

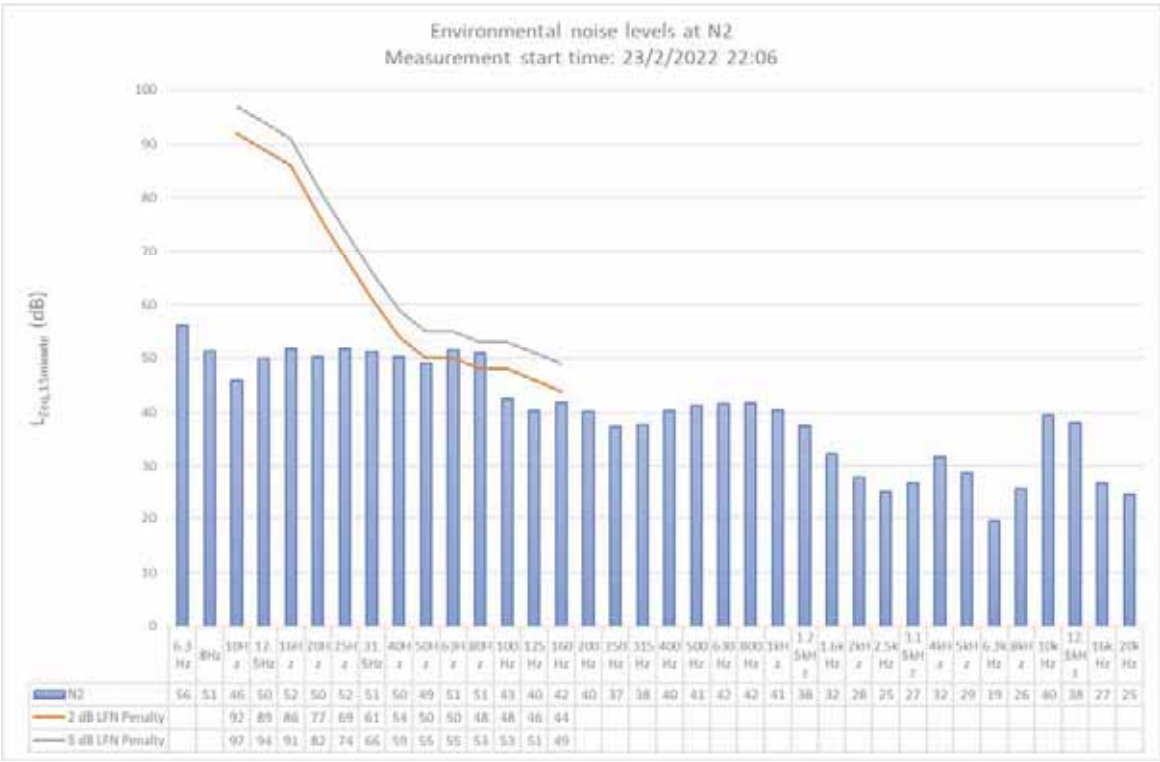

Figure 5.1 N2 total measured one-third octave band frequencies

Other mining operations in the vicinity were consistently audible during the operator-attended noise survey at monitoring location N2. The total cumulative mine noise contribution was estimated to be 29 dB $L_{Aeq,night}$ (ie Other mine noise of 30 dB $L_{Aeq,15\ minute}$ - 3 dB + 2 dB as per NPfI methodology), including a 2 dB positive adjustment for LFN. This is below the cumulative mine noise night-time criterion (ie $L_{Aeq,night}$ 40 dB). Therefore, the total cumulative mine $L_{Aeq,night}$ noise contribution was below the cumulative mine noise criterion.

5.3 N3 - Camberwell Village (north east)

Ashton Coal operations were inaudible during the entire operator-attended noise survey. 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 ambient noise sources included other mines in the vicinity, insects, frogs, traffic on the New England Highway, and dogs barking. A graph of the total linear noise levels measured in the one-third octave frequency bands is shown in Figure 5.2.

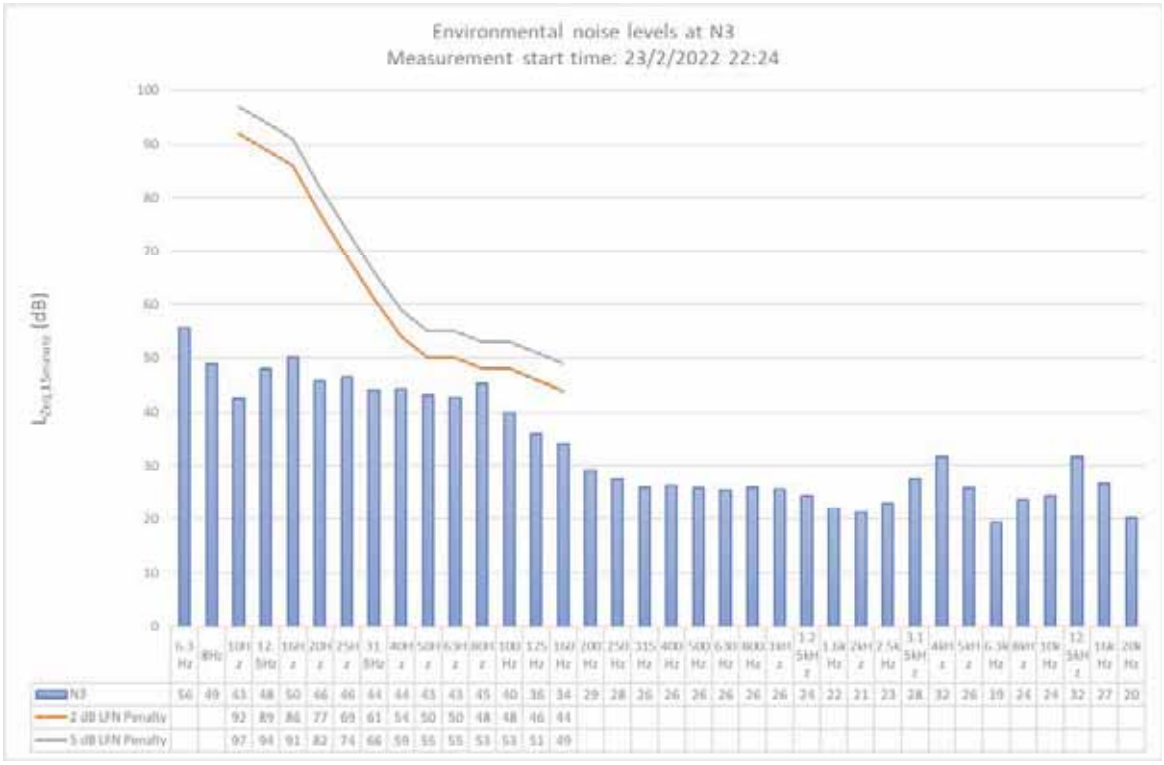

Figure 5.2 N3 total measured one-third octave band frequencies

Other mining operations in the vicinity were consistently audible during the operator-attended noise survey at monitoring location N3. The total cumulative mine noise contribution was estimated to be 28 dB $L_{Aeq,night}$ (ie Other mine noise of 31 dB $L_{Aeq,15\ minute}$ - 3 dB as per NPfI methodology). This is below the cumulative mine noise night-time criterion (ie $L_{Aeq,night}$ 40 dB). Therefore, the total cumulative mine $L_{Aeq,night}$ noise contribution was below the cumulative mine noise criterion.

5.4 N4 - South of New England Highway

Ashton Coal operations were inaudible during the entire operator-attended noise survey. Given this and the measured low pass noise level of 36 dB $L_{Aeq,15\ minute(10\ Hz–630\ Hz)}$, the Ashton Coal $L_{Aeq,15\ minute}$ mine noise contribution was estimated to be <31 dB $L_{Aeq,15\ minute}$. Road traffic on the New England Highway and other mines in the vicinity also contributed to the measured low pass noise level. Therefore, Ashton Coal noise contributions complied with the DC and EPL noise limits. Other ambient noise sources included other mines in the vicinity, insects (consistent and dominant hence setting the background noise level close to the ambient L_{Aeq} level), frogs and traffic on the New England Highway.A graph of the total linear noise levels measured in one-third octave frequency bands is shown below in Figure 5.3.

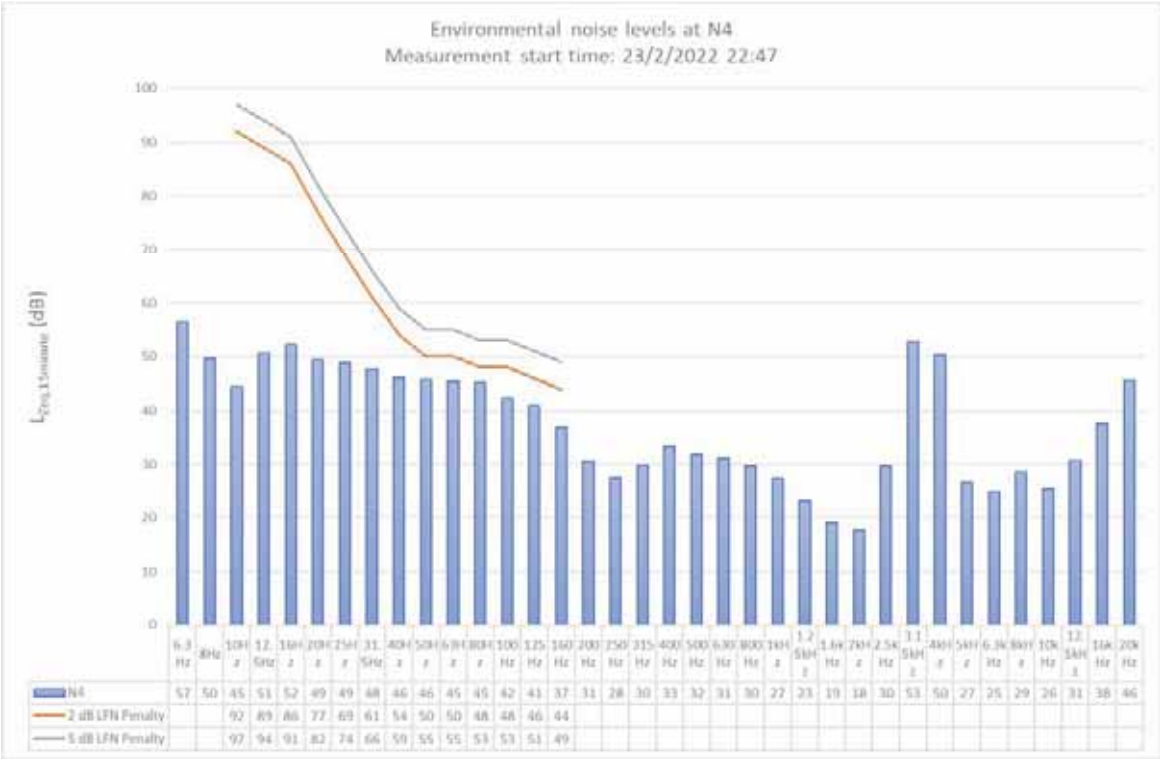

Figure 5.3 N4 total measured one-third octave band frequencies

Other mining operations in the vicinity were consistently audible during the operator-attended noise survey at monitoring location N4. The total cumulative mine noise contribution was estimated to be 27 dB $L_{Aeq,night}$ (ie other mine noise of 30 dB $L_{Aeq,15\ minute}$ - 3 dB as per NPfI methodology). This is below the cumulative mine noise night-time criterion (ie $L_{Aeq,night}$ 40 dB). Therefore, the total cumulative mine $L_{Aeq,night}$ noise contribution was below the cumulative mine noise criterion.

6 Conclusion

EMM has completed a review of mine noise from Ashton Coal within the surrounding community based on attended measurements conducted on 23 February 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 the site. Noise limits were found to be applicable during all three measurements.

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

Ashton Coal noise contributions and cumulative mine noise contributions were below (satisfied) the relevant noise limits at all monitoring locations for 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

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 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 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 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 shall 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

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

Appendix C

Calibration certificates

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C30881

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	94.05 dB	999.99 Hz	1.00 %
Level2:	NA	N	114.05 dB	999.99 Hz	1.00 %
Uncertainty			±0.11 dB	±0.05%	±0.20 %
Uncertainty (at 95% c.l.) k=2					

CONDITION OF TEST:

Ambient Pressure	1002	hPa ±1 hPa	**Date of Receipt :**	20/10/2021
Temperature	23	°C ±1° C	**Date of Calibration :**	20/10/2021
Relative Humidity	41	% ±5%	**Date of Issue :**	20/10/2021

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

CHECKED BY: .....

AUTHORISED SIGNATURE: .....
Jack Kidd

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

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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.: SLM 26291 & FILT 5615

Equipment Description:	Sound Level Meter		
Manufacturer:	B & K		
Model No:	2250	**Serial No:**	2759405
Microphone Type:	4189	**Serial No:**	2888134
Preamplifier Type:	ZC0032	**Serial No:**	16037
Filter Type:	1/3 Octave	**Serial No:**	2759405
Comments:	All tests passed for class 1. (See over for details)		
Owner:	EMM Consulting Level 3, 175 Scott Street Newcastle, NSW 2300		
Ambient Pressure:	1007 hPa ±1.5 hPa		
Temperature:	24 °C ±2° C	**Relative Humidity:**	53% ±5%
Date of Calibration:	05/02/2020	**Issue Date:**	05/02/2020

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

CHECKED BY: JKB **AUTHORISED SIGNATURE:** Jack Kielt

Accredited for compliance with ISO/IEC 17025 - Calibration
The results of the tests, calibration and/or measurements included in this document are traceable to Australian/national standards.

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Accredited Lab. No. 9262
Acoustic and Vibration Measurements

Appendix C

Monthly attended noise monitoring report – March 2022

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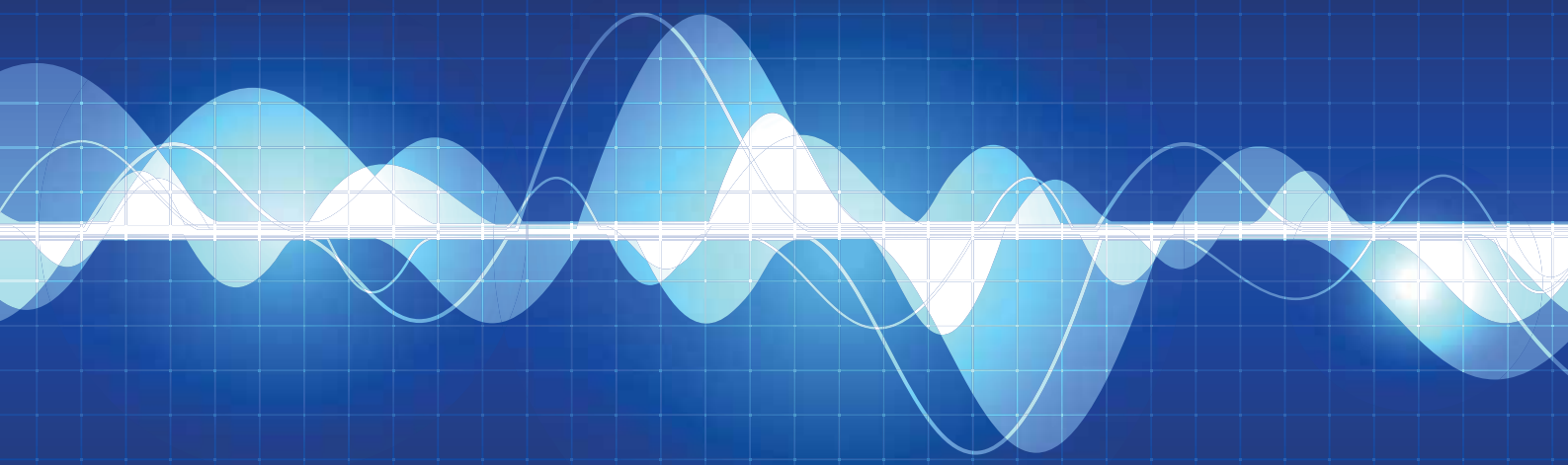
Ashton Coal

Monthly attended noise monitoring
March 2022

Prepared for Ashton Coal Operations Pty Ltd
April 2022



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South Melbourne VIC 3205

PERTH
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Fremantle WA 6160

CANBERRA
PO Box 9148
Deakin ACT 2600

Ashton Coal

Monthly attended noise monitoring - March 2022

Prepared for Ashton Coal Operations Pty Ltd
April 2022

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Level 3, 175 Scott Street
Newcastle NSW 2300

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E info@emmconsulting.com.au

Ashton Coal

Monthly attended noise monitoring - March 2022

Report Number

E211129 RP3

Client

Ashton Coal Operations Pty Ltd

Date

4 April 2022

Version

v1-0 Final

Prepared by

Lucas Adamson
Senior Acoustic Consultant
4 April 2022

Approved by

Katie Teyhan
Associate
4 April 2022

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 purpose of the monitoring was to address requirements of the approved Ashton Coal Noise Management Plan (NMP), prepared to satisfy the requirements of the 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 21 March 2022.

The following material was referenced as part of this assessment:

- Department of Planning, Industry and Environment (DPIE), Development Consent 309-11-2001-I, as modified on 20 June 2016 (current as of 21 March 2022);
- Environment Protection Authority (EPA), Environment Protection License 11879, as varied on 3 February 2020 (current as of 21 March 2022);
- Ashton Coal Project Noise Management Plan (NMP), approved by DPIE on 23 September 2020 (current as of 21 March 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 what an average person perceives about 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

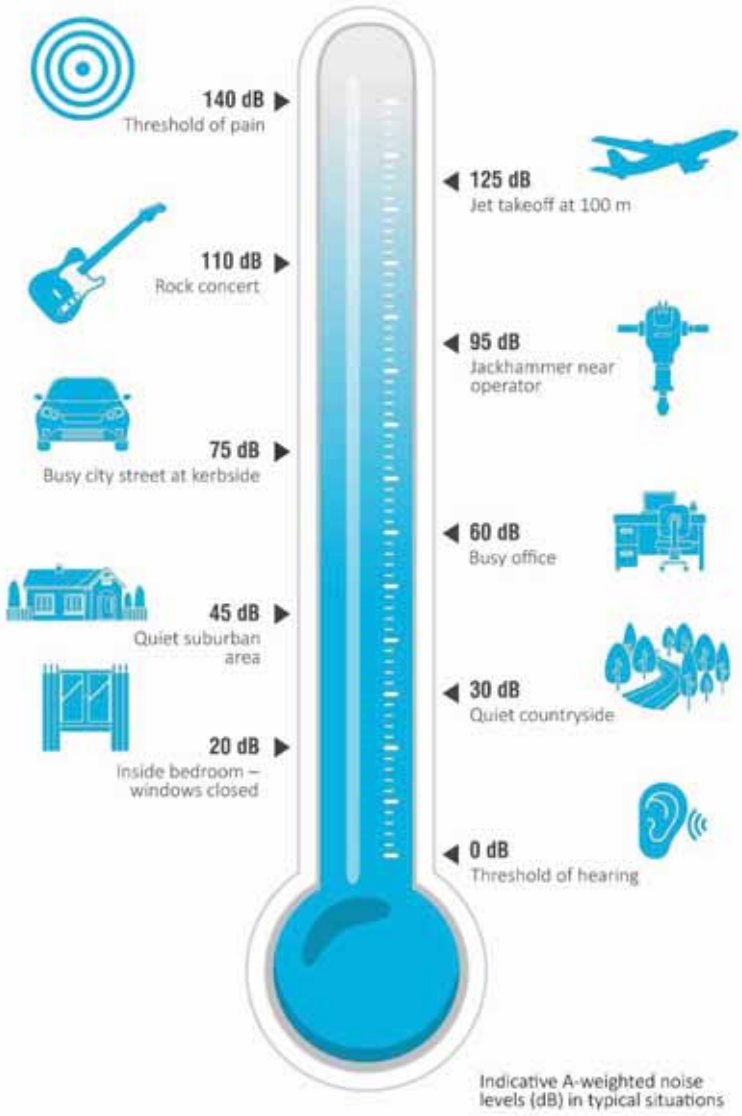


Figure 2.1 Common noise levels

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 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/100m.

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 (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 factors.

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 ion 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 Low frequency noise criteria

Condition 3 of Appendix 8 of the DC states that noise generated by Ashton Coal is to be measured in accordance with the relevant requirements of the INP. The INP application notes state that Section 4 of the INP has been withdrawn and the modifying factor adjustments outlined in Fact Sheet C of the NPfI are to be used when assessing the characteristics of a noise source.

Fact sheet C of the NPfI (EPA 2017) provides guidelines for applying modifying factor corrections to account for low frequency noise emissions. The NPfI specifies that a difference of 15 dB or more between site 'C-weighted' and site 'A-weighted' noise emission levels identifies the potential for an unbalanced spectrum and potential increased annoyance.

Where a difference of 15 dB or more between site 'C-weighted' and site 'A-weighted' noise emission levels is identified, the one-third octave noise levels recorded should be compared to the values in Table C2 of the NPfI (EPA 2017), which has been reproduced in Table 3.2 below.

Table 3.2 One-third octave low-frequency noise thresholds

	One-third octave $L_{Zeq,15\ minute}$ threshold level												
Frequency (Hz)	**10**	**12.5**	**16**	**20**	**25**	**31.5**	**40**	**50**	**63**	**80**	**100**	**125**	**160**
dB (Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

The following modifying factor correction is to be applied where the site 'C-weighted' and site 'A-weighted' noise emission level is 15 dB or more and:

- where any of the one-third octave noise levels in Table 3.2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2 dB positive adjustment to measured/predicted A-weighted levels applies for the evening/night period; or

- where any of the one-third octave noise levels in Table 3.2 are exceeded by more than 5 dB and cannot be mitigated, a 5 dB positive adjustment to measured/predicted A-weighted levels applies for the evening/night period.

Hence, where relevant throughout each survey the operator has estimated the difference between site 'C-weighted' and site 'A-weighted' noise emission levels by matching audible sounds with the response of the analyser (L_{Ceq}-L_{Aeq}). Where this was deemed to be 15 dB or greater, the measured one-third octave frequencies have been compared to the values in Table 3.2 to identify the relevant modifying factor correction (if applicable). This method has been applied to this assessment as presented in Section 5.

It is of note that the NPfI (EPA 2017) states that low-frequency noise corrections only apply under the standard or noise-enhancing meteorological conditions.

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

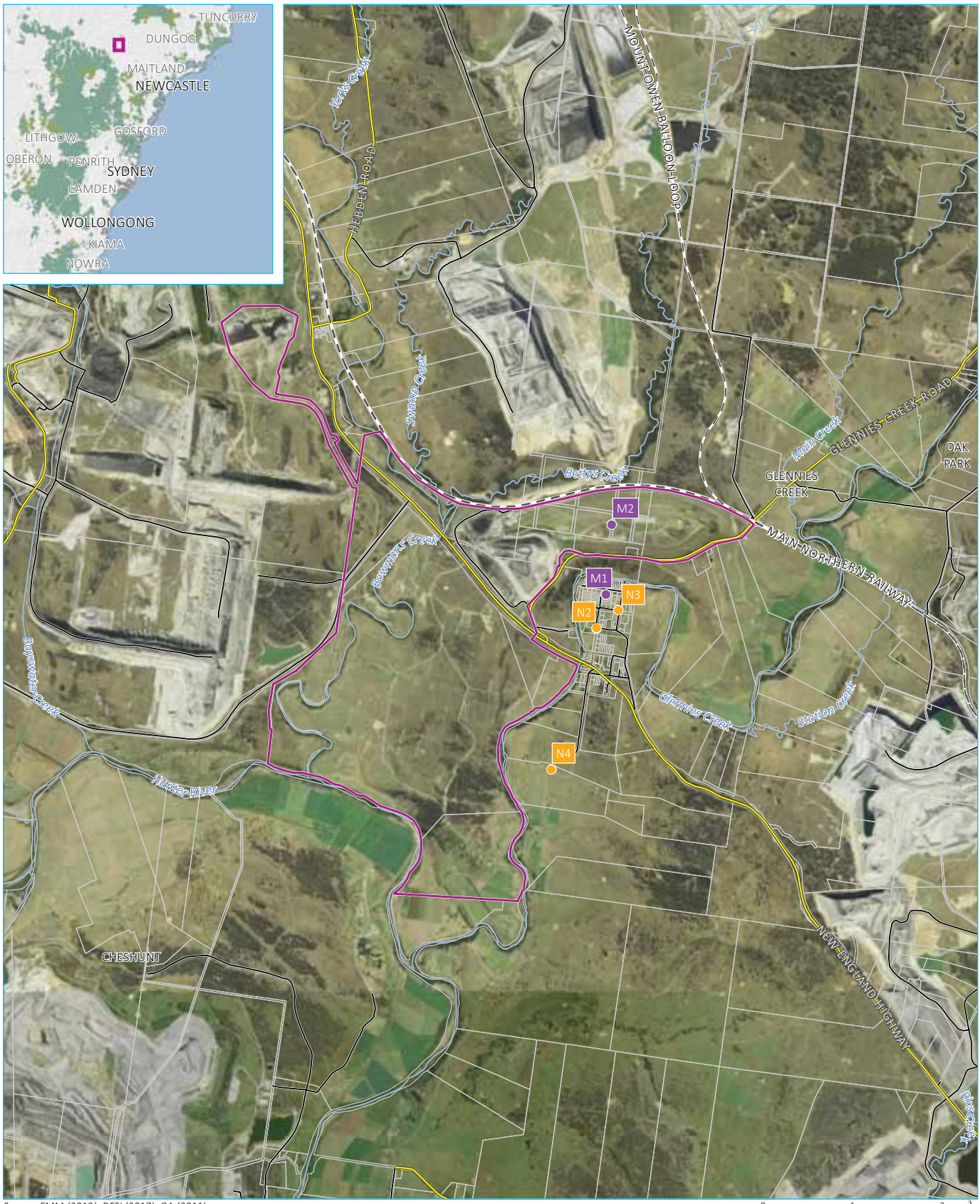
Monitoring location	Description	MGA56	
		Easting	Northing
N2	Camberwell Village (west)	320297	6405670
N3	Camberwell Village (north east)	320554	6405839
N4	South of New England Highway	319776	6404101

Attended noise monitoring is scheduled to be "unannounced" and, to EMM's knowledge, Ashton Coal were not aware of the monitoring prior to its commencing. 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 filtering).

4.2 Instrumentation

A Brüel & Kjær 2250 Type 1 sound analyser (s/n 2759405) 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). The instrumentation's calibration certificates are provided in Appendix C.



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

0 1 2 km

GDA 1994 MGA Zone 56

N

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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

EMM
creating opportunities

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 the relevant noise criteria. This response plan is implemented if site noise levels are determined to be above the relevant noise criteria and when noise limits are 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 the relevant noise criteria 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. An additional monitoring test should be scheduled to be undertaken at the same location within one week and move on to the next monitoring location.
- If the follow up measurement indicates that site noise levels are below the relevant noise criteria and that noise limits are applicable, the consultant will record the result, note the site has passed, schedule an additional monitoring test to be undertaken at the location within one week and move on to the next monitoring location.

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 Appendix E2 of the INP (EPA 2000).

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 E1 of the INP (EPA 2000) 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: INP (EPA 2000).

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.

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, ie above 630 Hz). Attended monitoring was completed on 21 March 2022. Noise from Ashton Coal operations was audible during one of the three operator-attended noise surveys.

The 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 not to be applicable during all three measurements due to the presence of temperature inversion conditions greater than 3°C/100m at the time of the measurements.

Low frequency noise is typically conservatively assessed by comparison of the total measured one-third octave L_{Aeq} noise levels to the NPfI one-third octave low-frequency noise thresholds, where site is audible.

Given that Ashton Coal was not audible during measurements at N2 and N3, LFN modifying factors were not applied to site noise levels at these locations. Notwithstanding the preceding, it is noted that total measured noise levels did not exceed the relevant LFN thresholds during any of the three measurements. Therefore, in accordance with the NPfI, LFN modifying factors were not applied to estimated cumulative noise levels at any of the locations.

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 –March 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}	LFN mod. factor[1]	L_{Aeq}	L_{Amax}[2]	L_{Aeq}	L_{Amax}[2]			
N2	21/3	22:06	36	39	47	52	55	58	57	Nil	IA	IA	36	46	2.2 m/s @ 85° F class stability 3.8°C/100m VTG N	N/A	Ashton Coal inaudible. Insects, frogs, and traffic on the New England Highway consistently audible. Distant music from residence and trains on the main line (unrelated to Ashton Coal) frequently audible. Bird noise occasionally audible.
N3	21/3	22:24	33	34	39	42	46	63	53	Nil	IA	IA	36	46	1.6 m/s @ 93° G class stability 4.1°C/100m VTG N	N/A	Ashton Coal inaudible. Insects, frogs traffic on the New England Highway, and trains on the main line (unrelated to Ashton Coal) consistently audible. Residential noise, livestock, dogs barking, and distant music were occasionally audible.
N4	21/3	22:46	46	49	52	53	55	62	55	Nil	26	33	36	46	1.8 m/s @ 102° F class stability 3.8°C/100m VTG N	N/A	Ashton Coal mine hum and bangs from site occasionally audible. Other mines in the vicinity (28 dB $L_{Aeq,15\ minute}$), traffic on the New England Highway, insects, frogs, and music from distant resident consistently audible.

Notes:
1. Modifying factor correction for low frequency noise in accordance with Fact Sheet C of the NPfI (refer Section 3.3).
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. N/A = not applicable.

5.2 N2 - Camberwell Village (west)

Ashton Coal operations were inaudible during the entire operator-attended noise survey. Typically, when a particular source is not audible above local ambient noise levels, the likely contribution of that source is at least 10 dB below the measured background (L_{A90}) level. Given this and the measured background noise level of 39 dB L_{A90}, the Ashton Coal $L_{Aeq,15\ minute}$ mine noise contribution was estimated to be ≤29 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 ambient noise sources included insects, frogs, traffic on the New England Highway, bird noise, trains on the main line, and distant music from residence. A graph of the total linear noise levels measured in each one-third octave frequency bands is shown in Figure 5.1.

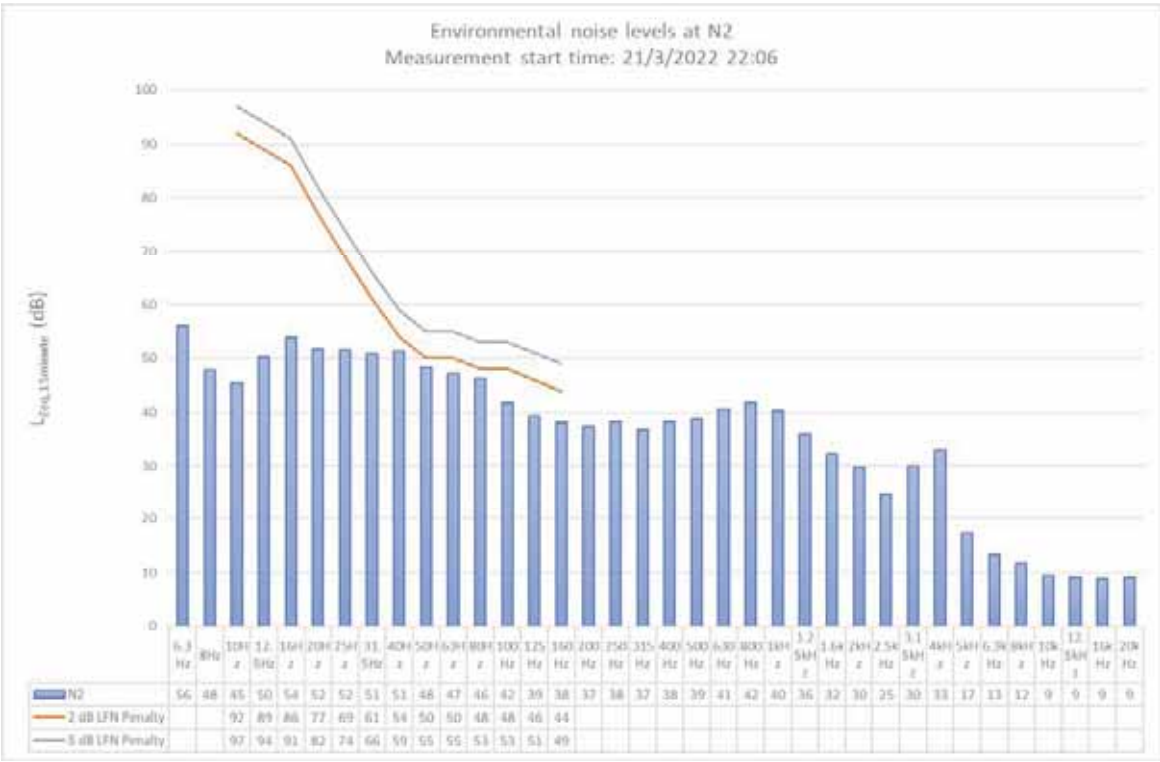

Figure 5.1 N2 total measured one-third octave band frequencies

Other mining operations in the vicinity were also inaudible during the entire operator-attended noise survey at monitoring location N2. Therefore, the total cumulative mine $L_{Aeq,night}$ noise contribution was below the cumulative mine noise criterion.

5.3 N3 - Camberwell Village (north east)

Ashton Coal operations were inaudible during the entire operator-attended noise survey. Given this and the measured background noise level of 34 dB L_{A90}, the Ashton Coal $L_{Aeq,15\ minute}$ mine noise contribution was estimated to be ≤24 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 ambient noise sources included insects, frogs, traffic on the New England Highway, trains on the main line, residential noise, livestock, dogs barking, and distant music from residence. A graph of the total linear noise levels measured in the one-third octave frequency bands is shown in Figure 5.2.

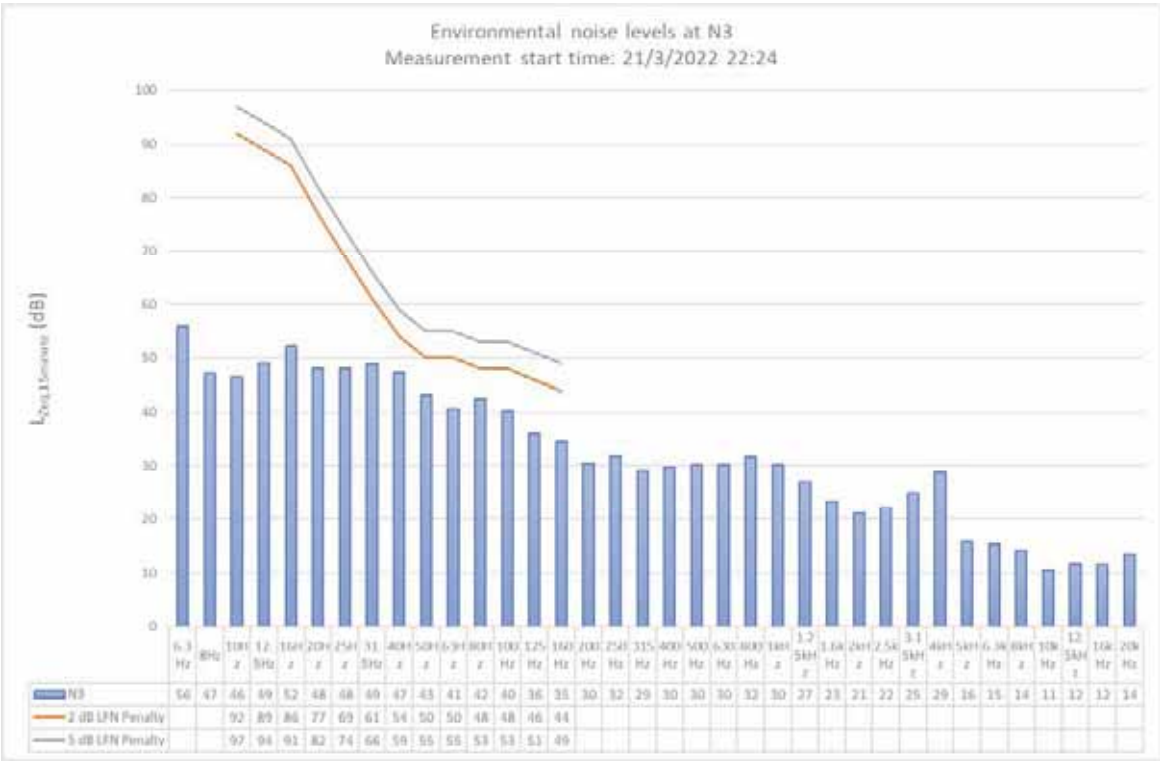

Figure 5.2 N3 total measured one-third octave band frequencies

Other mining operations in the vicinity were also inaudible during the entire operator-attended noise survey at monitoring location N3. Therefore, the total cumulative mine $L_{Aeq,night}$ noise contribution was below the cumulative mine noise criterion.

5.4 N4 - South of New England Highway

Ashton Coal operations were consistently audible in traffic lulls during the entire operator-attended noise survey. The Ashton Coal mine noise contribution was estimated at up to 26 dB $LA_{eq,15\ minute}$. The dropping of material at site generated an estimated 33 dB L_{Amax}. Ashton Coal noise contributions complied with the DC and EPL noise limits. Other ambient noise sources included other mines in the vicinity, insects, frogs, traffic on the New England Highway, and distant music from residence. A graph of the total linear noise levels measured in one-third octave frequency bands is shown below in Figure 5.3.

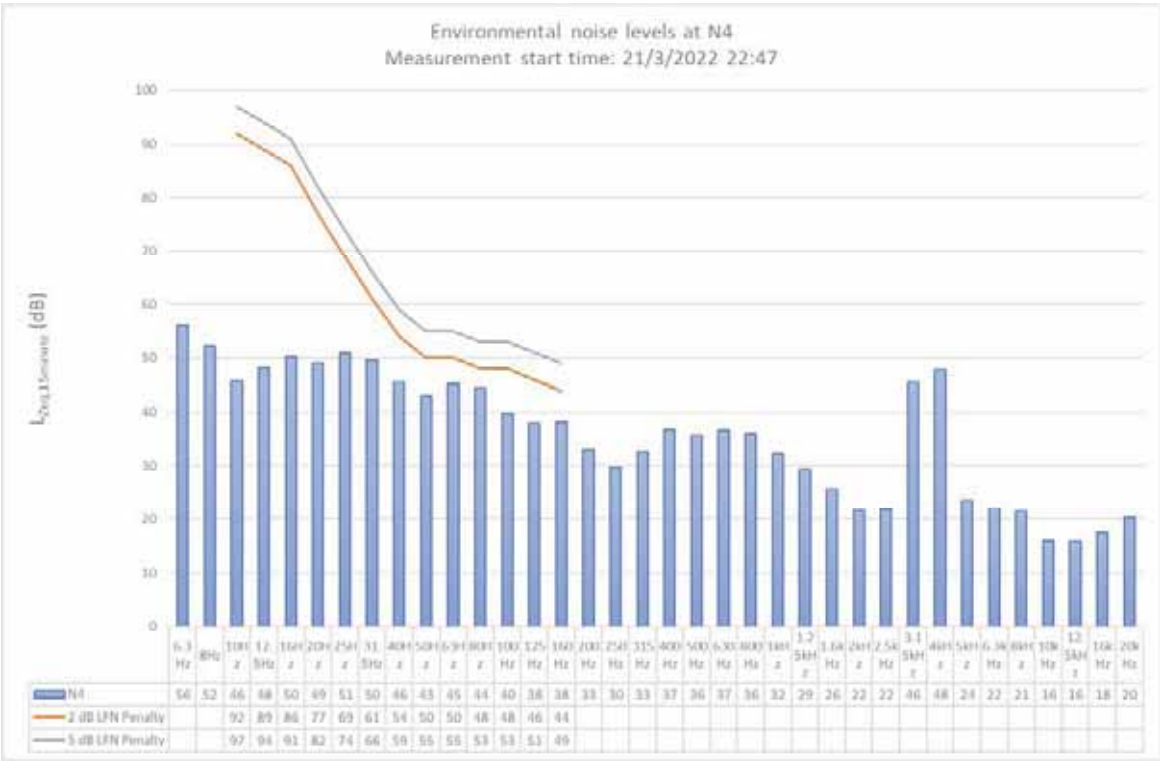

Figure 5.3 N4 total measured one-third octave band frequencies

Other mining operations in the vicinity were consistently audible during the operator-attended noise survey at monitoring location N4. The total cumulative mine noise contribution was estimated to be 25 dB $L_{Aeq,night}$ (ie Other mine noise of 28 dB $L_{Aeq,15\ minute}$ - 3 dB as per NPfI methodology). This is below the cumulative mine noise night-time criterion (ie $L_{Aeq,night}$ 40 dB). Therefore, the total cumulative mine $L_{Aeq,night}$ noise contribution was below the cumulative mine noise criterion.

6 Conclusion

EMM has completed a review of mine noise from Ashton Coal within the surrounding community based on attended measurements conducted on 21 March 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 the site. Noise limits were found not to be applicable during all three measurements due to the presence of temperature inversion conditions greater than 3°C/100m at the time of the measurements.

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

Ashton Coal noise contributions and cumulative mine noise contributions were below (satisfied) the relevant noise limits, had they applied, at all monitoring locations for 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

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 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 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 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 shall 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

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

Appendix C

Calibration certificates

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C30881

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	94.05 dB	999.99 Hz	1.00 %
Level2:	NA	N	114.05 dB	999.99 Hz	1.00 %
Uncertainty			±0.11 dB	±0.05%	±0.20 %
Uncertainty (at 95% c.l.) k=2					

CONDITION OF TEST:

Ambient Pressure	1002	hPa ±1 hPa	**Date of Receipt :**	20/10/2021
Temperature	23	°C ±1° C	**Date of Calibration :**	20/10/2021
Relative Humidity	41	% ±5%	**Date of Issue :**	20/10/2021

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

CHECKED BY: .....

AUTHORISED SIGNATURE: .....
Jack Kidd

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

CERTIFICATE OF CALIBRATION

CERTIFICATE NO.: SLM 26291 & FILT 5615

Equipment Description:	Sound Level Meter		
Manufacturer:	B & K		
Model No:	2250	**Serial No:**	2759405
Microphone Type:	4189	**Serial No:**	2888134
Preamplifier Type:	ZC0032	**Serial No:**	16037
Filter Type:	1/3 Octave	**Serial No:**	2759405
Comments:	All tests passed for class 1. (See over for details)		
Owner:	EMM Consulting Level 3, 175 Scott Street Newcastle, NSW 2300		
Ambient Pressure:	1007 hPa ±1.5 hPa		
Temperature:	24 °C ±2° C	**Relative Humidity:**	53% ±5%
Date of Calibration:	05/02/2020	**Issue Date:**	05/02/2020

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

CHECKED BY: JKB **AUTHORISED SIGNATURE:** Jack Kielt

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Appendix D

Monthly attended noise monitoring report – April 2022

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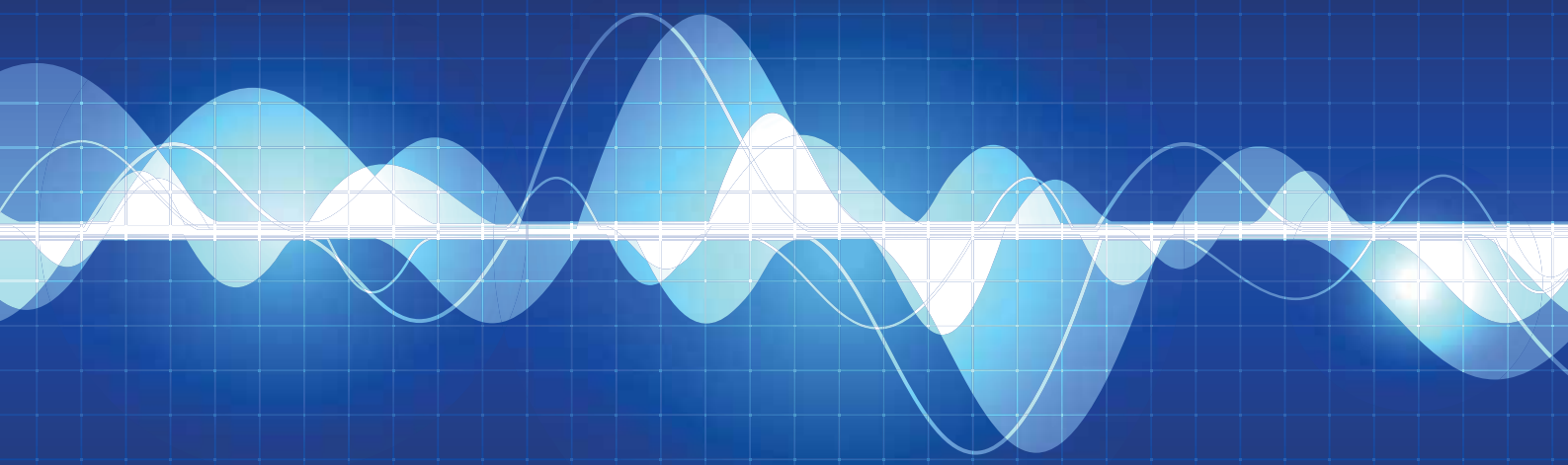
Ashton Coal

Monthly attended noise monitoring
April 2022

Prepared for Ashton Coal Operations Pty Ltd
May 2022



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Ashton Coal

Monthly attended noise monitoring - April 2022

Prepared for Ashton Coal Operations Pty Ltd
May 2022

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Ashton Coal

Monthly attended noise monitoring - April 2022

Report Number

E211129 RP4

Client

Ashton Coal Operations Pty Ltd

Date

11 May 2022

Version

v1-0 Final

Prepared by

Lucas Adamson
Senior Acoustic Consultant
11 May 2022

Approved by

Katie Teyhan
Associate
11 May 2022

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 purpose of the monitoring was to address requirements of the approved Ashton Coal Noise Management Plan (NMP), prepared to satisfy the requirements of the 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 26 April 2022.

The following material was referenced as part of this assessment:

- Department of Planning, Industry and Environment (DPIE), Development Consent 309-11-2001-I, as modified on 20 June 2016 (current as of 26 April 2022);
- Environment Protection Authority (EPA), Environment Protection License 11879, as varied on 3 February 2020 (current as of 26 April 2022);
- Ashton Coal Project Noise Management Plan (NMP), approved by DPIE on 23 September 2020 (current as of 26 April 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 what an average person perceives about 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

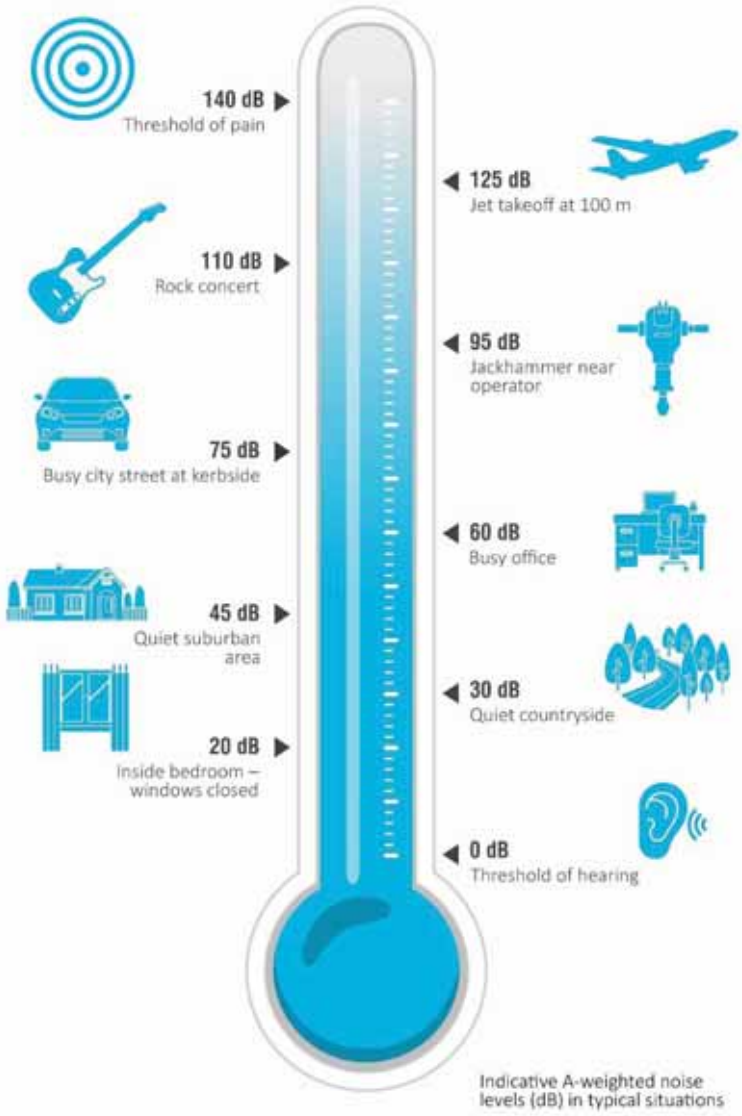


Figure 2.1 Common noise levels

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 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/100m.

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 (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 factors.

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 ion 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 Low frequency noise criteria

Condition 3 of Appendix 8 of the DC states that noise generated by Ashton Coal is to be measured in accordance with the relevant requirements of the INP. The INP application notes state that Section 4 of the INP has been withdrawn and the modifying factor adjustments outlined in Fact Sheet C of the NPfI are to be used when assessing the characteristics of a noise source.

Fact sheet C of the NPfI (EPA 2017) provides guidelines for applying modifying factor corrections to account for low frequency noise emissions. The NPfI specifies that a difference of 15 dB or more between site 'C-weighted' and site 'A-weighted' noise emission levels identifies the potential for an unbalanced spectrum and potential increased annoyance.

Where a difference of 15 dB or more between site 'C-weighted' and site 'A-weighted' noise emission levels is identified, the one-third octave noise levels recorded should be compared to the values in Table C2 of the NPfI (EPA 2017), which has been reproduced in Table 3.2 below.

Table 3.2 One-third octave low-frequency noise thresholds

	One-third octave $L_{Zeq,15\ minute}$ threshold level												
Frequency (Hz)	**10**	**12.5**	**16**	**20**	**25**	**31.5**	**40**	**50**	**63**	**80**	**100**	**125**	**160**
dB (Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

The following modifying factor correction is to be applied where the site 'C-weighted' and site 'A-weighted' noise emission level is 15 dB or more and:

- where any of the one-third octave noise levels in Table 3.2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2 dB positive adjustment to measured/predicted A-weighted levels applies for the evening/night period; or

- where any of the one-third octave noise levels in Table 3.2 are exceeded by more than 5 dB and cannot be mitigated, a 5 dB positive adjustment to measured/predicted A-weighted levels applies for the evening/night period.

Hence, where relevant throughout each survey the operator has estimated the difference between site 'C-weighted' and site 'A-weighted' noise emission levels by matching audible sounds with the response of the analyser (L_{Ceq}-L_{Aeq}). Where this was deemed to be 15 dB or greater, the measured one-third octave frequencies have been compared to the values in Table 3.2 to identify the relevant modifying factor correction (if applicable). This method has been applied to this assessment as presented in Section 5.

It is of note that the NPfI (EPA 2017) states that low-frequency noise corrections only apply under the standard or noise-enhancing meteorological conditions.

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

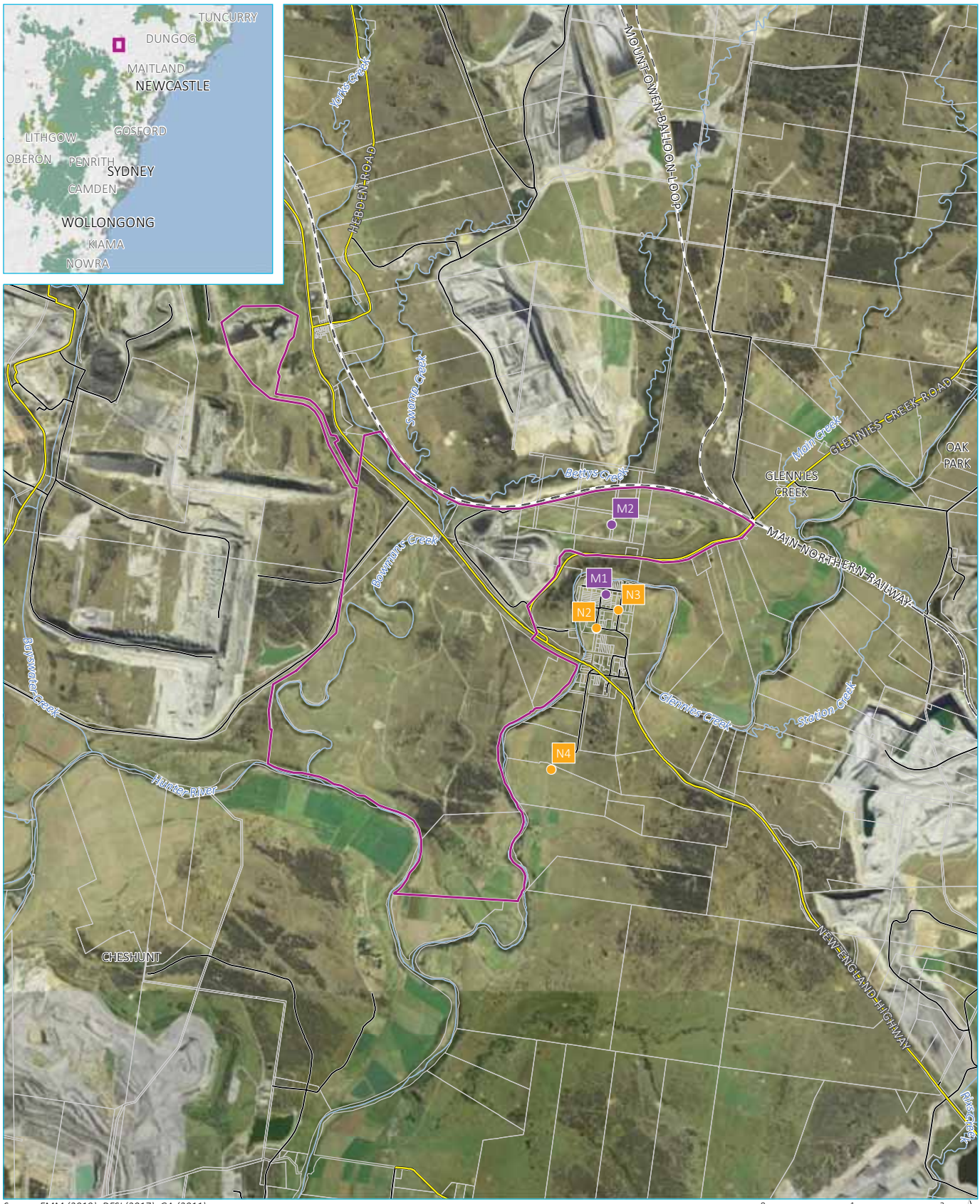
Monitoring location	Description	MGA56	
		Easting	Northing
N2	Camberwell Village (west)	320297	6405670
N3	Camberwell Village (north east)	320554	6405839
N4	South of New England Highway	319776	6404101

Attended noise monitoring is scheduled to be "unannounced" and, to EMM's knowledge, Ashton Coal were not aware of the monitoring prior to its commencing. 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 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 79952). The instrumentation's calibration certificates are provided in Appendix C.



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

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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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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 the relevant noise criteria. This response plan is implemented if site noise levels are determined to be above the relevant noise criteria and when noise limits are 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 the relevant noise criteria 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. An additional monitoring test should be scheduled to be undertaken at the same location within one week and move on to the next monitoring location.
- If the follow up measurement indicates that site noise levels are below the relevant noise criteria and that noise limits are applicable, the consultant will record the result, note the site has passed, schedule an additional monitoring test to be undertaken at the location within one week and move on to the next monitoring location.

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 Appendix E2 of the INP (EPA 2000).

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 E1 of the INP (EPA 2000) 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: INP (EPA 2000).

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.

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, ie above 630 Hz). Attended monitoring was completed on 26 April 2022. Noise from Ashton Coal operations was inaudible during all three operator-attended noise surveys.

The 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.

Low frequency noise is typically conservatively assessed by comparison of the total measured one-third octave L_{Aeq} noise levels to the NPfI one-third octave low-frequency noise thresholds, where site is audible.

Given that Ashton Coal was not audible during any of the three measurements, LFN modifying factors were not applied to site noise levels at any of the monitoring location. Notwithstanding the preceding, it is noted that total measured noise levels did not exceed the relevant LFN thresholds during any of the three measurements. Therefore, in accordance with the NPfI, LFN modifying factors were not applied to estimated cumulative noise levels at any of the locations.

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 –April 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}	LFN mod. factor[1]	L_{Aeq}	L_{Amax}[2]	L_{Aeq}	L_{Amax}[2]			
N2	26/4	22:02	30	33	44	48	53	57	56	Nil	IA	IA	36	46	2.2 m/s @ 135° F class stability 2.1°C/100m VTG Y	Nil	Ashton Coal inaudible. Other mines in the vicinity (<30 dB $L_{Aeq,15\ minute}$), insects, frogs, and traffic on the New England Highway consistently audible. Resident noise and trains on the main line (unrelated to Ashton Coal) occasionally audible.
N3	26/4	22:19	27	31	41	45	50	54	54	Nil	IA	IA	36	46	1.2 m/s @ 136° F class stability 2.3°C/100m VTG Y	Nil	Ashton Coal inaudible. Other mines in the vicinity (<30 dB $L_{Aeq,15\ minute}$), insects, frogs, and traffic on the New England Highway consistently audible. Trains on the main line (unrelated to Ashton Coal) occasionally audible.
N4	26/4	22:40	33	38	47	51	53	63	52	Nil	IA	IA	36	46	2.1 m/s @ 126° E class stability 1.1°C/100m VTG Y	Nil	Ashton Coal inaudible. Other mines in the vicinity (<25 dB $L_{Aeq,15\ minute}$), insects, frogs, powerline hum and traffic on the New England Highway consistently audible.

Notes:
1. Modifying factor correction for low frequency noise in accordance with Fact Sheet C of the NPfI (refer Section 3.3).
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. N/A = not applicable.

5.2 N2 - Camberwell Village (west)

Ashton Coal operations were inaudible during the entire operator-attended noise survey. Typically, when a particular source is not audible above local ambient noise levels, the likely contribution of that source is at least 10 dB below the measured background (L_{A90}) level. Given this and the measured background noise level of 33 dB L_{A90}, the Ashton Coal $L_{Aeq,15\ minute}$ mine noise contribution was estimated to be ≤23 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 ambient noise sources included other mines in the vicinity, insects, frogs, traffic on the New England Highway, resident noise and trains on the main line (unrelated to Ashton Coal). A graph of the total linear noise levels measured in each one-third octave frequency bands is shown in Figure 5.1.

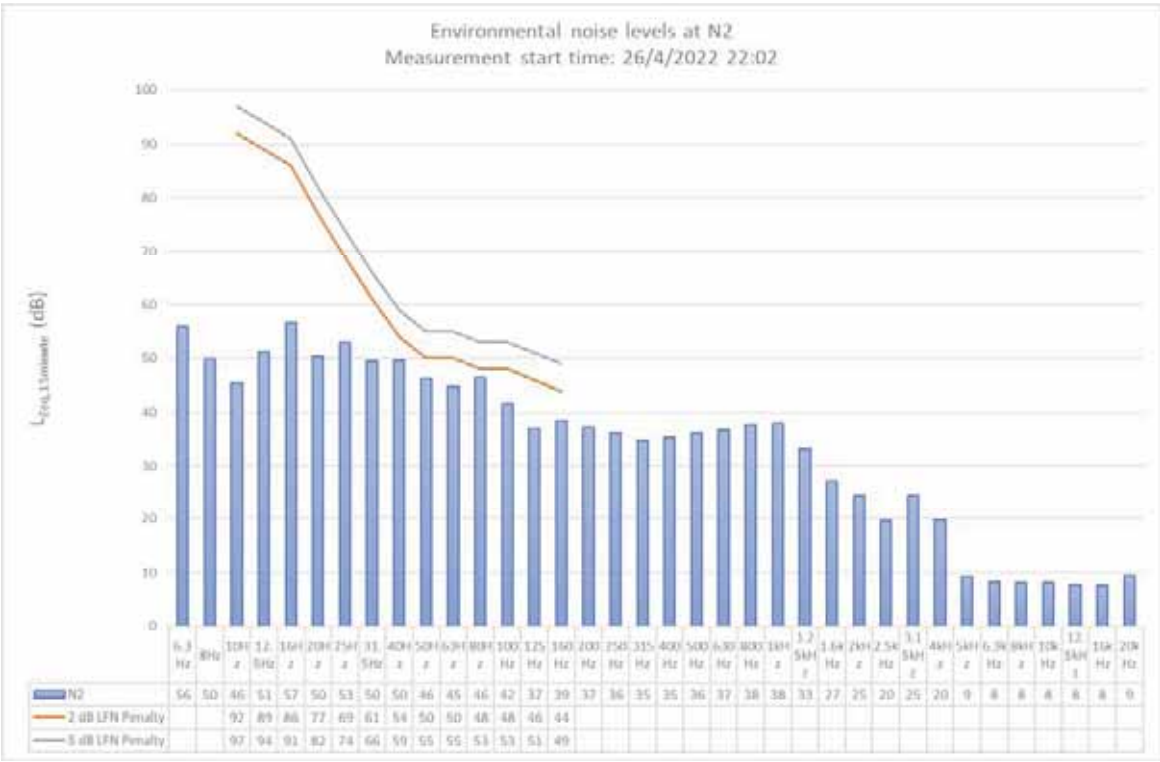

Figure 5.1 N2 total measured one-third octave band frequencies

Other mining operations in the vicinity were consistently audible during the operator-attended noise survey at monitoring location N2. The total cumulative mine noise contribution was estimated to be <27 dB $L_{Aeq,night}$ (ie Other mine noise of <30 dB $L_{Aeq,15\ minute}$ - 3 dB as per NPfI methodology). This is below the cumulative mine noise night-time criterion (ie $L_{Aeq,night}$ 40 dB). Therefore, the total cumulative mine $L_{Aeq,night}$ noise contribution was below the cumulative mine noise criterion.

5.3 N3 - Camberwell Village (north east)

Ashton Coal operations were inaudible during the entire operator-attended noise survey. Given this and the measured background noise level of 31 dB L_{A90}, the Ashton Coal $L_{Aeq,15\ minute}$ mine noise contribution was estimated to be ≤21 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 ambient noise sources included other mines in the vicinity, insects, frogs, traffic on the New England Highway and trains on the main line (unrelated to Ashton Coal). A graph of the total linear noise levels measured in the one-third octave frequency bands is shown in Figure 5.2.

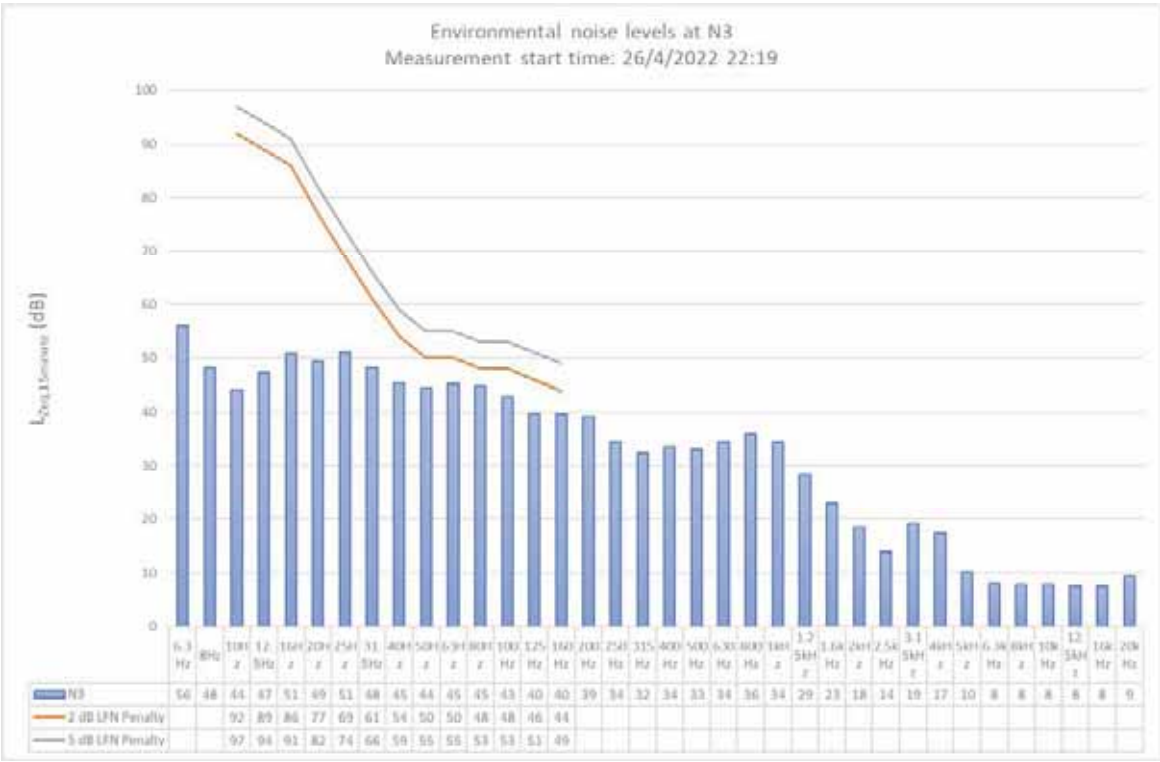

Figure 5.2 N3 total measured one-third octave band frequencies

Other mining operations in the vicinity were consistently audible during the operator-attended noise survey at monitoring location N3. The total cumulative mine noise contribution was estimated to be <27 dB $L_{Aeq,night}$ (ie Other mine noise of <30 dB $L_{Aeq,15\ minute}$ - 3 dB as per NPfI methodology). This is below the cumulative mine noise night-time criterion (ie $L_{Aeq,night}$ 40 dB). Therefore, the total cumulative mine $L_{Aeq,night}$ noise contribution was below the cumulative mine noise criterion.

5.4 N4 - South of New England Highway

Ashton Coal operations were inaudible during the entire operator-attended noise survey. Given this and the measured background noise level of 38 dB L_{A90}, the Ashton Coal $L_{Aeq,15\ minute}$ mine noise contribution was estimated to be ≤28 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 ambient noise sources included other mines in the vicinity, insects, frogs, traffic on the New England Highway and powerline hum. A graph of the total linear noise levels measured in one-third octave frequency bands is shown below in Figure 5.3.

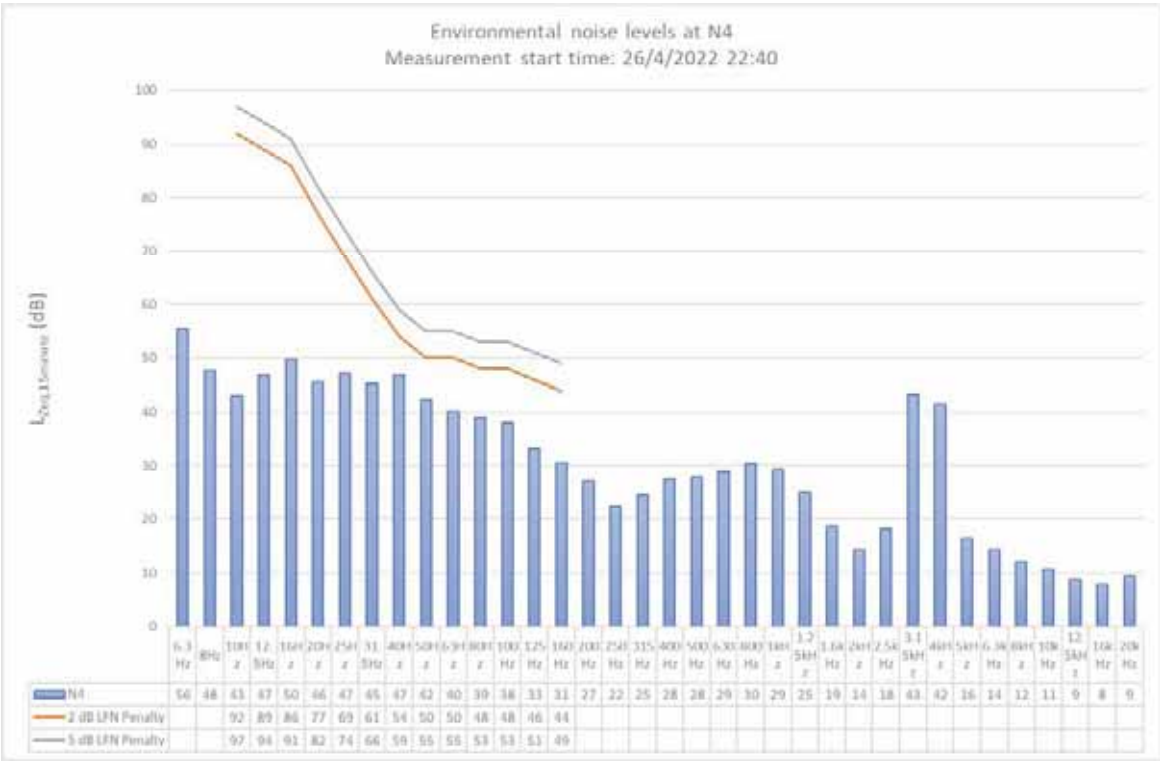

Figure 5.3 N4 total measured one-third octave band frequencies

Other mining operations in the vicinity were consistently audible during the operator-attended noise survey at monitoring location N4. The total cumulative mine noise contribution was estimated to be <22 dB $L_{Aeq,night}$ (ie Other mine noise of <25 dB $L_{Aeq,15\ minute}$ - 3 dB as per NPfI methodology). This is below the cumulative mine noise night-time criterion (ie $L_{Aeq,night}$ 40 dB). Therefore, the total cumulative mine $L_{Aeq,night}$ noise contribution was below the cumulative mine noise criterion.

6 Conclusion

EMM has completed a review of mine noise from Ashton Coal within the surrounding community based on attended measurements conducted on 26 April 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 the site. Noise limits were found to be applicable during all three measurements.

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

Ashton Coal noise contributions and cumulative mine noise contributions were below (satisfied) the relevant noise limits, had they applied, at all monitoring locations for 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

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 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 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 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 shall 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

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

Appendix C

Calibration certificates

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C30591

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	94.12 dB	999.99 Hz	1.58 %
Level2:	NA	N	114.05 dB	999.99 Hz	1.12 %
Uncertainty			±0.11 dB	±0.05%	±0.20 %
Uncertainty (at 95% c.l.) k=2					

CONDITION OF TEST:

Ambient Pressure	1007	hPa ±1 hPa	**Date of Receipt :**	16/09/2021
Temperature	21	°C ±1° C	**Date of Calibration :**	16/09/2021
Relative Humidity	43	% ±5%	**Date of Issue :**	16/09/2021

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

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

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%.

NATA
WORLD RECOGNISED ACCREDITATION
Accredited Lab No. 9262
Acoustic and Vibration Measurements

Acu-Vib Electronics
CALIBRATIONS SALES RENTALS REPAIRS

Head Office & Calibration Laboratory
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HBK HOTTINGER BRÜEL & KJÆR
The Calibration Laboratory
Skodsborgvej 307, DK-2850 Nærum, Denmark

ilac-MRA DANAK
CAL Reg.No. 307
Member of EA MLA

CERTIFICATE OF CALIBRATION

No: CDK2007931 Page 1 of 12

CALIBRATION OF

Sound Level Meter:	Brüel & Kjær Type 2250	No: 3029363	Id: -
Microphone:	Brüel & Kjær Type 4189	No: 3260501	
PreAmplifier:	Brüel & Kjær Type ZC-0032	No: 30109	
Supplied Calibrator:	None		
Software version:	BZ7222 Version 4.7.6	Pattern Approval:	-
Instruction manual:	BE1712-22		

CUSTOMER

EMM Consulting
Ground Floor, Suite 1
20 Chandos Street
2065 St Leonards
New South Wales, Australia

CALIBRATION CONDITIONS

Preconditioning: 4 hours at 23°C ± 3°C
Environment conditions: *See actual values in sections.*

SPECIFICATIONS

The Sound Level Meter Brüel & Kjær Type 2250 has been calibrated in accordance with the requirements as specified in IEC 61672-1:2013 class 1. Procedures from IEC 61672-3:2013 were used to perform the periodic tests. The accreditation assures the traceability to the international units system SI.

PROCEDURE

The measurements have been performed with the assistance of Brüel & Kjær Sound Level Meter Calibration System 3630 with application software type 7763 (version 8.2 - DB: 8.20) by using procedure B&K proc 2250, 4189 (IEC 61672:2013).

RESULTS

Calibration Mode: **Calibration as received.**

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ providing a level of confidence of approximately 95 %. The uncertainty evaluation has been carried out in accordance with EA-4/02 from elements originating from the standards, calibration method, effect of environmental conditions and any short time contribution from the device under calibration.

Date of calibration: 2020-11-26

Date of issue: 2020-11-26

Lene Petersen
Calibration Technician

Erik Bruus
Approved Signatory

Appendix E

Monthly attended noise monitoring report – May 2022

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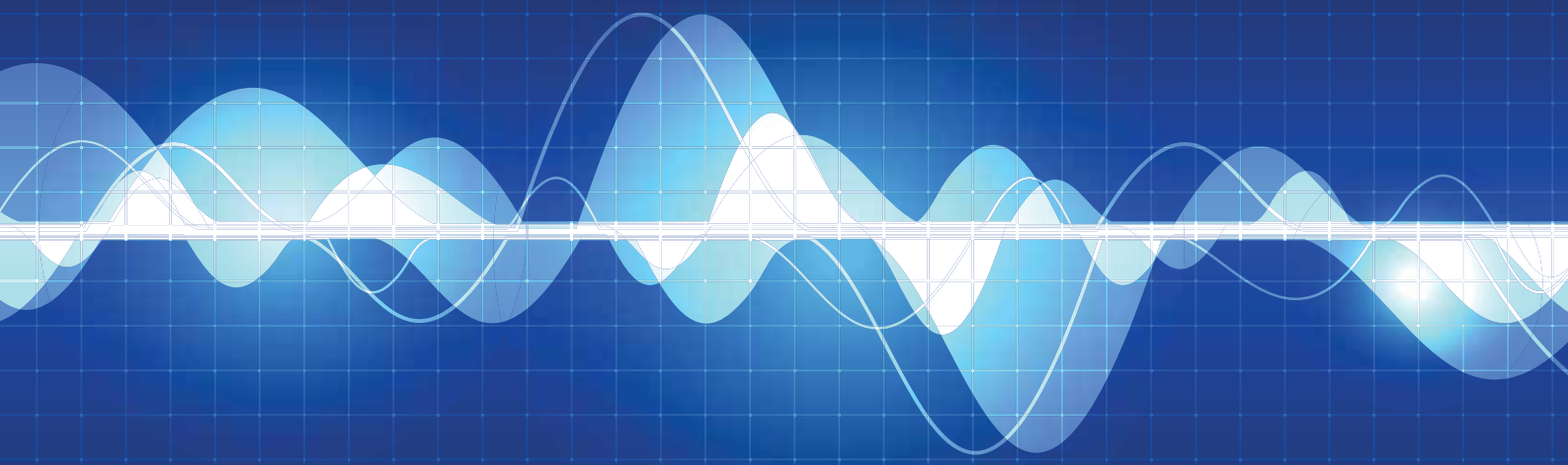
Ashton Coal

Monthly attended noise monitoring
May 2022

Prepared for Ashton Coal Operations Pty Ltd
June 2022



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Deakin ACT 2600

Ashton Coal

Monthly attended noise monitoring - May 2022

Prepared for Ashton Coal Operations Pty Ltd
June 2022

EMM Newcastle
Level 3, 175 Scott Street
Newcastle NSW 2300

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www.emmconsulting.com.au

Ashton Coal

Monthly attended noise monitoring - May 2022

Report Number

E211129 RP5

Client

Ashton Coal Operations Pty Ltd

Date

2 June 2022

Version

v1 Final

Prepared by

Lucas Adamson
Senior Acoustic Consultant
2 June 2022

Approved by

Katie Teyhan
Associate
2 June 2022

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 purpose of the monitoring was to address requirements of the approved Ashton Coal Noise Management Plan (NMP), prepared to satisfy the requirements of the 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 25 May 2022.

The following material was referenced as part of this assessment:

- Department of Planning, Industry and Environment (DPIE), Development Consent 309-11-2001-I, as modified on 20 June 2016 (current as of 25 May 2022);
- Environment Protection Authority (EPA), Environment Protection License 11879, as varied on 3 February 2020 (current as of 25 May 2022);
- Ashton Coal Project Noise Management Plan (NMP), approved by DPIE on 23 September 2020 (current as of 25 May 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 what an average person perceives about 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

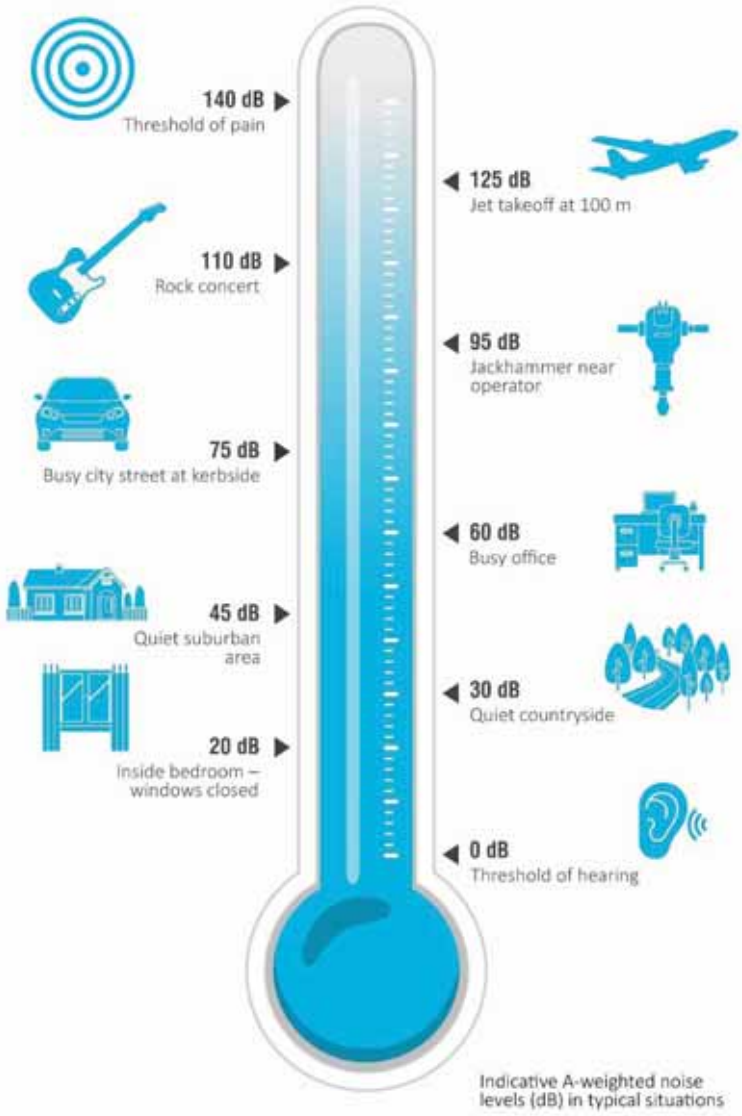


Figure 2.1 Common noise levels

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 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/100m.

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 (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 factors.

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 ion 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 Low frequency noise criteria

Condition 3 of Appendix 8 of the DC states that noise generated by Ashton Coal is to be measured in accordance with the relevant requirements of the INP. The INP application notes state that Section 4 of the INP has been withdrawn and the modifying factor adjustments outlined in Fact Sheet C of the NPfI are to be used when assessing the characteristics of a noise source.

Fact sheet C of the NPfI (EPA 2017) provides guidelines for applying modifying factor corrections to account for low frequency noise emissions. The NPfI specifies that a difference of 15 dB or more between site 'C-weighted' and site 'A-weighted' noise emission levels identifies the potential for an unbalanced spectrum and potential increased annoyance.

Where a difference of 15 dB or more between site 'C-weighted' and site 'A-weighted' noise emission levels is identified, the one-third octave noise levels recorded should be compared to the values in Table C2 of the NPfI (EPA 2017), which has been reproduced in Table 3.2 below.

Table 3.2 One-third octave low-frequency noise thresholds

	One-third octave $L_{Zeq,15\ minute}$ threshold level												
Frequency (Hz)	**10**	**12.5**	**16**	**20**	**25**	**31.5**	**40**	**50**	**63**	**80**	**100**	**125**	**160**
dB (Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

The following modifying factor correction is to be applied where the site 'C-weighted' and site 'A-weighted' noise emission level is 15 dB or more and:

- where any of the one-third octave noise levels in Table 3.2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2 dB positive adjustment to measured/predicted A-weighted levels applies for the evening/night period; or

- where any of the one-third octave noise levels in Table 3.2 are exceeded by more than 5 dB and cannot be mitigated, a 5 dB positive adjustment to measured/predicted A-weighted levels applies for the evening/night period.

Hence, where relevant throughout each survey the operator has estimated the difference between site 'C-weighted' and site 'A-weighted' noise emission levels by matching audible sounds with the response of the analyser (L_{Ceq}-L_{Aeq}). Where this was deemed to be 15 dB or greater, the measured one-third octave frequencies have been compared to the values in Table 3.2 to identify the relevant modifying factor correction (if applicable). This method has been applied to this assessment as presented in Section 5.

It is of note that the NPfI (EPA 2017) states that low-frequency noise corrections only apply under the standard or noise-enhancing meteorological conditions.

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

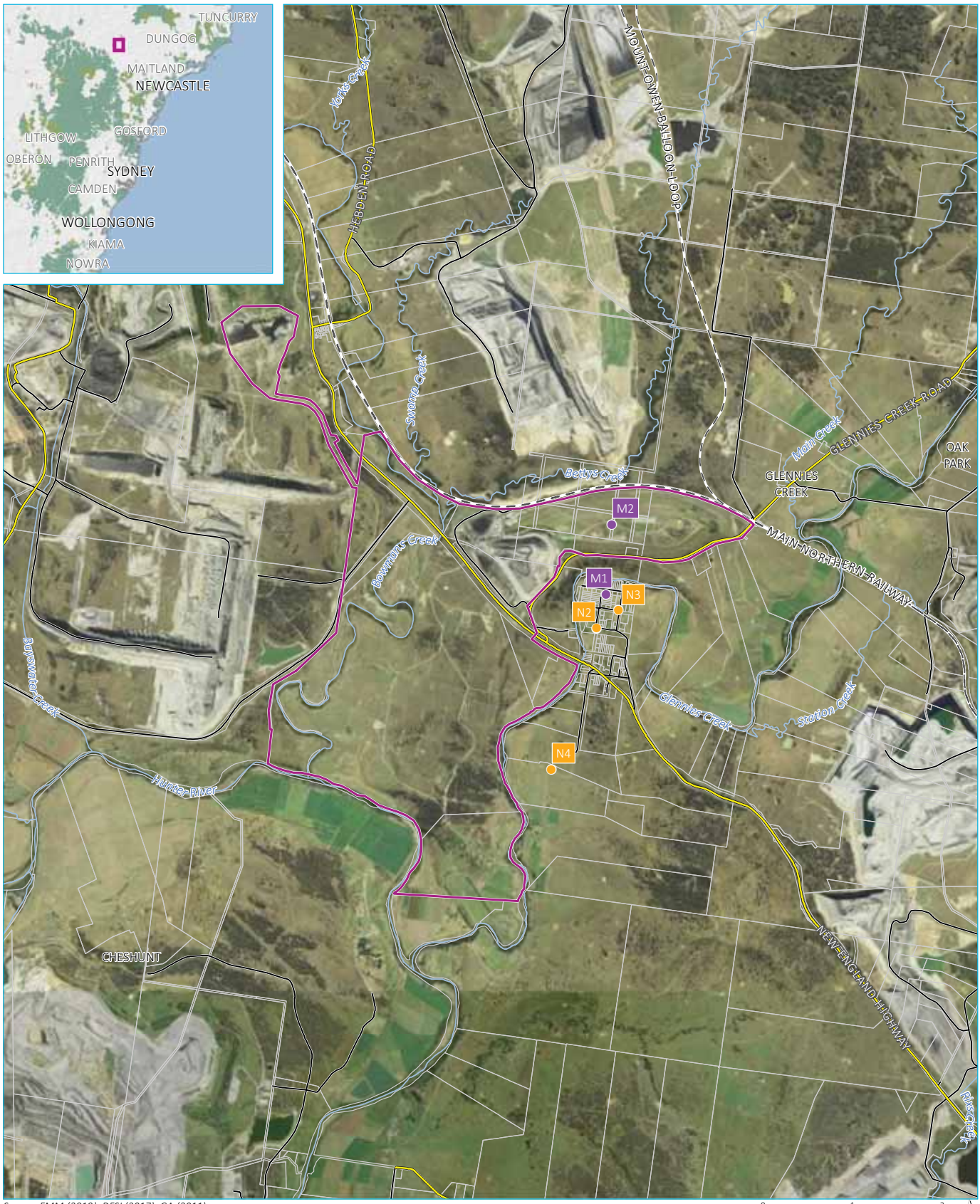
Monitoring location	Description	MGA56	
		Easting	Northing
N2	Camberwell Village (west)	320297	6405670
N3	Camberwell Village (north east)	320554	6405839
N4	South of New England Highway	319776	6404101

Attended noise monitoring is scheduled to be "unannounced" and, to EMM's knowledge, Ashton Coal were not aware of the monitoring prior to its commencing. 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 filtering).

4.2 Instrumentation

A Brüel & Kjær 2250 Type 1 sound analyser (s/n 2759405) 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). The instrumentation's calibration certificates are provided in Appendix C.



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

0 1 2 km

GDA 1994 MGA Zone 56

N

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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

EMM
creating opportunities

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 the relevant noise criteria. This response plan is implemented if site noise levels are determined to be above the relevant noise criteria and when noise limits are 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 the relevant noise criteria 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. An additional monitoring test should be scheduled to be undertaken at the same location within one week and move on to the next monitoring location.
- If the follow up measurement indicates that site noise levels are below the relevant noise criteria and that noise limits are applicable, the consultant will record the result, note the site has passed, schedule an additional monitoring test to be undertaken at the location within one week and move on to the next monitoring location.

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 Appendix E2 of the INP (EPA 2000).

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 E1 of the INP (EPA 2000) 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: INP (EPA 2000).

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.

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, ie above 630 Hz). Attended monitoring was completed on 25 May 2022. Noise from Ashton Coal operations was inaudible during all three operator-attended noise surveys.

The 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.

Low frequency noise is typically conservatively assessed by comparison of the total measured one-third octave L_{Aeq} noise levels to the NPfI one-third octave low-frequency noise thresholds, where site is audible.

Given that Ashton Coal was not audible during any of the three measurements, LFN modifying factors were not applied to site noise levels at any of the locations. Notwithstanding the preceding, it is noted that total measured noise levels exceeded the relevant LFN thresholds during one of the three measurements (at N3). Therefore, in accordance with the NPfI, LFN modifying factors were applied to estimated cumulative noise levels at location N3.

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 –May 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}	LFN mod. factor[1]	L_{Aeq}	L_{Amax}[2]	L_{Aeq}	L_{Amax}[2]			
N2	25/05	22:01	27	32	46	50	55	59	56	Nil	IA	IA	36	46	1.7 m/s @ 158° F class stability 1.6°C/100m VTG Y	Nil	Ashton Coal inaudible. Other mines in the vicinity (26 dB $L_{Aeq,15\ minute}$), insects,, nearby livestock, and traffic on the New England Highway consistently audible.
N3	25/05	22:20	27	31	43	48	52	61	54	Nil	IA	IA	36	46	1.4 m/s @ 165° F class stability 1.6°C/100m VTG Y	Nil	Ashton Coal inaudible. Other mines in the vicinity (27 dB $L_{Aeq,15\ minute}$), insects, frogs and traffic on the New England Highway consistently audible. Water system at nearby residence consistently audible for first 5 minutes of measurement. Nearby livestock occasionally audible.
N4	25/05	22:42	23	26	37	42	46	60	51	Nil	IA	IA	36	46	1.3 m/s @ 154° F class stability 1.6°C/100m VTG Y	Nil	Ashton Coal inaudible. Other mines in the vicinity (25 dB $L_{Aeq,15\ minute}$), traffic on the New England Highway, insects and frogs consistently audible.

Notes:
1. Modifying factor correction for low frequency noise in accordance with Fact Sheet C of the NPfI (refer Section 3.3).
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. N/A = not applicable.

5.2 N2 - Camberwell Village (west)

Ashton Coal operations were inaudible during the entire operator-attended noise survey. Typically, when a particular source is not audible above local ambient noise levels, the likely contribution 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 ambient noise sources included other mines in the vicinity, insects, livestock, and traffic on the New England Highway. A graph of the total linear noise levels measured in each one-third octave frequency bands is shown in Figure 5.1.

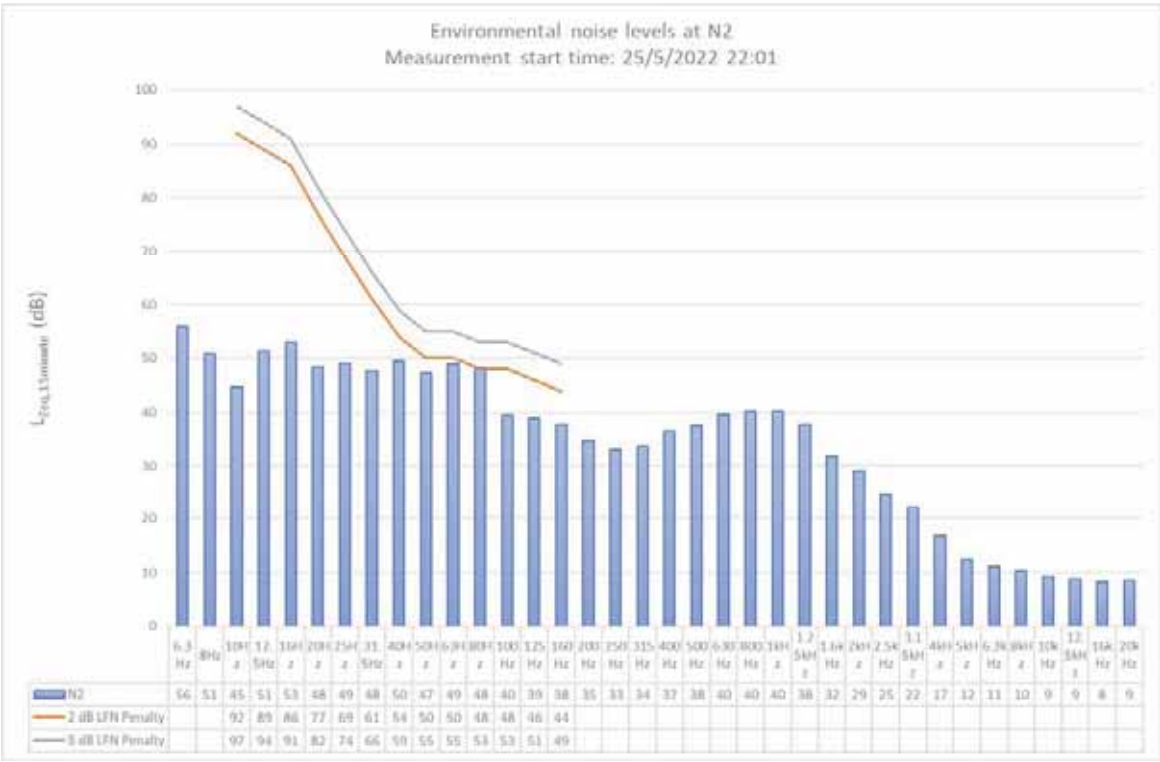

Figure 5.1 N2 total measured one-third octave band frequencies

Other mining operations in the vicinity were consistently audible during the operator-attended noise survey at monitoring location N2. The total cumulative mine noise contribution was estimated to be 23 dB $L_{Aeq,night}$ (ie Other mine noise of 26 dB $L_{Aeq,15\ minute}$ - 3 dB). This is below the cumulative mine noise night-time criterion (ie $L_{Aeq,night}$ 40 dB). Therefore, the total cumulative mine $L_{Aeq,night}$ noise contribution was below the cumulative mine noise criterion.

5.3 N3 - Camberwell Village (north east)

Ashton Coal operations were inaudible during the entire operator-attended noise survey. Given this and the measured background noise level of 31 dB L_{A90}, the Ashton Coal $L_{Aeq,15\ minute}$ mine noise contribution was estimated to be ≤21 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 ambient noise sources included other mines in the vicinity, insects, frogs,traffic on the New England Highway, and a water system of a nearby residence. A graph of the total linear noise levels measured in the one-third octave frequency bands is shown in Figure 5.2.

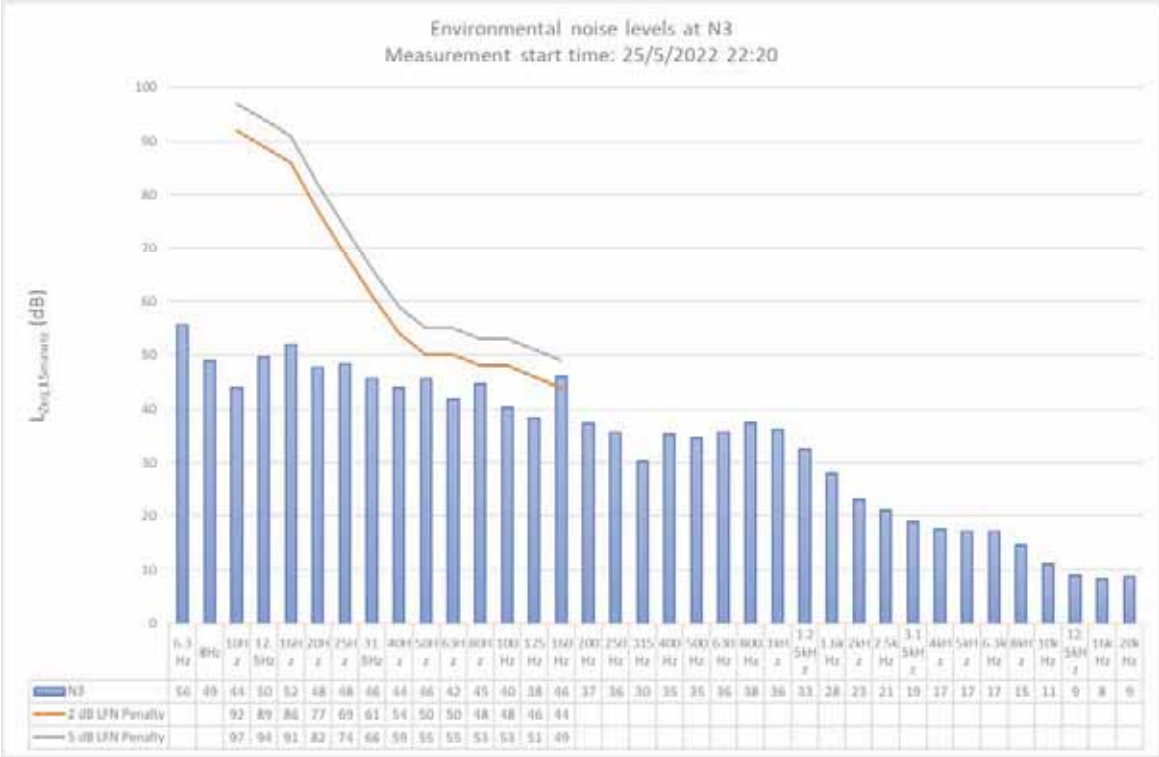

Figure 5.2 N3 total measured one-third octave band frequencies

Other mining operations in the vicinity were consistently audible during the operator-attended noise survey at monitoring location N3. The total cumulative mine noise contribution was estimated to be 26 dB $L_{Aeq,night}$ (ie Other mine noise of 27 dB $L_{Aeq,15\ minute}$ - 3 dB + 2 dB as per NPfI methodology), including a 2 dB positive adjustment for LFN. This is below the cumulative mine noise night-time criterion (ie $L_{Aeq,night}$ 40 dB). Therefore, the total cumulative mine $L_{Aeq,night}$ noise contribution was below the cumulative mine noise criterion.

5.4 N4 - South of New England Highway

Ashton Coal operations were inaudible during the entire operator-attended noise survey. Given this and the measured background noise level of 26 dB L_{A90}, the Ashton Coal $L_{Aeq,15\ minute}$ mine noise contribution was estimated to be <20 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 ambient noise sources included other mines in the vicinity, insects, frogs, and traffic on the New England Highway. A graph of the total linear noise levels measured in one-third octave frequency bands is shown below in Figure 5.3.

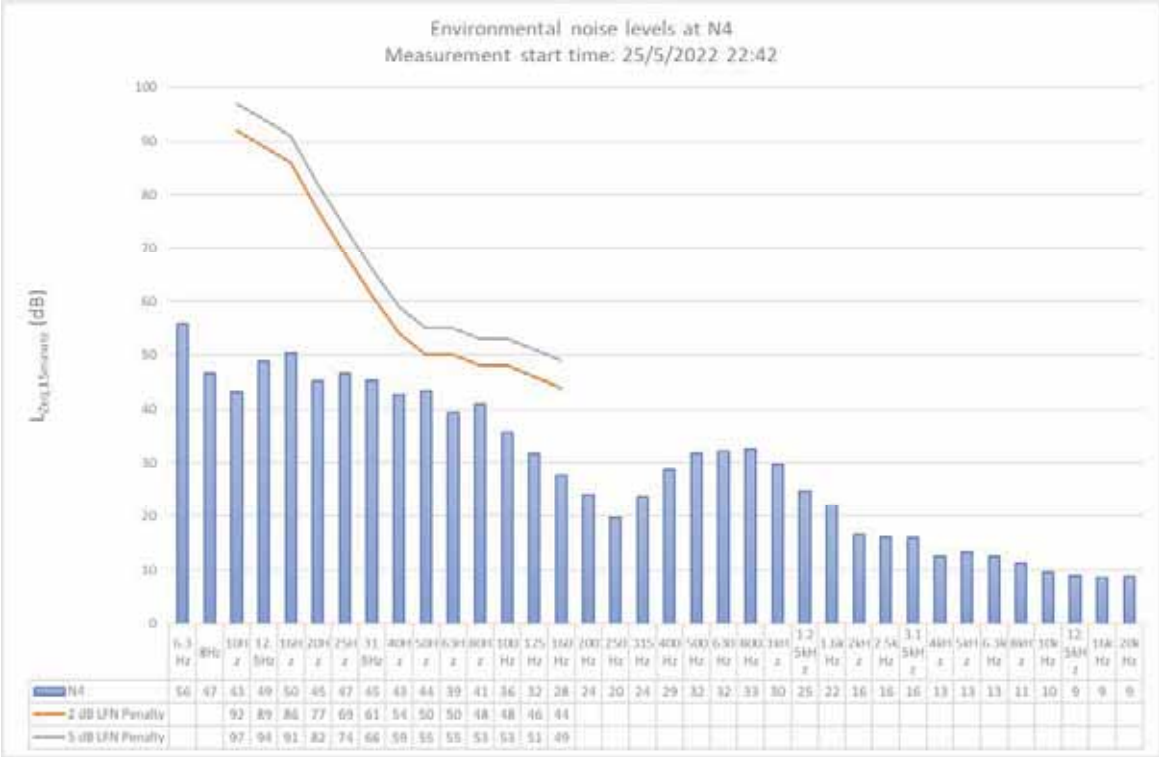

Figure 5.3 N4 total measured one-third octave band frequencies

Other mining operations in the vicinity were consistently audible during the operator-attended noise survey at monitoring location N4. The total cumulative mine noise contribution was estimated to be 22 dB $L_{Aeq,night}$ (ie other mine noise of 25 dB $L_{Aeq,15\ minute}$ - 3 dB as per NPfI methodology). This is below the cumulative mine noise night-time criterion (ie $L_{Aeq,night}$ 40 dB). Therefore, the total cumulative mine $L_{Aeq,night}$ noise contribution was below the cumulative mine noise criterion.

6 Conclusion

EMM has completed a review of mine noise from Ashton Coal within the surrounding community based on attended measurements conducted on 25 May 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 the site. Noise limits were found to be applicable during all three measurements.

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

Ashton Coal noise contributions and cumulative mine noise contributions were at or below (satisfied) the relevant noise limits at all monitoring locations for 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

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 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 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 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 shall 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

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

Appendix C

Calibration certificates

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C30881

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	94.05 dB	999.99 Hz	1.00 %
Level2:	NA	N	114.05 dB	999.99 Hz	1.00 %
Uncertainty			±0.11 dB	±0.05%	±0.20 %
Uncertainty (at 95% c.l.) k=2					

CONDITION OF TEST:

Ambient Pressure	1002	hPa ±1 hPa	**Date of Receipt :**	20/10/2021
Temperature	23	°C ±1° C	**Date of Calibration :**	20/10/2021
Relative Humidity	41	% ±5%	**Date of Issue :**	20/10/2021

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

CHECKED BY: .....

AUTHORISED SIGNATURE: .....
Jack Kidd

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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Accredited Lab No. 9262
Acoustic and Vibration Measurements

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	**Serial No:**	2759405
Type No:	2250	**Serial No:**	2983733
Mic. Type:	4189	**Serial No:**	22666
Pre-Amp. Type:	ZC0032		
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
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Appendix F

Monthly attended noise monitoring report – June 2022

EMM
creating opportunities

Ashton Coal

Monthly attended noise monitoring - June 2022

Prepared for Ashton Coal Operations Pty Ltd

June 2022

Ashton Coal

Monthly attended noise monitoring - June 2022

Ashton Coal Operations Pty Ltd

E211192 RP#6

June 2022

Version	Date	Prepared by	Approved by	Comments
1	30 June 2022	Lucas Adamson	Katie Teyhan	

Approved by

Katie Teyhan
Associate
30 June 2022

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 purpose of the monitoring was to address requirements of the approved Ashton Coal Noise Management Plan (NMP), prepared to satisfy the requirements of the 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 9 and 10 June 2022.

The following material was referenced as part of this assessment:

- Department of Planning, Industry and Environment (DPIE), Development Consent 309-11-2001-I, as modified on 20 June 2016 (current as of 9 June 2022);
- Environment Protection Authority (EPA), Environment Protection License 11879, as varied on 3 February 2020 (current as of 9 June 2022);
- Ashton Coal Project Noise Management Plan (NMP), approved by DPIE on 23 September 2020 (current as of 9 June 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 what an average person perceives about 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

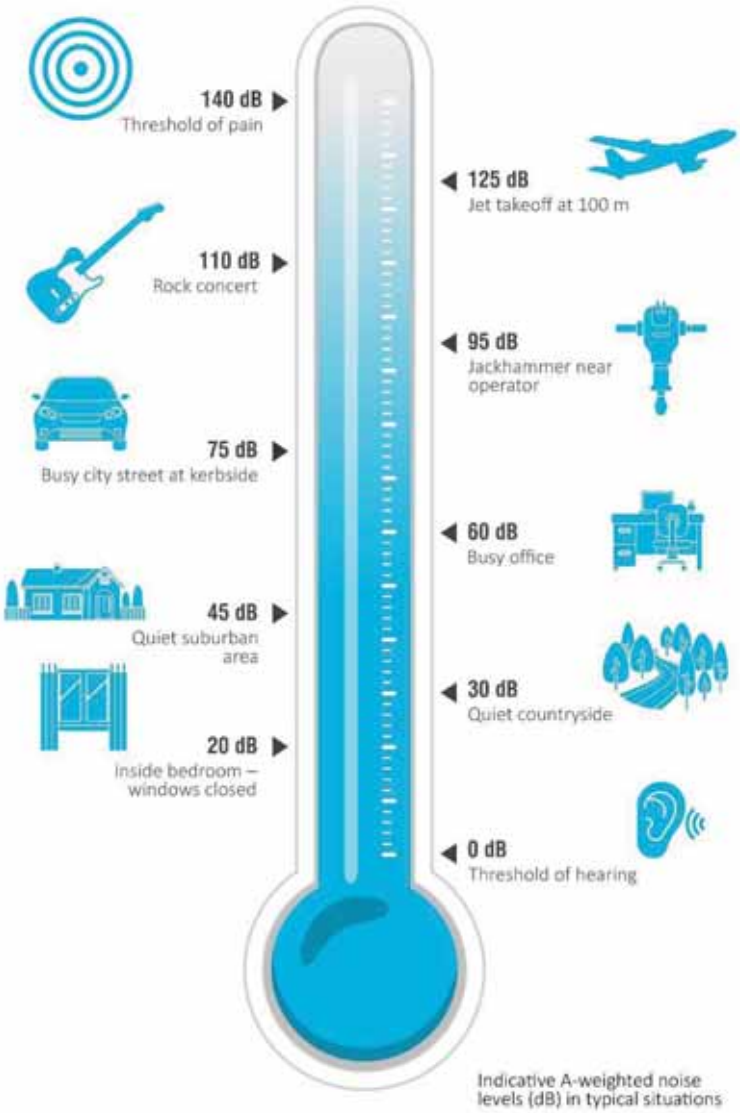


Figure 2.1 Common noise levels

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 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/100m.

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 (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 factors.

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 ion 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 Low frequency noise criteria

Condition 3 of Appendix 8 of the DC states that noise generated by Ashton Coal is to be measured in accordance with the relevant requirements of the INP. The INP application notes state that Section 4 of the INP has been withdrawn and the modifying factor adjustments outlined in Fact Sheet C of the NPfI are to be used when assessing the characteristics of a noise source.

Fact sheet C of the NPfI (EPA 2017) provides guidelines for applying modifying factor corrections to account for low frequency noise emissions. The NPfI specifies that a difference of 15 dB or more between site 'C-weighted' and site 'A-weighted' noise emission levels identifies the potential for an unbalanced spectrum and potential increased annoyance.

Where a difference of 15 dB or more between site 'C-weighted' and site 'A-weighted' noise emission levels is identified, the one-third octave noise levels recorded should be compared to the values in Table C2 of the NPfI (EPA 2017), which has been reproduced in Table 3.2 below.

Table 3.2 One-third octave low-frequency noise thresholds

	One-third octave $L_{Zeq,15\ minute}$ threshold level												
Frequency (Hz)	**10**	**12.5**	**16**	**20**	**25**	**31.5**	**40**	**50**	**63**	**80**	**100**	**125**	**160**
dB (Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

The following modifying factor correction is to be applied where the site 'C-weighted' and site 'A-weighted' noise emission level is 15 dB or more and:

- where any of the one-third octave noise levels in Table 3.2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2 dB positive adjustment to measured/predicted A-weighted levels applies for the evening/night period; or
- where any of the one-third octave noise levels in Table 3.2 are exceeded by more than 5 dB and cannot be mitigated, a 5 dB positive adjustment to measured/predicted A-weighted levels applies for the evening/night period.

Hence, where relevant throughout each survey the operator has estimated the difference between site 'C-weighted' and site 'A-weighted' noise emission levels by matching audible sounds with the response of the analyser (L_{Ceq}-L_{Aeq}). Where this was deemed to be 15 dB or greater, the measured one-third octave frequencies have been compared to the values in Table 3.2 to identify the relevant modifying factor correction (if applicable). This method has been applied to this assessment as presented in Section 5.

It is of note that the NPfI (EPA 2017) states that low-frequency noise corrections only apply under the standard or noise-enhancing meteorological conditions.

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

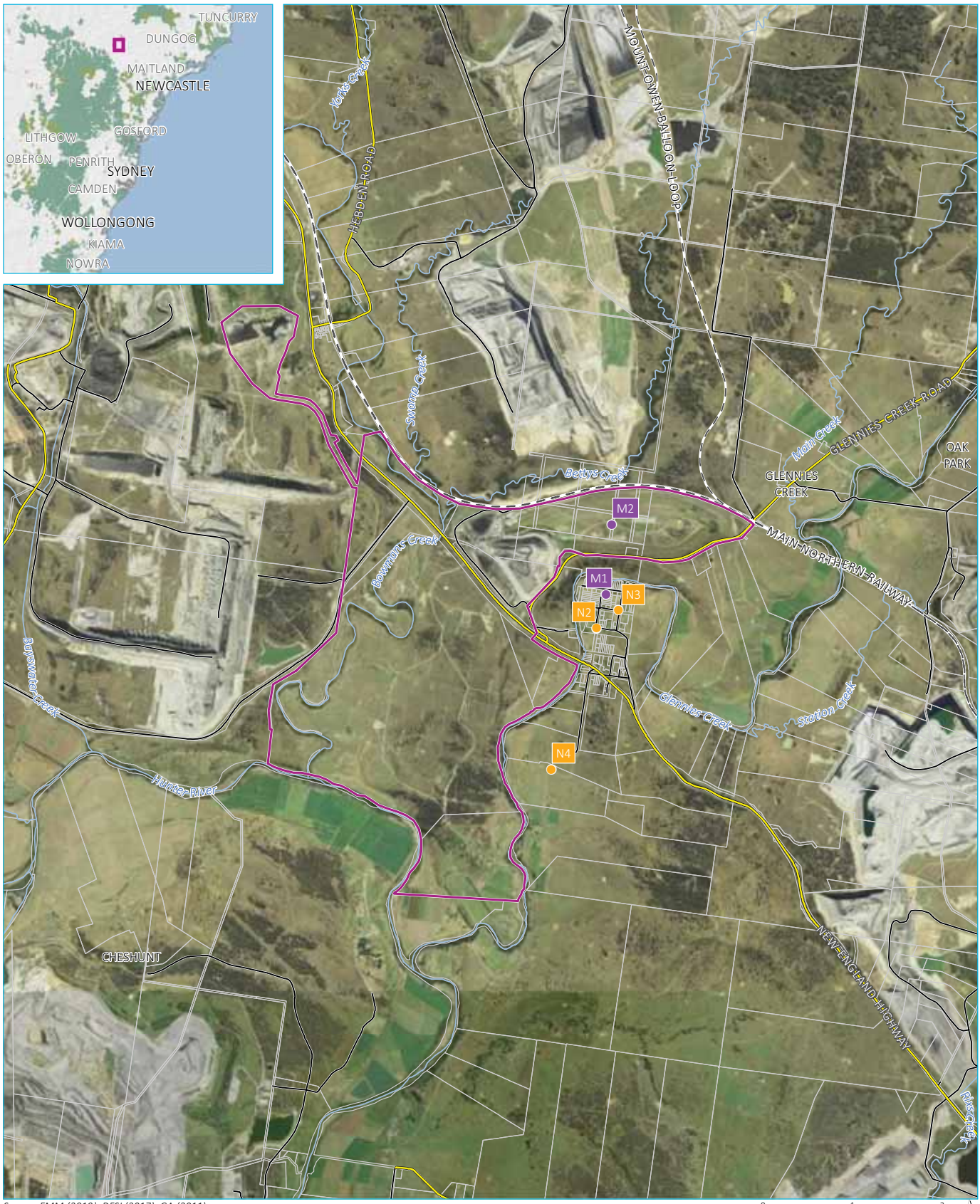
Monitoring location	Description	MGA56	
		Easting	Northing
N2	Camberwell Village (west)	320297	6405670
N3	Camberwell Village (north east)	320554	6405839
N4	South of New England Highway	319776	6404101

Attended noise monitoring is scheduled to be "unannounced" and, to EMM's knowledge, Ashton Coal were not aware of the monitoring prior to its commencing. 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 filtering).

4.2 Instrumentation

Brüel & Kjær 2250 Type 1 sound analysers (s/n 3029363 and 2759405) were used to conduct 15-minute attended measurements and record 1/3 octave frequency and statistical noise indices. The sound analysers were calibrated before and on completion of the survey using a Svantek SV-36 calibrator (s/n 79952). The instrumentation's calibration certificates are provided in Appendix C.



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 4.1

EMM
creating opportunities

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 the relevant noise criteria. This response plan is implemented if site noise levels are determined to be above the relevant noise criteria and when noise limits are 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 the relevant noise criteria 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. An additional monitoring test should be scheduled to be undertaken at the same location within one week and move on to the next monitoring location.
- If the follow up measurement indicates that site noise levels are below the relevant noise criteria and that noise limits are applicable, the consultant will record the result, note the site has passed, schedule an additional monitoring test to be undertaken at the location within one week and move on to the next monitoring location.

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 Appendix E2 of the INP (EPA 2000).

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 E1 of the INP (EPA 2000) 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: INP (EPA 2000).

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.

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, ie above 630 Hz). Attended monitoring was completed on 9 and 10 June 2022. Noise from Ashton Coal operations was audible during all three operator-attended noise surveys.

The 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 not applicable during all three measurements due to the presence of wind speeds greater than 3 m/s at the time of the measurements.

Low frequency noise is typically conservatively assessed by comparison of the total measured one-third octave L_{Aeq} noise levels to the NPfI one-third octave low-frequency noise thresholds, where site is audible.

Given that noise limits were not applicable during any of the three measurements due to relatively high wind speeds, LFN modifying factors were not applied to site or cumulative noise levels at any of the monitoring locations. Notwithstanding the preceding, it is noted that total measured noise levels exceeded the relevant LFN thresholds during one of the three measurements (at N3).

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 –June 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}	LFN mod. factor[1]	L_{Aeq}	L_{Amax}[2]	L_{Aeq}	L_{Amax}[2]			
N2	9/6	23:55	37	40	44	47	51	55	61	Nil	34	36	36	46	5.2 m/s @ 299° E class stability -0.1°C/100m VTG N	N/A	Ashton Coal mine hum consistently audible. Other mines in the vicinity (33 dB $L_{Aeq,15\ minute}$), insects, frogs and wind in foliage consistently audible. Traffic on the New England Highway frequently audible. Trains on the main line (unrelated to Ashton Coal) occasionally audible.
N3	10/6	00:15	38	41	50	48	53	76	62	Nil	33	36	36	46	6.1 m/s @ 296° E class stability 0.0°C/100m VTG N	N/A	Ashton Coal mine hum consistently audible. Other mines in the vicinity (34 dB $L_{Aeq,15\ minute}$), insects, frogs and wind in foliage consistently audible. Traffic on the New England Highway and dogs barking frequently audible. Trains on the main line (unrelated to Ashton Coal) and a traffic passby occasionally audible.
N4	10/6	00:20	33	35	39	41	46	65	62	Nil	<30	<30	36	46	6.1 m/s @ 296° E class stability 0.0°C/100m VTG N	N/A	Ashton Coal mine hum just audible. Other mines in the vicinity (34 dB $L_{Aeq,15\ minute}$) and traffic on the New England Highway consistently audible.

Notes:
1. Modifying factor correction for low frequency noise in accordance with Fact Sheet C of the NPfI (refer Section 3.3).
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. N/A = not applicable.

5.2 N2 - Camberwell Village (west)

Ashton Coal operations were consistently audible during the entire operator-attended noise survey including mine hum. The Ashton Coal mine noise contribution was estimated at up to 34 dB $L_{Aeq,15\ minute}$. Mine hum from site generated an estimated 36 dB L_{Amax}. Ashton Coal noise contributions would have complied with the DC and EPL noise limits, had they applied. Other ambient noise sources included other mines in the vicinity, insects, frogs, traffic on the New England Highway, wind in foliage and trains on the main line (unrelated to Ashton Coal). A graph of the total linear noise levels measured in each one-third octave frequency bands is shown in Figure 5.1.

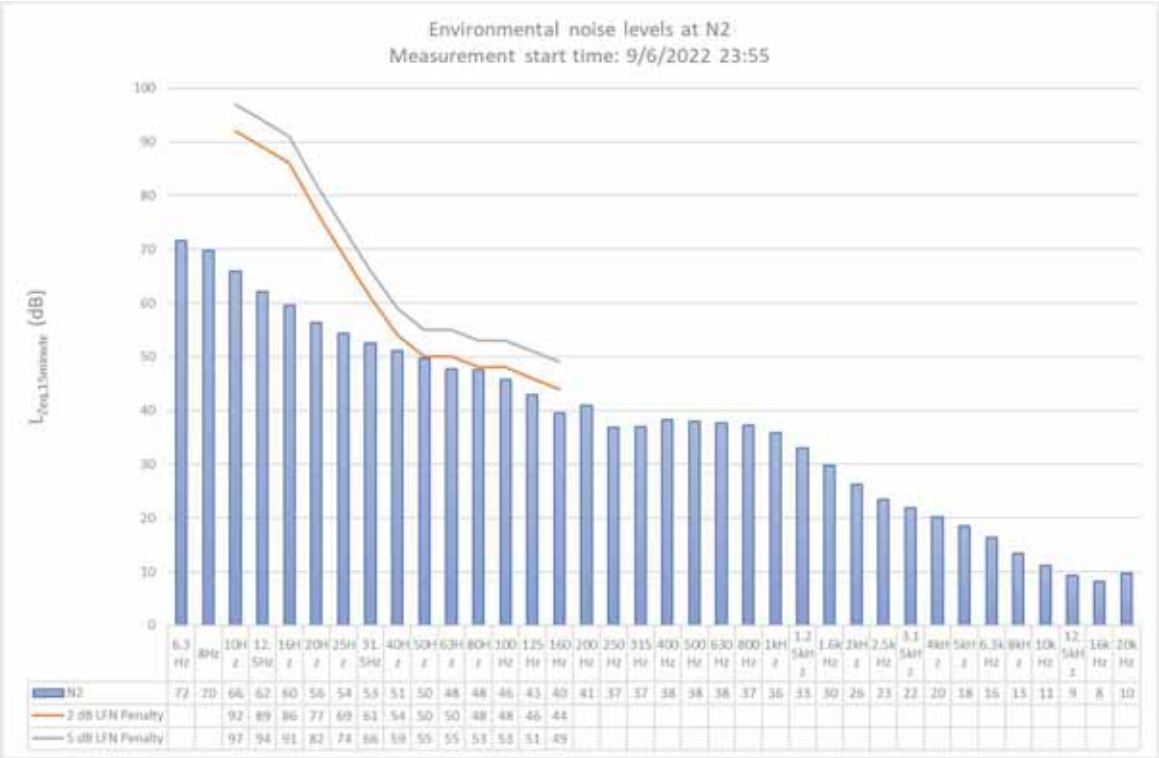


Figure 5.1 N2 total measured one-third octave band frequencies

Other mining operations in the vicinity were consistently audible during the operator-attended noise survey at monitoring location N2. The total cumulative mine noise contribution was estimated to be 34 dB $L_{Aeq,night}$ (ie Ashton Coal mine noise of 34 dB $L_{Aeq,15\ minute}$ + Other mine noise of 33 dB $L_{Aeq,15\ minute}$ - 3 dB). This is below the cumulative mine noise night-time criterion (ie $L_{Aeq,night}$ 40 dB). Therefore, the total cumulative mine $L_{Aeq,night}$ noise contribution was below the cumulative mine noise criterion.

5.3 N3 - Camberwell Village (north east)

Ashton Coal operations were consistently audible during the entire operator-attended noise survey including mine hum. The Ashton Coal mine noise contribution was estimated at up to 33 dB $L_{Aeq,15\ minute}$. Mine hum from site generated an estimated 36 dB L_{Amax}. Ashton Coal noise contributions would have complied with the DC and EPL noise limits, had they applied. Other ambient noise sources included other mines in the vicinity, insects, frogs, traffic on the New England Highway, wind in foliage, dogs barking, a traffic passby and trains on the main line (unrelated to Ashton Coal). A graph of the total linear noise levels measured in the one-third octave frequency bands is shown in Figure 5.2.

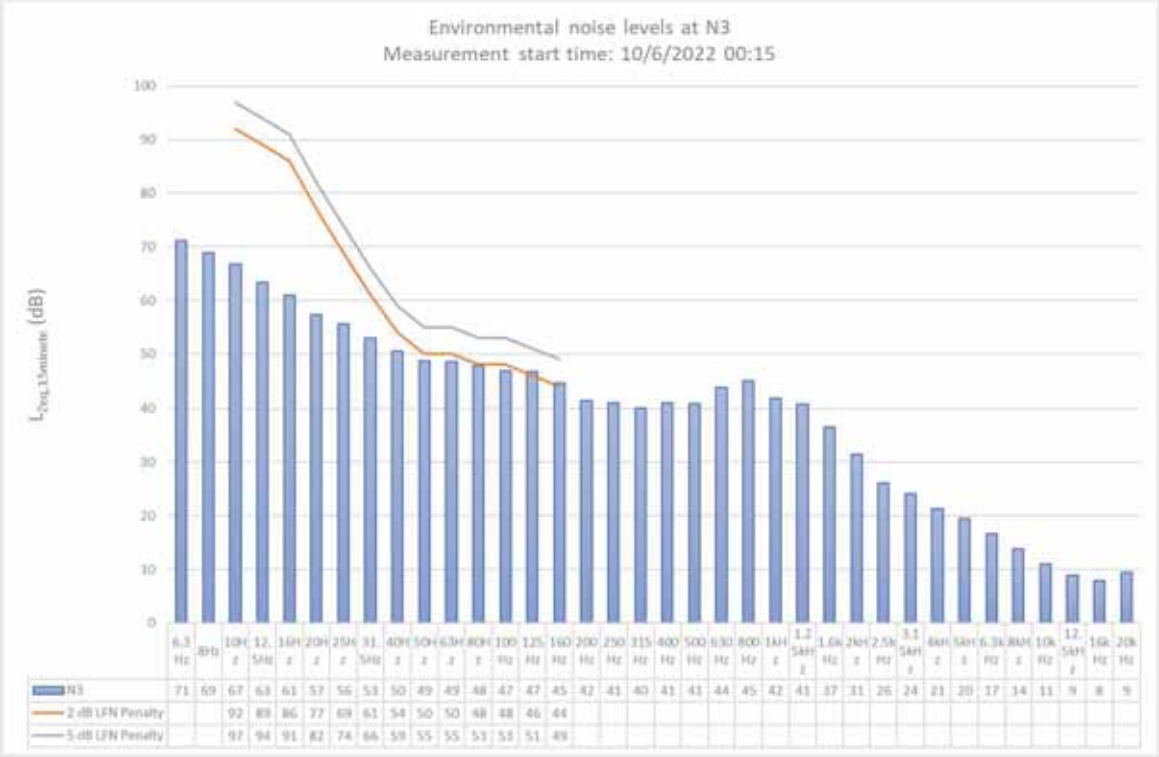


Figure 5.2 N3 total measured one-third octave band frequencies

Other mining operations in the vicinity were consistently audible during the operator-attended noise survey at monitoring location N3. The total cumulative mine noise contribution was estimated to be 33 dB $L_{Aeq,night}$ (ie Ashton Coal mine noise of 33 dB $L_{Aeq,15\ minute}$ + Other mine noise of 33 dB $L_{Aeq,15\ minute}$ - 3 dB). This is below the cumulative mine noise night-time criterion (ie $L_{Aeq,night}$ 40 dB). Therefore, the total cumulative mine $L_{Aeq,night}$ noise contribution was below the cumulative mine noise criterion.

5.4 N4 - South of New England Highway

Ashton Coal operations were just audible during the entire operator-attended noise survey including mine hum. The Ashton Coal mine noise contribution was estimated at up to <30 dB $L_{Aeq,15\ minute}$. Mine hum from site generated an estimated <30 dB L_{Amax}. Ashton Coal noise contributions would have complied with the DC and EPL noise limits, had they applied. Other ambient noise sources included other mines in the vicinity and traffic on the New England Highway. A graph of the total linear noise levels measured in one-third octave frequency bands is shown below in Figure 5.3.

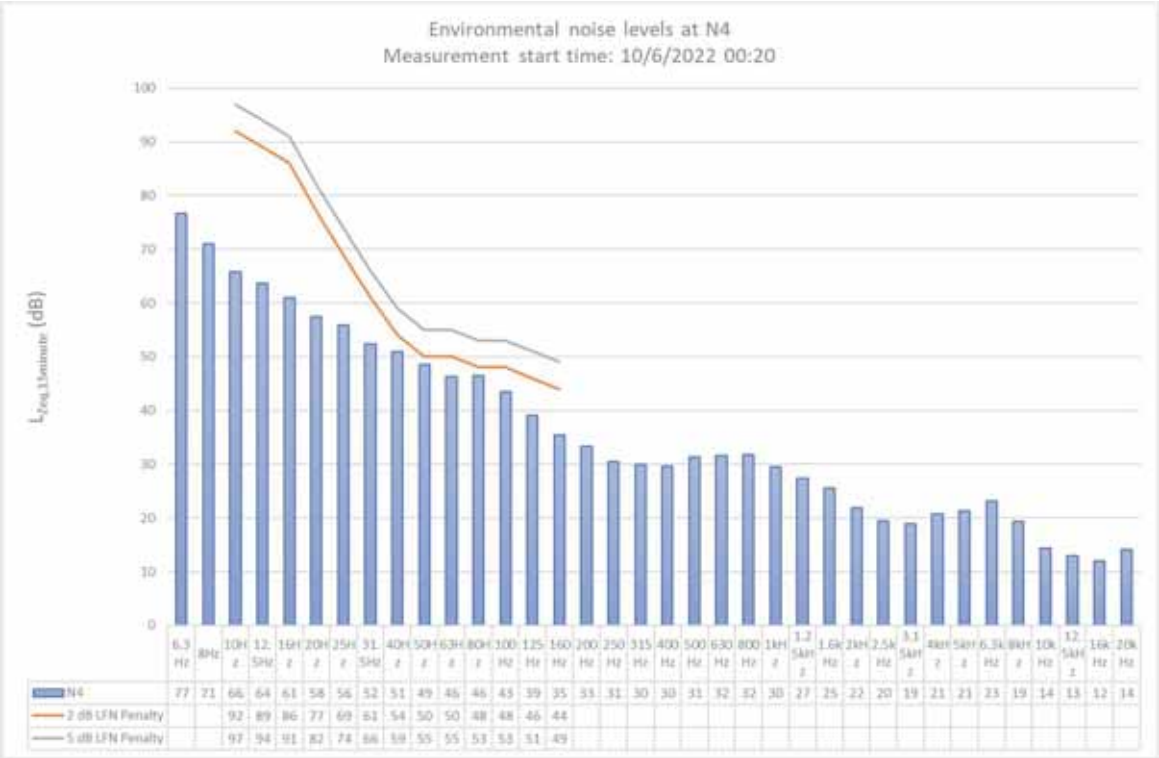


Figure 5.3 N4 total measured one-third octave band frequencies

Other mining operations in the vicinity were consistently audible during the operator-attended noise survey at monitoring location N4. The total cumulative mine noise contribution was estimated to be <31 dB $L_{Aeq,night}$ (ie Ashton Coal mine noise of <30 dB $L_{Aeq,15\ minute}$ + other mine noise of 34 dB $L_{Aeq,15\ minute}$ - 3 dB as per NPfI methodology). This is below the cumulative mine noise night-time criterion (ie $L_{Aeq,night}$ 40 dB). Therefore, the total cumulative mine $L_{Aeq,night}$ noise contribution was below the cumulative mine noise criterion.

6 Conclusion

EMM has completed a review of mine noise from Ashton Coal within the surrounding community based on attended measurements conducted on 9 and 10 June 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 the site. Noise limits were found to be not applicable during all three measurements due to the presence of wind speeds greater than 3 m/s at the time of the measurements.

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

Ashton Coal noise contributions and cumulative mine noise contributions were at or below (satisfied) the relevant noise limits at all monitoring locations for 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 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 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 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 shall 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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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

Appendix C
Calibration certificates

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C30591

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	94.12 dB	999.99 Hz	1.58 %
Level2:	NA	N	114.05 dB	999.99 Hz	1.12 %
Uncertainty			±0.11 dB	±0.05%	±0.20 %
Uncertainty (at 95% c.l.) k=2					

CONDITION OF TEST:

Ambient Pressure	1007	hPa ±1 hPa	**Date of Receipt :**	16/09/2021
Temperature	21	°C ±1° C	**Date of Calibration :**	16/09/2021
Relative Humidity	43	% ±5%	**Date of Issue :**	16/09/2021

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

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

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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HBK HOTTINGER BRÜEL & KJÆR
The Calibration Laboratory
Skodsborgvej 307, DK-2850 Nærum, Denmark

ilac-MRA DANAK
CAL Reg.No. 307
Member of EA MLA

CERTIFICATE OF CALIBRATION

No: CDK2007931 Page 1 of 12

CALIBRATION OF

Sound Level Meter:	Brüel & Kjær Type 2250	No: 3029363	Id: -
Microphone:	Brüel & Kjær Type 4189	No: 3260501	
PreAmplifier:	Brüel & Kjær Type ZC-0032	No: 30109	
Supplied Calibrator:	None		
Software version:	BZ7222 Version 4.7.6	Pattern Approval:	-
Instruction manual:	BE1712-22		

CUSTOMER

EMM Consulting
Ground Floor, Suite 1
20 Chandos Street
2065 St Leonards
New South Wales, Australia

CALIBRATION CONDITIONS

Preconditioning: 4 hours at 23°C ± 3°C
Environment conditions: *See actual values in sections.*

SPECIFICATIONS

The Sound Level Meter Brüel & Kjær Type 2250 has been calibrated in accordance with the requirements as specified in IEC 61672-1:2013 class 1. Procedures from IEC 61672-3:2013 were used to perform the periodic tests. The accreditation assures the traceability to the international units system SI.

PROCEDURE

The measurements have been performed with the assistance of Brüel & Kjær Sound Level Meter Calibration System 3630 with application software type 7763 (version 8.2 - DB: 8.20) by using procedure B&K proc 2250, 4189 (IEC 61672:2013).

RESULTS

Calibration Mode: **Calibration as received.**

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ providing a level of confidence of approximately 95 %. The uncertainty evaluation has been carried out in accordance with EA-4/02 from elements originating from the standards, calibration method, effect of environmental conditions and any short time contribution from the device under calibration.

Date of calibration: 2020-11-26

Date of issue: 2020-11-26

Lene Petersen
Calibration Technician

Erik Bruus
Approved Signatory

Certificate Of Calibration

Certificate No: SLM31670

Equipment Tested: Sound Level Meter

Manufacturer:	B & K	**Serial No:**	2759405
Type No:	2250	**Serial No:**	2983733
Mic. Type:	4189	**Serial No:**	22666
Pre-Amp. Type:	ZC0032		
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.

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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Appendix G

Monthly attended noise monitoring report – July 2022

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Ashton Coal

Monthly attended noise monitoring - July 2022

Prepared for Ashton Coal Operations Pty Ltd

August 2022

Ashton Coal

Monthly attended noise monitoring - July 2022

Ashton Coal Operations Pty Ltd

E211129 RP#7

August 2022

Version	Date	Prepared by	Approved by	Comments
1	4 August 2022	Lucas Adamson	Katie Teyhan	

Approved by

Katie Teyhan
Associate
4 August 2022

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 purpose of the monitoring was to address requirements of the approved Ashton Coal Noise Management Plan (NMP), prepared to satisfy the requirements of the 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 July 2022.

The following material was referenced as part of this assessment:

- Department of Planning, Industry and Environment (DPIE), Development Consent 309-11-2001-I, as modified on 6 July 2022 (current as of 12 July 2022);
- Environment Protection Authority (EPA), Environment Protection License 11879, as varied on 3 February 2020 (current as of 12 July 2022);
- Ashton Coal Project Noise Management Plan (NMP), approved by DPIE on 23 September 2020 (current as of 12 July 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 what an average person perceives about 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

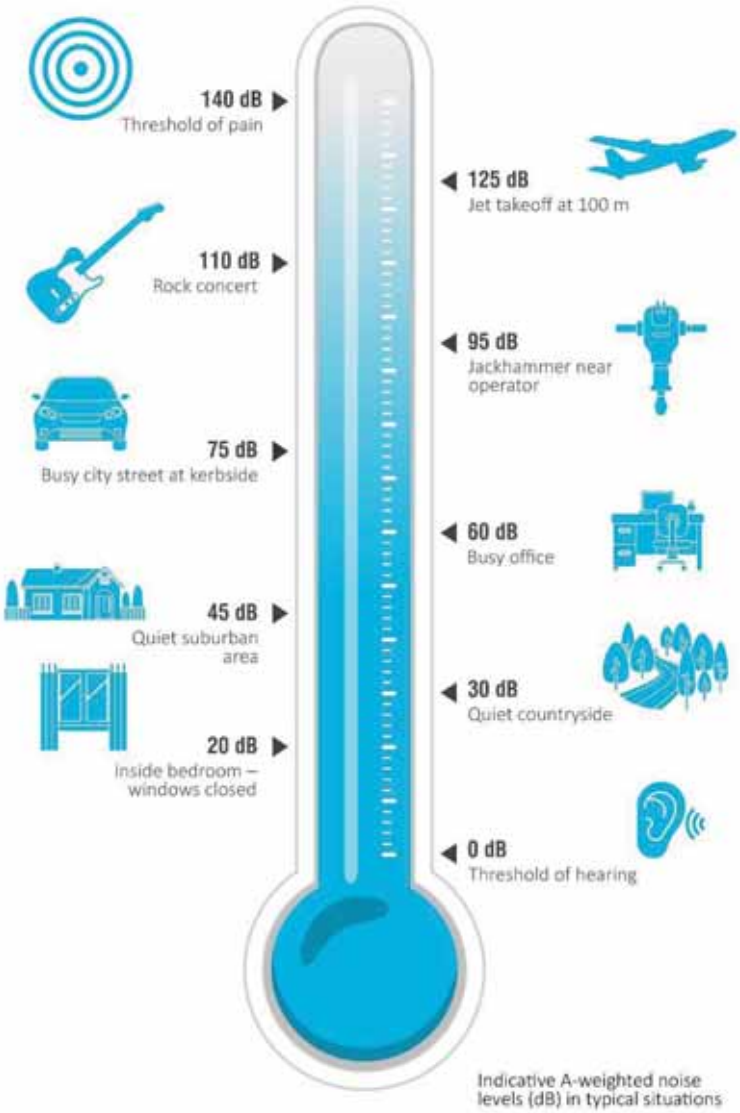


Figure 2.1 Common noise levels

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 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/100m.

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 (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 factors.

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 ion 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 Low frequency noise criteria

Condition 3 of Appendix 8 of the DC states that noise generated by Ashton Coal is to be measured in accordance with the relevant requirements of the INP. The INP application notes state that Section 4 of the INP has been withdrawn and the modifying factor adjustments outlined in Fact Sheet C of the NPfI are to be used when assessing the characteristics of a noise source.

Fact sheet C of the NPfI (EPA 2017) provides guidelines for applying modifying factor corrections to account for low frequency noise emissions. The NPfI specifies that a difference of 15 dB or more between site 'C-weighted' and site 'A-weighted' noise emission levels identifies the potential for an unbalanced spectrum and potential increased annoyance.

Where a difference of 15 dB or more between site 'C-weighted' and site 'A-weighted' noise emission levels is identified, the one-third octave noise levels recorded should be compared to the values in Table C2 of the NPfI (EPA 2017), which has been reproduced in Table 3.2 below.

Table 3.2 One-third octave low-frequency noise thresholds

	One-third octave $L_{Zeq,15\ minute}$ threshold level												
Frequency (Hz)	**10**	**12.5**	**16**	**20**	**25**	**31.5**	**40**	**50**	**63**	**80**	**100**	**125**	**160**
dB (Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

The following modifying factor correction is to be applied where the site 'C-weighted' and site 'A-weighted' noise emission level is 15 dB or more and:

- where any of the one-third octave noise levels in Table 3.2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2 dB positive adjustment to measured/predicted A-weighted levels applies for the evening/night period; or
- where any of the one-third octave noise levels in Table 3.2 are exceeded by more than 5 dB and cannot be mitigated, a 5 dB positive adjustment to measured/predicted A-weighted levels applies for the evening/night period.

Hence, where relevant throughout each survey the operator has estimated the difference between site 'C-weighted' and site 'A-weighted' noise emission levels by matching audible sounds with the response of the analyser (L_{Ceq}-L_{Aeq}). Where this was deemed to be 15 dB or greater, the measured one-third octave frequencies have been compared to the values in Table 3.2 to identify the relevant modifying factor correction (if applicable). This method has been applied to this assessment as presented in Section 5.

It is of note that the NPfI (EPA 2017) states that low-frequency noise corrections only apply under the standard or noise-enhancing meteorological conditions.

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

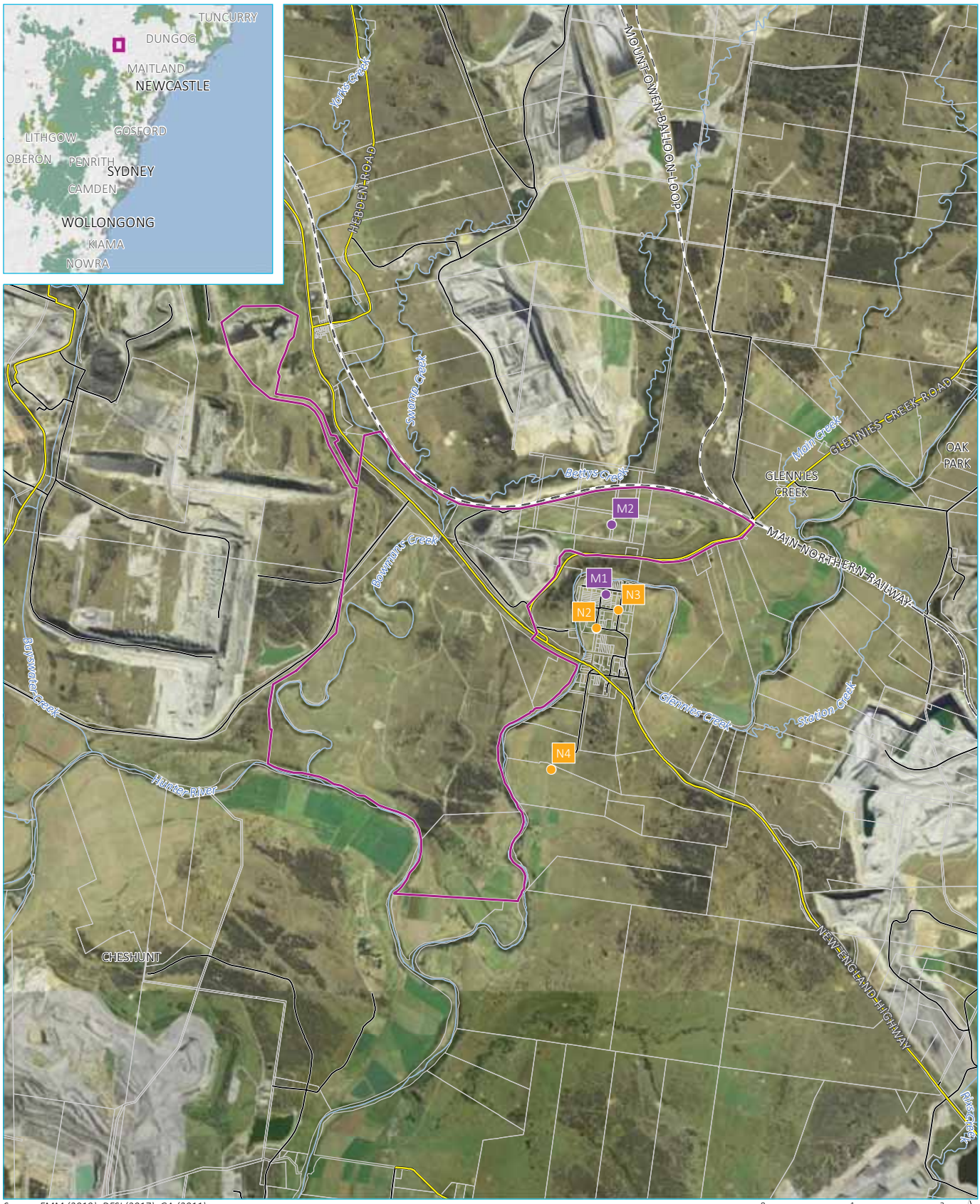
Monitoring location	Description	MGA56	
		Easting	Northing
N2	Camberwell Village (west)	320297	6405670
N3	Camberwell Village (north east)	320554	6405839
N4	South of New England Highway	319776	6404101

Attended noise monitoring is scheduled to be "unannounced" and, to EMM's knowledge, Ashton Coal were not aware of the monitoring prior to its commencing. 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 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 79952). The instrumentation's calibration certificates are provided in **Error! Reference source not found.**.



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 4.1

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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 the relevant noise criteria. This response plan is implemented if site noise levels are determined to be above the relevant noise criteria and when noise limits are 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 the relevant noise criteria 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. An additional monitoring test should be scheduled to be undertaken at the same location within one week and move on to the next monitoring location.
- If the follow up measurement indicates that site noise levels are below the relevant noise criteria and that noise limits are applicable, the consultant will record the result, note the site has passed, schedule an additional monitoring test to be undertaken at the location within one week and move on to the next monitoring location.

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 Appendix E2 of the INP (EPA 2000).

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 E1 of the INP (EPA 2000) 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: INP (EPA 2000).

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.

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, ie above 630 Hz). Attended monitoring was completed on 12 July 2022. Noise from Ashton Coal operations was audible during all three operator-attended noise surveys.

The 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.

Low frequency noise was initially conservatively assessed by comparison of the total measured one-third octave L_{Aeq} noise levels to the NPfI one-third octave low-frequency noise thresholds. Total measured LFN levels did not exceed the relevant LFN thresholds at locations N3 and N4. However, LFN thresholds were exceeded during the measurement at N2 and therefore a more detailed analysis of overall mining noise contributions was conducted. The survey was reviewed for periods with low levels of extraneous noise (such as traffic and other mines in the area) as to determine and assess the Ashton Coal low-frequency noise contributions toward the LFN thresholds. It was determined that the relevant LFN thresholds would not have been exceeded solely by noise emissions from Ashton Coal due to the following:

- the relative contribution of Ashton Coal;
- the relative contribution of other mines in the area;
- the relative contribution from traffic on the New England Highway; and
- onsite operations were consistent for all measurements (ie fixed and mobile plant activities).

Therefore, in accordance with the NPfI, LFN modifying factors were not applied to estimated site noise levels at any of the locations.

Ashton Coal noise contributions and cumulative mine noise contributions were at or below (ie complied with) the relevant noise limits at all monitoring locations.

Table 5.1 Ashton Coal attended noise monitoring results –July 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}	LFN mod. factor[1]	L_{Aeq}	L_{Amax}[2]	L_{Aeq}	L_{Amax}[2]			
N2	12/7	22:07	37	40	46	49	56	61	61	Nil	36	45	36	46	1.1 m/s @ 336° E class stability 0.7°C/100m VTG Y	Nil	Ashton Coal mine hum consistently audible, with engine revs audible on occasion. Other mines in the vicinity (36 dB $L_{Aeq,15\ minute}$), traffic on the New England Highway, insects and frogs consistently audible.
N3	12/7	22:26	35	37	39	42	45	49	57	Nil	34	42	36	46	0.9 m/s @ 356° E class stability 0.7°C/100m VTG Y	Nil	Ashton Coal mine hum consistently audible, with engine revs audible on occasion. Other mines in the vicinity (34 dB $L_{Aeq,15\ minute}$), insects and frogs consistently audible. Traffic on the New England Highway frequently audible.
N4	12/7	22:47	31	33	40	43	47	68	58	Nil	28	34	36	46	1.5 m/s @ 310° E class stability 0.5°C/100m VTG Y	Nil	Ashton Coal mine hum frequently audible, with engine revs occasionally audible. Insects and frogs consistently audible. Other mines in the vicinity (29 dB $L_{Aeq,15\ minute}$) and traffic on the New England Highway frequently audible. Dogs barking in the distance occasionally audible.

Notes:
1. Modifying factor correction for low frequency noise in accordance with Fact Sheet C of the NPfI (refer Section 3.3).
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. N/A = not applicable.

5.2 N2 - Camberwell Village (west)

Ashton Coal operations were consistently audible during the entire operator-attended noise survey including mine hum and engine revs. The Ashton Coal mine noise contribution was estimated at up to 36 dB $L_{Aeq,15\ minute}$. Engine revs generated an estimated 45 dB L_{Amax}. Ashton Coal noise contributions complied with the DC and EPL noise limits. Other ambient noise sources included other mines in the vicinity, insects, frogs and traffic on the New England Highway. A graph of the total linear noise levels measured in each one-third octave frequency bands is shown in Figure 5.1.

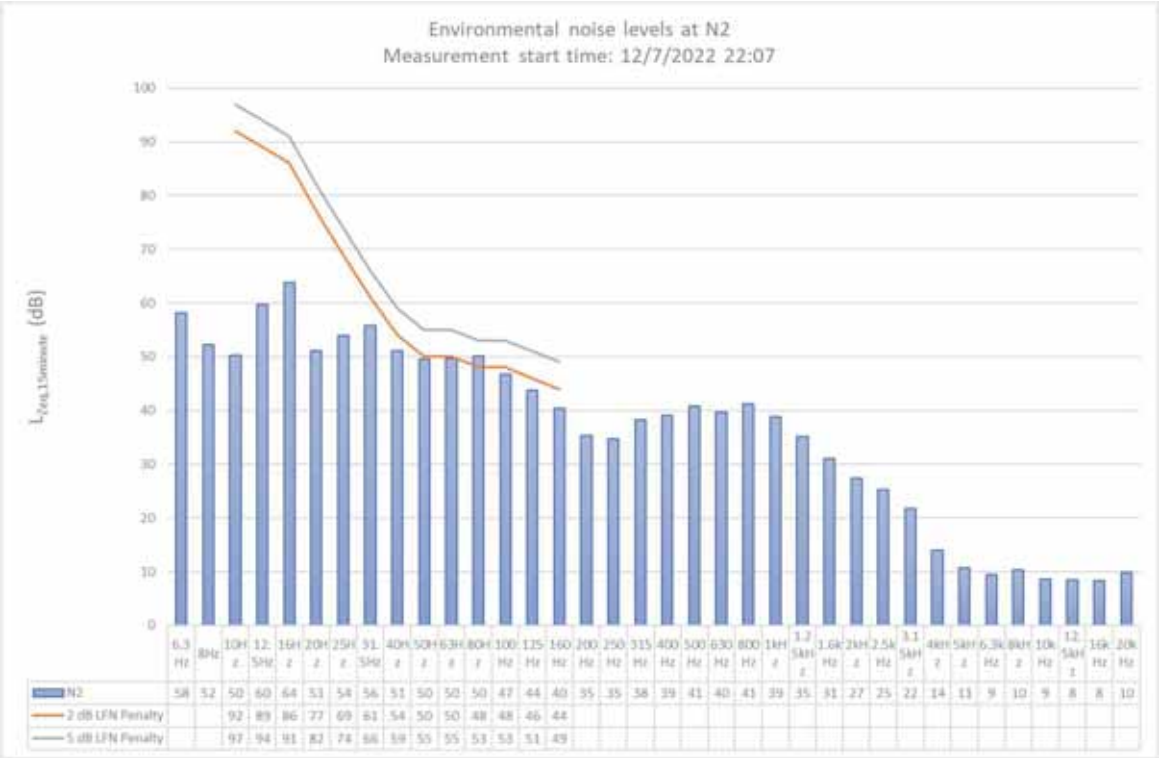

Figure 5.1 N2 total measured one-third octave band frequencies

Other mining operations in the vicinity were consistently audible during the operator-attended noise survey at monitoring location N2. The total cumulative mine noise contribution was estimated to be 36 dB $L_{Aeq,night}$ (ie Ashton Coal mine noise of 36 dB $L_{Aeq,15\ minute}$ + Other mine noise of 36 dB $L_{Aeq,15\ minute}$ - 3 dB). This is below the cumulative mine noise night-time criterion (ie $L_{Aeq,night}$ 40 dB). Therefore, the total cumulative mine $L_{Aeq,night}$ noise contribution was below the cumulative mine noise criterion.

5.3 N3 - Camberwell Village (north east)

Ashton Coal operations were consistently audible during the entire operator-attended noise survey including mine hum and engine revs. The Ashton Coal mine noise contribution was estimated at up to 34 dB $L_{Aeq,15\ minute}$. Engine revs from site generated an estimated 42 dB L_{Amax}. Ashton Coal noise contributions complied with the DC and EPL noise limits. Other ambient noise sources included other mines in the vicinity, insects, frogs, and traffic on the New England Highway. A graph of the total linear noise levels measured in the one-third octave frequency bands is shown in Figure 5.2.

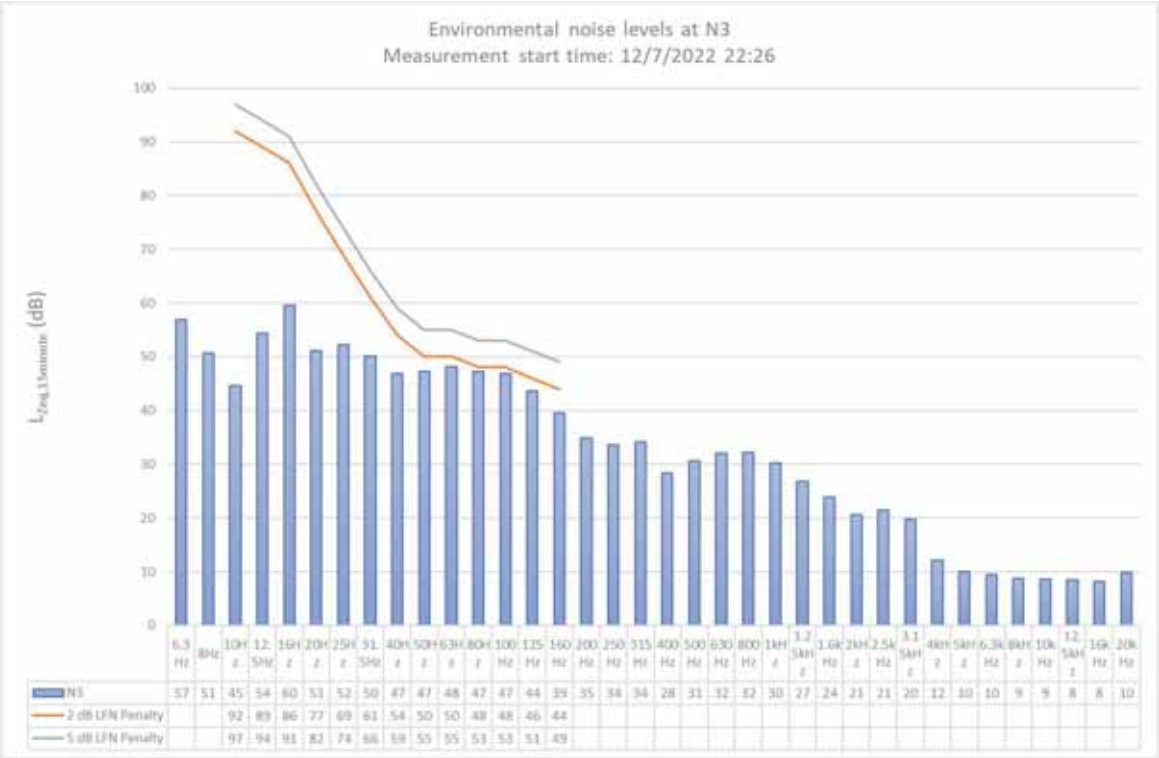

Figure 5.2 N3 total measured one-third octave band frequencies

Other mining operations in the vicinity were consistently audible during the operator-attended noise survey at monitoring location N3. The total cumulative mine noise contribution was estimated to be 34 dB $L_{Aeq,night}$ (ie Ashton Coal mine noise of 34 dB $L_{Aeq,15\ minute}$ + Other mine noise of 34 dB $L_{Aeq,15\ minute}$ - 3 dB). This is below the cumulative mine noise night-time criterion (ie $L_{Aeq,night}$ 40 dB). Therefore, the total cumulative mine $L_{Aeq,night}$ noise contribution was below the cumulative mine noise criterion.

5.4 N4 - South of New England Highway

Ashton Coal operations were frequently audible during the entire operator-attended noise survey including mine hum and engine revs. The Ashton Coal mine noise contribution was estimated at up to 28dB $L_{Aeq,15\ minute}$. Engine revs from site generated an estimated 34dB L_{Amax}. Ashton Coal noise contributions complied with the DC and EPL noise limits. Other ambient noise sources included insects and frogs, other mines in the vicinity, traffic on the New England Highway and dogs barking. A graph of the total linear noise levels measured in one-third octave frequency bands is shown below in Figure 5.3.

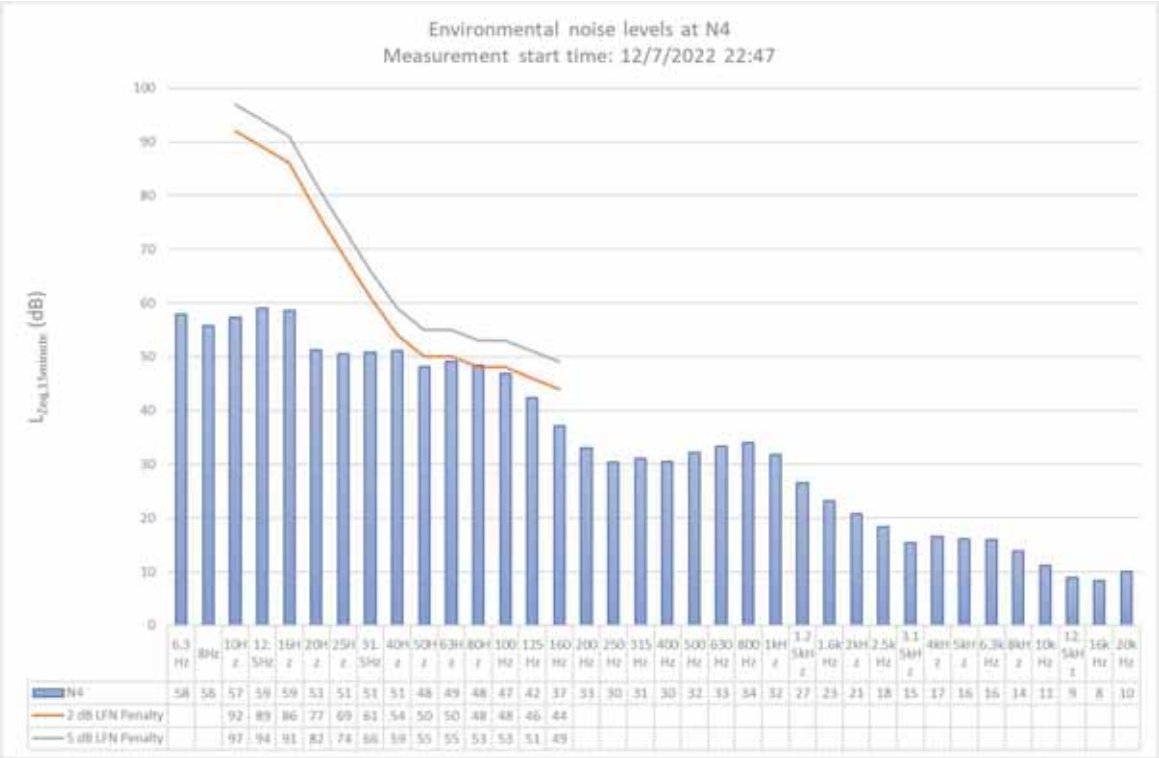

Figure 5.3 N4 total measured one-third octave band frequencies

Other mining operations in the vicinity were frequently audible during the operator-attended noise survey at monitoring location N4. The total cumulative mine noise contribution was estimated to be 29 dB $L_{Aeq,night}$ (ie Ashton Coal mine noise of 28 dB $L_{Aeq,15\ minute}$ + other mine noise of 30 dB $L_{Aeq,15\ minute}$ - 3 dB as per NPfI methodology). This is below the cumulative mine noise night-time criterion (ie $L_{Aeq,night}$ 40 dB). Therefore, the total cumulative mine $L_{Aeq,night}$ noise contribution was below the cumulative mine noise criterion.

6 Conclusion

EMM has completed a review of mine noise from Ashton Coal within the surrounding community based on attended measurements conducted on 12 July 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 the site. Noise limits were found to be applicable during all three measurements.

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

Ashton Coal noise contributions and cumulative mine noise contributions were at or below (satisfied) the relevant noise limits at all monitoring locations for 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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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

Appendix C
Calibration certificates

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C30591

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	94.12 dB	999.99 Hz	1.58 %
Level2:	NA	N	114.05 dB	999.99 Hz	1.12 %
Uncertainty			±0.11 dB	±0.05%	±0.20 %
Uncertainty (at 95% c.l.) k=2					

CONDITION OF TEST:

Ambient Pressure	1007	hPa ±1 hPa	**Date of Receipt :**	16/09/2021
Temperature	21	°C ±1° C	**Date of Calibration :**	16/09/2021
Relative Humidity	43	% ±5%	**Date of Issue :**	16/09/2021

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

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

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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The Calibration Laboratory
Skodsborgvej 307, DK-2850 Nærum, Denmark

ilac-MRA DANAK
CAL Reg.No. 307
Member of EA MLA

CERTIFICATE OF CALIBRATION

No: CDK2007931 Page 1 of 12

CALIBRATION OF

Sound Level Meter:	Brüel & Kjær Type 2250	No: 3029363	Id: -
Microphone:	Brüel & Kjær Type 4189	No: 3260501	
PreAmplifier:	Brüel & Kjær Type ZC-0032	No: 30109	
Supplied Calibrator:	None		
Software version:	BZ7222 Version 4.7.6	Pattern Approval:	-
Instruction manual:	BE1712-22		

CUSTOMER

EMM Consulting
Ground Floor, Suite 1
20 Chandos Street
2065 St Leonards
New South Wales, Australia

CALIBRATION CONDITIONS

Preconditioning: 4 hours at 23°C ± 3°C
Environment conditions: *See actual values in sections.*

SPECIFICATIONS

The Sound Level Meter Brüel & Kjær Type 2250 has been calibrated in accordance with the requirements as specified in IEC 61672-1:2013 class 1. Procedures from IEC 61672-3:2013 were used to perform the periodic tests. The accreditation assures the traceability to the international units system SI.

PROCEDURE

The measurements have been performed with the assistance of Brüel & Kjær Sound Level Meter Calibration System 3630 with application software type 7763 (version 8.2 - DB: 8.20) by using procedure B&K proc 2250, 4189 (IEC 61672:2013).

RESULTS

Calibration Mode: **Calibration as received.**

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ providing a level of confidence of approximately 95 %. The uncertainty evaluation has been carried out in accordance with EA-4/02 from elements originating from the standards, calibration method, effect of environmental conditions and any short time contribution from the device under calibration.

Date of calibration: 2020-11-26

Date of issue: 2020-11-26

Lene Petersen
Calibration Technician

Erik Bruus
Approved Signatory

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Appendix H

Monthly attended noise monitoring report – August 2022

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Ashton Coal

Monthly attended noise monitoring - August 2022

Prepared for Ashton Coal Operations Pty Ltd

September 2022

Ashton Coal

Monthly attended noise monitoring - August 2022

Ashton Coal Operations Pty Ltd

E211129 RP#8

September 2022

Version	Date	Prepared by	Approved by	Comments
1	21 September 2022	Harry Flick/Lucas Adamson	Tony Welbourne	

Approved by

Tony Welbourne
Associate Director
21 September 2022

Level 3 175 Scott Street
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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 29 August 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 29 August 2022);
- Environment Protection Authority (EPA), Environment Protection Licence 11879, as varied on 3 February 2020 (current as of 29 August 2022);
- Ashton Coal Project Noise Management Plan (NMP), approved by DPE on 23 September 2020 (current as of 29 August 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

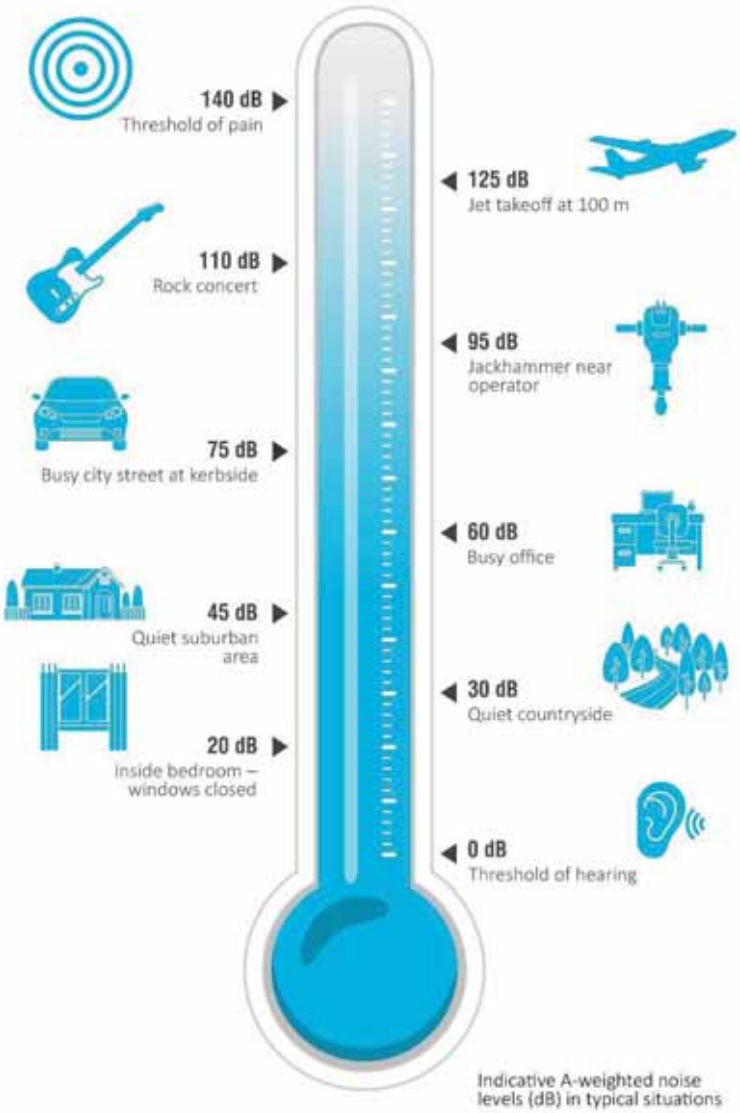


Figure 2.1 Common noise levels

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 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/100m.

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 (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 ion 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 has 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

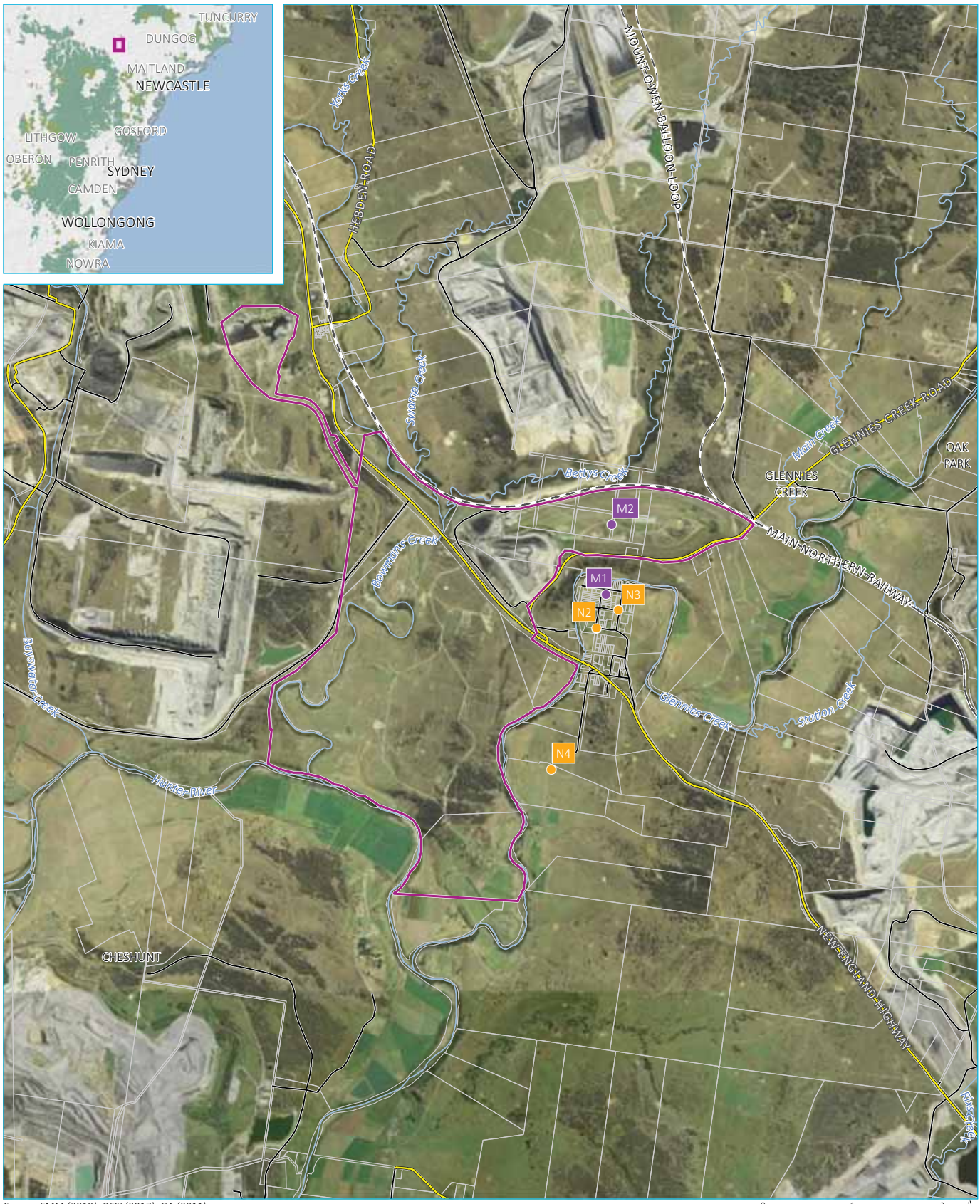
Monitoring location	Description	MGA56	
		Easting	Northing
N2	Camberwell Village (west)	320297	6405670
N3	Camberwell Village (north-east)	320554	6405839
N4	South of New England Highway	319776	6404101

Attended noise monitoring is scheduled to be "unannounced" and, to EMM's knowledge, Ashton Coal were not aware of the monitoring prior to its commencing. 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 filtering).

4.2 Instrumentation

A Brüel & Kjær 2250 Type 1 sound analyser (s/n 2759405) 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.



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

0 1 2 km

GDA 1994 MGA Zone 56

N

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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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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 Appendix E2 of the INP (EPA 2000).

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 E1 of the INP (EPA 2000) 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: INP (EPA 2000).

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.

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 29 August 2022. Noise from Ashton Coal operations was audible during all three 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 not to be applicable during one of the three measurements due to temperature inversion conditions greater than 3°C/100m.

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 at or below (ie complied with) the relevant noise limits at all monitoring locations.

Table 5.1 Ashton Coal attended noise monitoring results –August 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	29/8	22:27	40	43	48	51	55	66	64	Nil	<35	38	36	46	0.8 m/s @ 294° F class stability 3.0°C/100m VTG Y	Nil	Ashton Coal mine hum consistently audible, with engine revs audible on occasion. Other mines in the vicinity (37 dB $L_{Aeq,15\ minute}$), traffic on the New England Highway, insects and frogs consistently audible. Trains on the main line (unrelated to Ashton) frequently audible. Dogs barking and noise from livestock occasionally audible.
N3	29/8	22:47	40	42	44	46	49	67	63	Nil	<33	36	36	46	1.5 m/s @ 29° F class stability 3.4°C/100m VTG N	N/A	Ashton Coal mine hum consistently audible, with engine revs audible on occasion. Other mines in the vicinity (39 dB $L_{Aeq,15\ minute}$), insects and frogs consistently audible. Traffic on the New England Highway frequently audible. Dogs barking occasionally audible.
N4	29/8	23:09	38	41	46	48	53	64	61	Nil	<34	38	36	46	1.6 m/s @ 28° E class stability 2.9°C/100m VTG Y	Nil	Ashton Coal mine hum consistently audible, with engine revs occasionally audible. Other mines in the vicinity (36 dB $L_{Aeq,15\ minute}$), traffic on the New England Highway, insects and frogs consistently audible. A car passby briefly audible for one minute.

Notes:
1. Modifying factor correction for low frequency, tonal or intermittent noise in accordance with Fact Sheet C of the NPfI (refer Section 3.3).
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. N/A = not applicable.

5.2 N2 - Camberwell Village (west)

Ashton Coal operations were audible during the entire measurement, consisting of mine hum and engine revs. Ashton Coal mine noise was estimated as less than 35 dB $L_{Aeq,15\ minute}$ with engine revs responsible for the estimated 38 dB L_{Amax}. Ashton Coal noise complied with DC and EPL noise limits.

Other noise sources included other mines in the vicinity, insects, frogs, traffic on the New England Highway, trains, dogs barking, and nearby livestock. A graph of the total noise levels measured in each one-third octave frequency bands is shown in Figure 5.1.

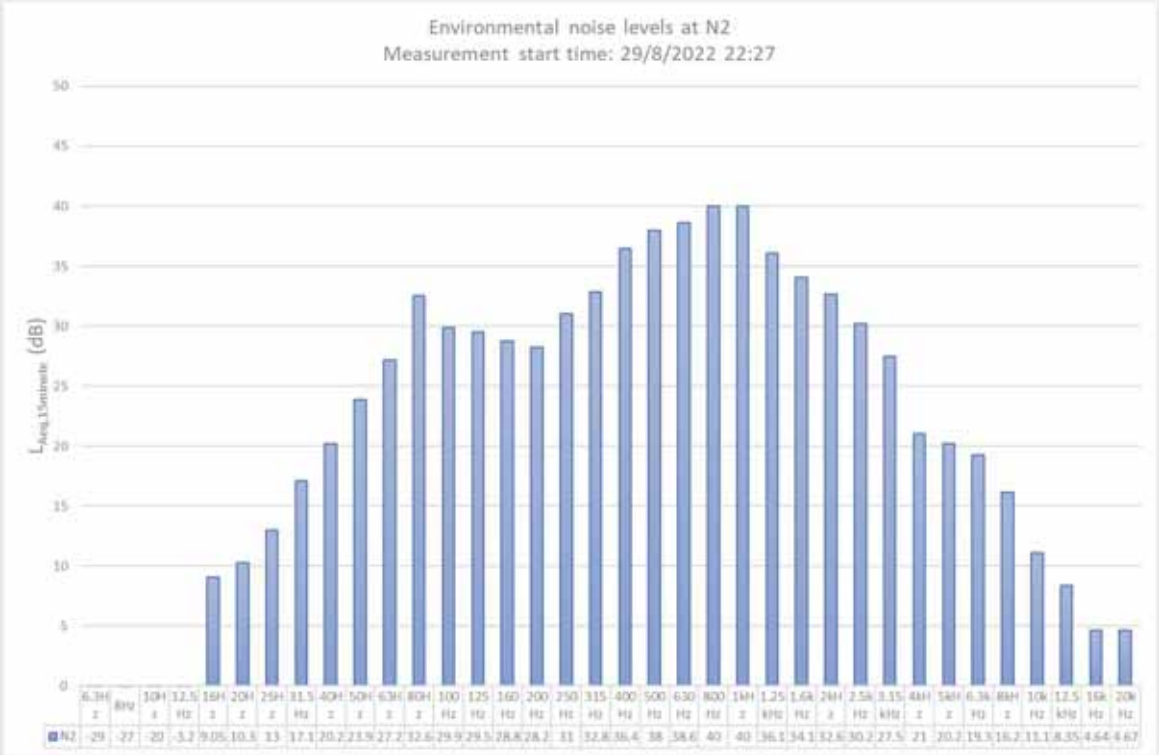

Figure 5.1 N2 total measured one-third octave band frequencies

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 36 dB $L_{Aeq,night}$ (ie Ashton Coal mine noise less than 35 dB $L_{Aeq,15\ minute}$ plus other mine noise of 37 dB $L_{Aeq,15\ minute}$ less 3 dB as per NPfI methodology) which is below the relevant 40 dB $L_{Aeq,night}$ criterion.

5.3 N3 - Camberwell Village (north-east)

Ashton Coal operations were audible during the entire measurement, consisting of mine hum and engine revs. Ashton Coal mine noise was estimated less than 33 dB $L_{Aeq,15\ minute}$. Engine revs from site generated the estimated 36 dB L_{Amax}. Ashton Coal noise complied with DC and EPL noise limits.

Other noise sources included other mines in the vicinity, insects, frogs, traffic on the New England Highway, and dogs barking. A graph of the total noise levels measured in the one-third octave frequency bands is shown in Figure 5.2.

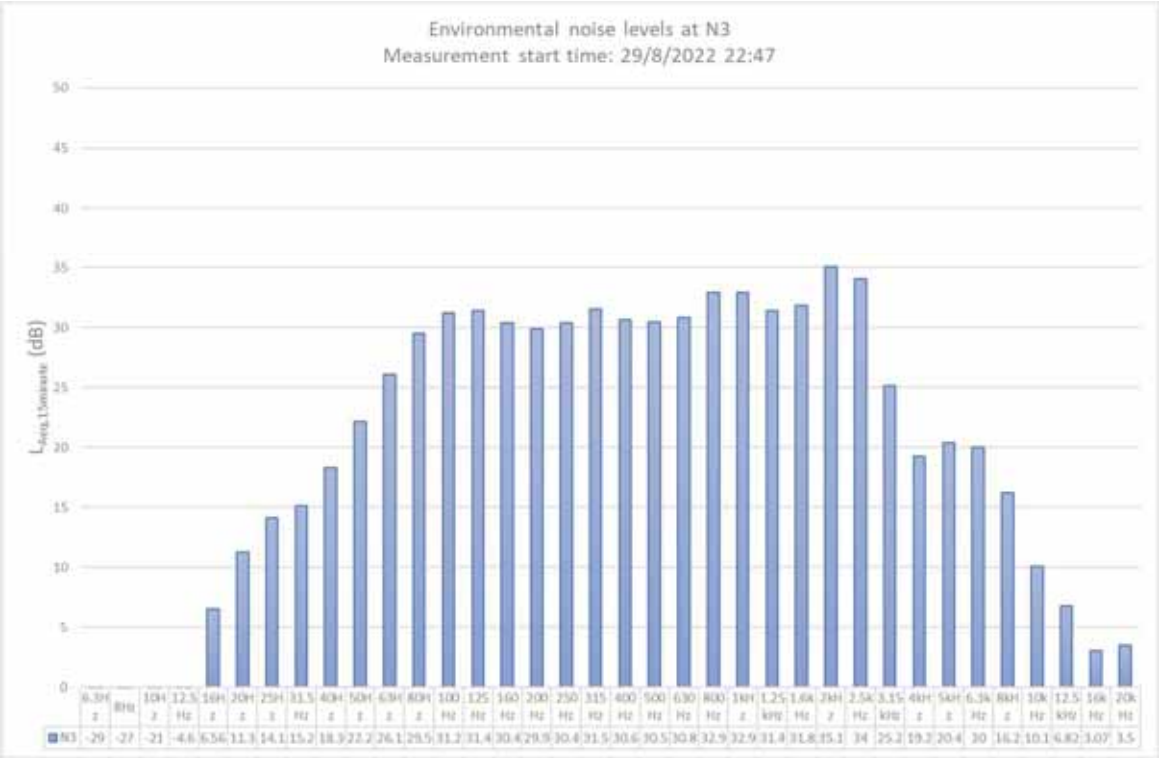

Figure 5.2 N3 total measured one-third octave band frequencies

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 37 dB $L_{Aeq,night}$ (ie Ashton Coal mine noise of less than 33 dB $L_{Aeq,15\ minute}$ plus other mine noise of 39 dB $L_{Aeq,15\ minute}$ less 3 dB as per NPfI methodology) which is below the relevant 40 dB $L_{Aeq,night}$ criterion.

5.4 N4 - South of New England Highway

Ashton Coal operations were audible during the entire measurement, consisting of mine hum and engine revs. Ashton Coal mine noise was estimated as less than 34 dB $L_{Aeq,15\ minute}$. Engine revs from site generated the estimated 38 dB L_{Amax}. Ashton Coal noise complied with the DC and EPL noise limits.

Other noise sources included insects and frogs, other mines in the vicinity, traffic on the New England Highway and a local traffic passby. A graph of the total noise levels measured in one-third octave frequency bands is shown below in Figure 5.3.

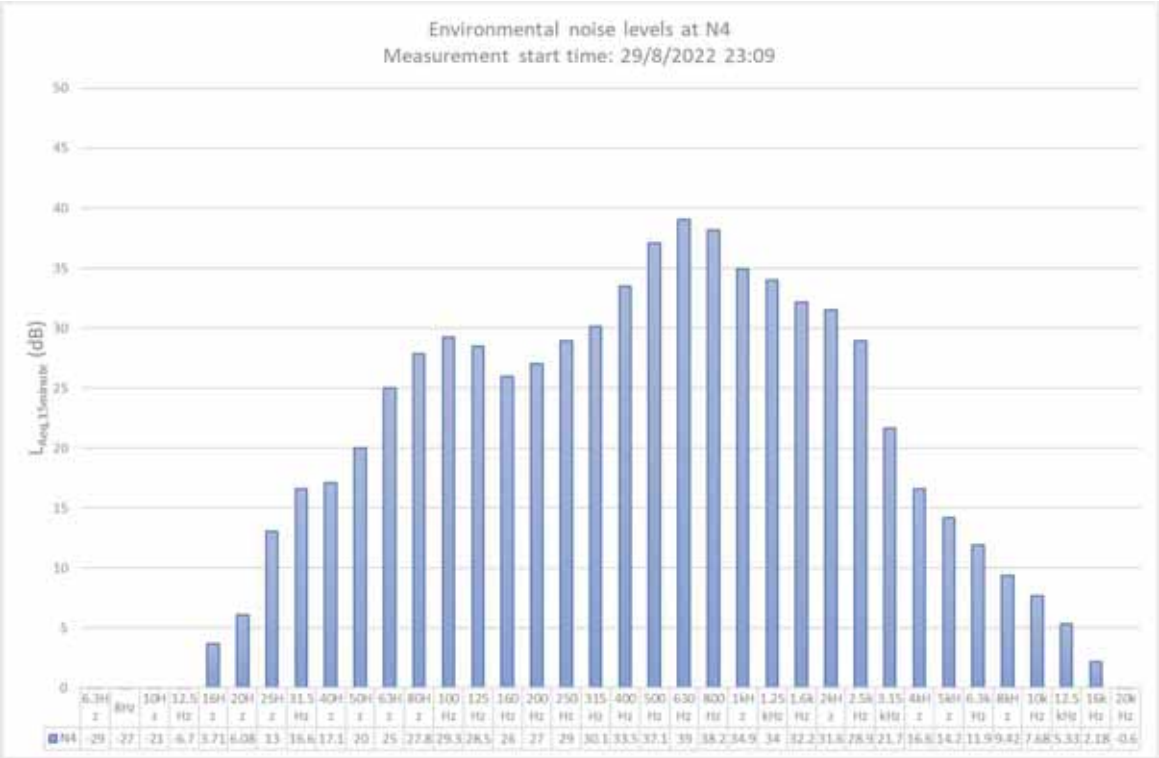

Figure 5.3 N4 total measured one-third octave band frequencies

Other mining operations in the vicinity were frequently audible during the operator-attended noise survey at monitoring location N4. The cumulative mining noise level was estimated to be 35 dB $L_{Aeq,night}$ (ie Ashton Coal mine noise of less than 34 dB $L_{Aeq,15\ minute}$ plus other mine noise of 36 dB $L_{Aeq,15\ minute}$ less 3 dB as per NPfI methodology). which is below the relevant 40 dB $L_{Aeq,night}$ criterion.

6 Conclusion

EMM has completed a review of mine noise from Ashton Coal within the surrounding community based on attended measurements conducted on 29 August 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 the site. Noise limits were found not to be applicable during one of the three measurements due to the presence of temperature inversion conditions greater than 3°C/100m at the time of the measurement.

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 at or 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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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

Appendix C
Calibration certificates

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C30881

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	94.05 dB	999.99 Hz	1.00 %
Level2:	NA	N	114.05 dB	999.99 Hz	1.00 %
Uncertainty			±0.11 dB	±0.05%	±0.20 %
Uncertainty (at 95% c.l.) k=2					

CONDITION OF TEST:

Ambient Pressure	1002	hPa ±1 hPa	**Date of Receipt :**	20/10/2021
Temperature	23	°C ±1° C	**Date of Calibration :**	20/10/2021
Relative Humidity	41	% ±5%	**Date of Issue :**	20/10/2021

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

CHECKED BY: .....

AUTHORISED SIGNATURE: .....
Jack Kidd

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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Equipment Tested: Sound Level Meter

Manufacturer:	B & K	**Serial No:**	2759405
Type No:	2250	**Serial No:**	2983733
Mic. Type:	4189	**Serial No:**	22666
Pre-Amp. Type:	ZC0032		
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.

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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Appendix I

Monthly attended noise monitoring report – September 2022

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Ashton Coal

Monthly attended noise monitoring - September 2022

Prepared for Ashton Coal Operations Pty Ltd

October 2022

Ashton Coal

Monthly attended noise monitoring - September 2022

Ashton Coal Operations Pty Ltd

E211129 RP#9

October 2022

Version	Date	Prepared by	Approved by	Comments
1	21 October 2022	Harry Flick / Lucas Adamson	Najah Ishac	

Approved by

Najah Ishac
Director
21 October 2022

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 20 September 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 20 September 2022);
- Environment Protection Authority (EPA), Environment Protection Licence 11879, as varied on 3 February 2020 (current as of 20 September 2022);
- Ashton Coal Project Noise Management Plan (NMP), approved by DPE on 23 September 2020 (current as of 20 September 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

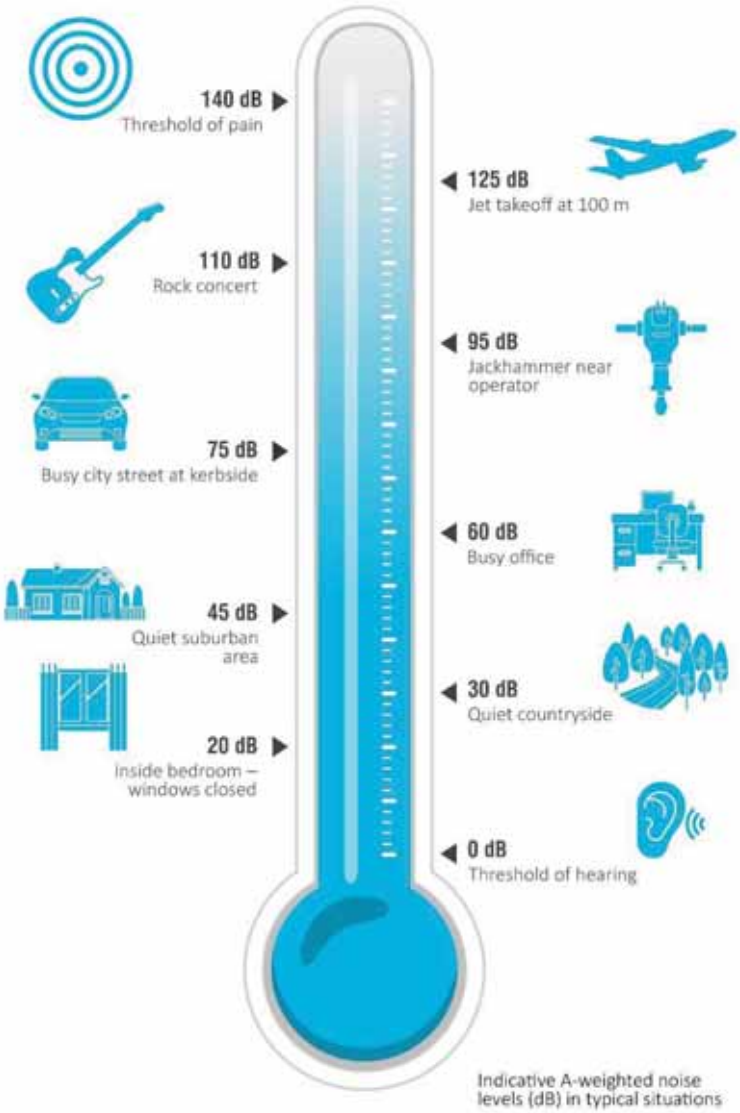


Figure 2.1 Common noise levels

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 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/100m.

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 (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 ion 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 has 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 commencing. 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 filtering).

4.2 Instrumentation

A Brüel & Kjær 2250 Type 1 sound analyser (s/n 2759405) 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).

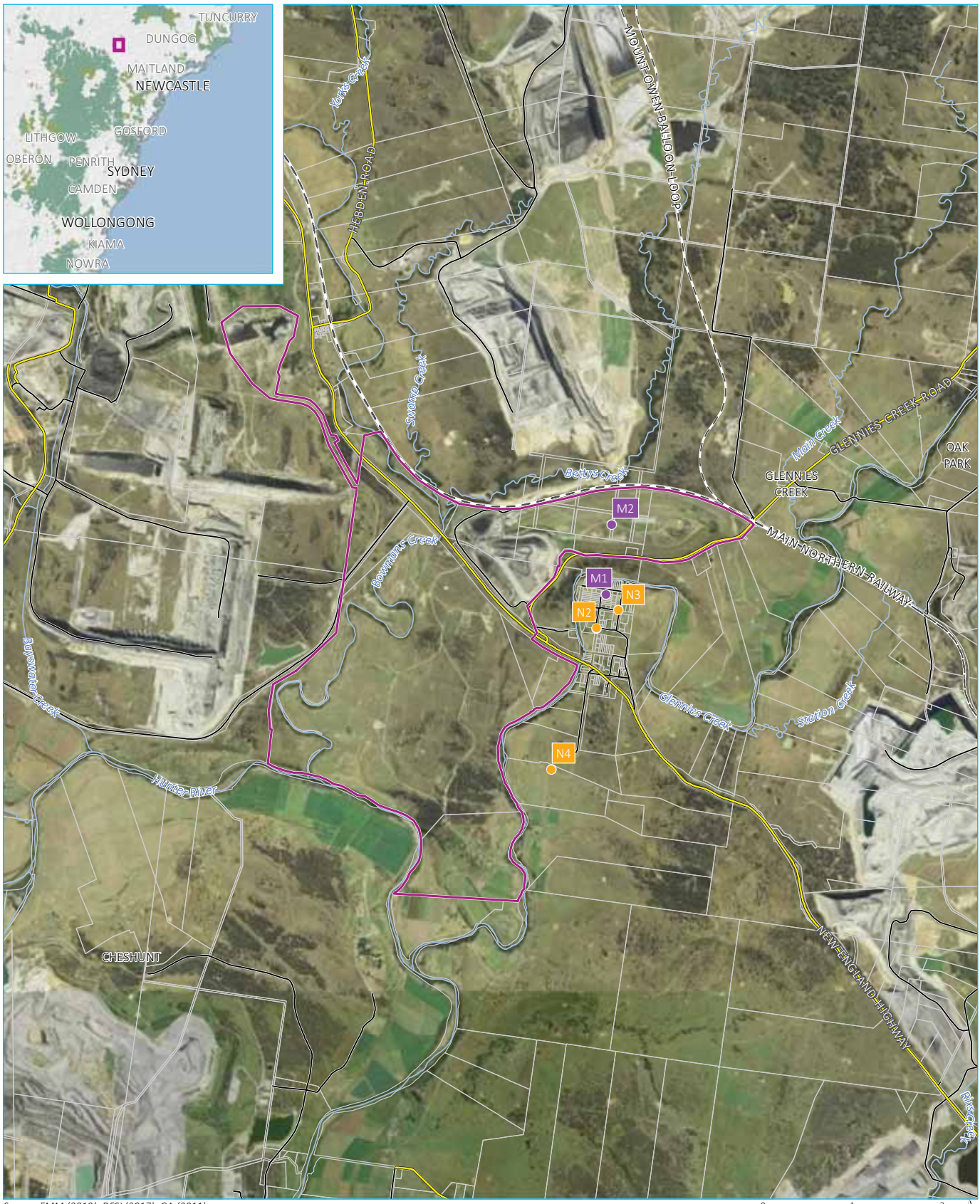
Table D2 of the NPfI (EPA 2017) is reproduced in Table 4.2 and presents the stability categories and associated ranges in temperature lapse rates.

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

N

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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 20 September 2022. Noise from Ashton Coal operations was inaudible during all three 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.

Given that Ashton Coal was not audible during any of the three measurements, LFN modifying factors were not applied to site noise levels at any of the locations. Notwithstanding the preceding, it is noted that total measured noise levels did not exceed the relevant LFN thresholds during any of the three measurements. Therefore, in accordance with the NPfI, LFN modifying factors were not applied to estimated cumulative noise levels at any of the locations. 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 –September 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	20/9	22:44	34	36	49	52	60	66	57	Nil	IA	IA	36	46	2.2 m/s @ 152° E class stability 1.0°C/100m VTG Y	Nil	Ashton Coal mine inaudible. Other mines in the vicinity (32 dB $L_{Aeq,15\ minute}$), traffic on the New England Highway, insects and frogs consistently audible. Trains on the main line (unrelated to Ashton) and birds frequently audible. Noise from livestock occasionally audible.
N3	20/9	23:02	34	36	41	43	47	56	54	Nil	IA	IA	36	46	2.6 m/s @ 140° E class stability 1.1°C/100m VTG Y	Nil	Ashton Coal mine inaudible. Other mines in the vicinity (33 dB $L_{Aeq,15\ minute}$), insects, frogs, and traffic on the New England Highway consistently audible. A brief noise from residences was audible.
N4	20/9	23:23	32	34	41	45	48	58	57	Nil	IA	IA	36	46	2.1 m/s @ 134° E class stability 1.5°C/100m VTG Y	Nil	Ashton Coal mine inaudible. Other mines in the vicinity (32 dB $L_{Aeq,15\ minute}$), insects and frogs consistently audible. Traffic on the New England Highway and trains on the main line frequently audible, Noise from livestock occasionally 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. N/A = not applicable.

5.2 N2 - Camberwell Village (west)

Ashton Coal operations were inaudible during the entire measurement. Typically, when a particular source is not audible above local ambient noise levels, the likely contribution of that source is at least 10 dB below the measured background (L_{A90}) level. Given this and the measured background noise level of 36 dB L_{A90}, the Ashton Coal $L_{Aeq,15\ minute}$ mine noise contribution was estimated to be ≤26 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 other mines in the vicinity, insects, frogs, traffic on the New England Highway, trains, birds and nearby livestock. A graph of the total noise levels measured in each one-third octave frequency bands is shown in Figure 5.1.

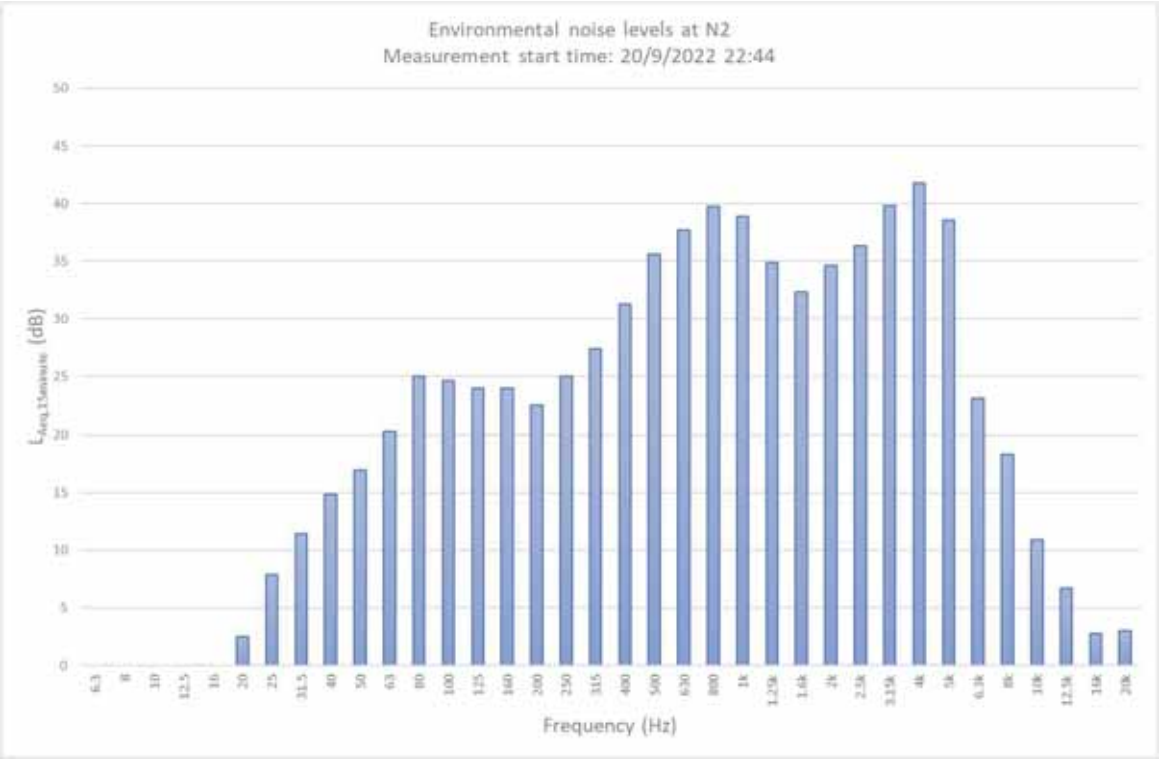

Figure 5.1 N2 total measured one-third octave band frequencies

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 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 $L_{Aeq,night}$ criterion.

5.3 N3 - Camberwell Village (north-east)

Ashton Coal operations were inaudible during the entire measurement. Typically, when a particular source is not audible above local ambient noise levels, the likely contribution of that source is at least 10 dB below the measured background (L_{A90}) level. Given this and the measured background noise level of 36 dB L_{A90}, the Ashton Coal $L_{Aeq,15\ minute}$ mine noise contribution was estimated to be ≤26 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 other mines in the vicinity, insects, frogs, traffic on the New England Highway and noise from residences. A graph of the total noise levels measured in the one-third octave frequency bands is shown in Figure 5.2.

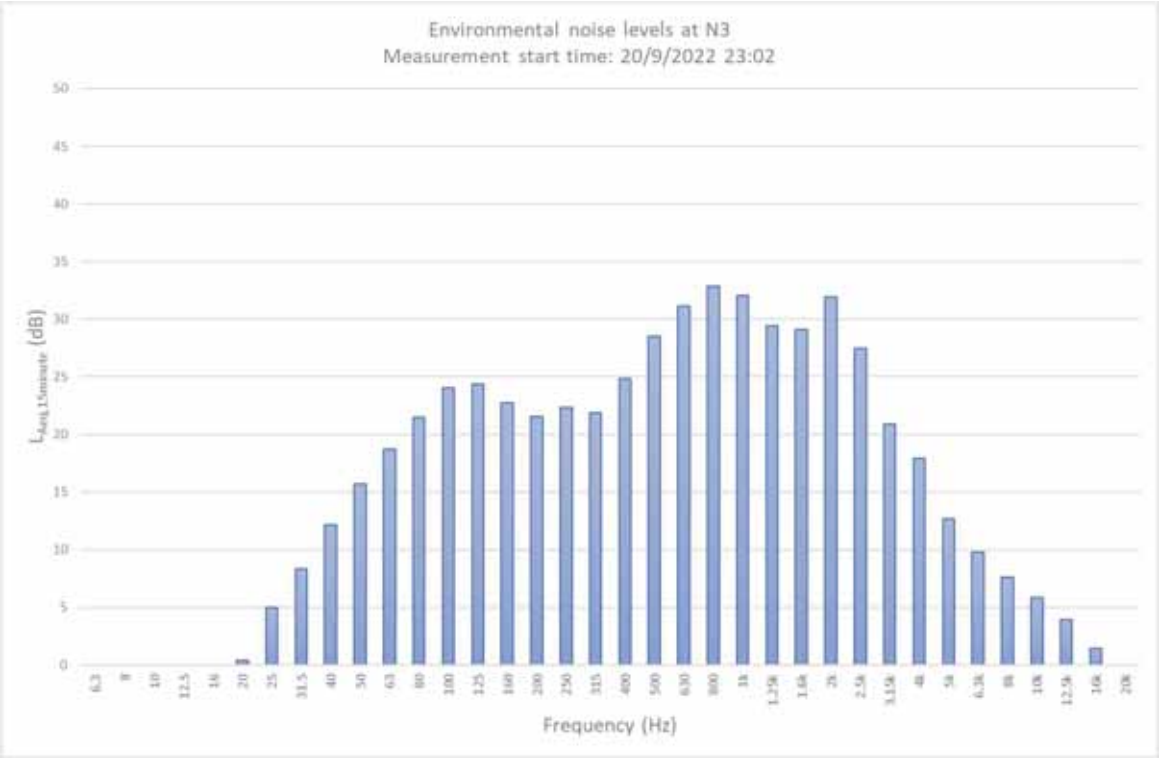

Figure 5.2 N3 total measured one-third octave band frequencies

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 37 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 $L_{Aeq,night}$ criterion.

5.4 N4 - South of New England Highway

Ashton Coal operations were inaudible during the entire measurement. Typically, when a particular source is not audible above local ambient noise levels, the likely contribution of that source is at least 10 dB below the measured background (L_{A90}) level. Given this and the measured background noise level of 34 dB L_{A90}, the Ashton Coal $L_{Aeq,15\ minute}$ mine noise contribution was estimated to be ≤24 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, other mines in the vicinity, traffic on the New England Highway, trains on the main line and noise from livestock. A graph of the total noise levels measured in one-third octave frequency bands is shown below in Figure 5.3.

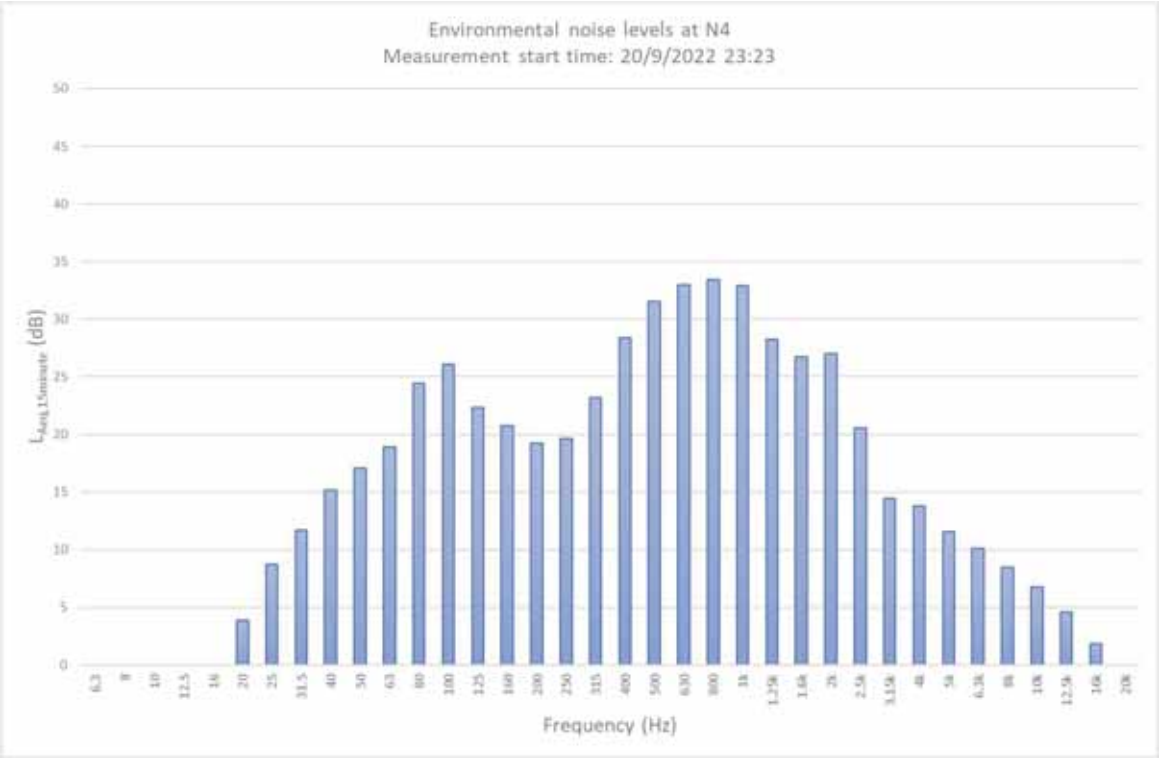

Figure 5.3 N4 total measured one-third octave band frequencies

Other mining operations in the vicinity were frequently audible during the operator-attended noise survey at monitoring location N4. 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 $L_{Aeq,night}$ criterion.

6 Conclusion

EMM has completed a review of mine noise from Ashton Coal within the surrounding community based on attended measurements conducted on 20 September 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 the site. 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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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

Appendix C
Calibration certificates

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C30881

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	94.05 dB	999.99 Hz	1.00 %
Level2:	NA	N	114.05 dB	999.99 Hz	1.00 %
Uncertainty			±0.11 dB	±0.05%	±0.20 %
Uncertainty (at 95% c.l.) k=2					

CONDITION OF TEST:

Ambient Pressure	1002	hPa ±1 hPa	**Date of Receipt :**	20/10/2021
Temperature	23	°C ±1° C	**Date of Calibration :**	20/10/2021
Relative Humidity	41	% ±5%	**Date of Issue :**	20/10/2021

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

CHECKED BY: .....

AUTHORISED SIGNATURE: .....
Jack Kidd

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	**Serial No:**	2759405
Type No:	2250	**Serial No:**	2983733
Mic. Type:	4189	**Serial No:**	22666
Pre-Amp. Type:	ZC0032		
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.

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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Appendix J

Monthly attended noise monitoring report – October 2022

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Ashton Coal

Monthly attended noise monitoring - October 2022

Prepared for Ashton Coal Operations Pty Ltd

October 2022

Ashton Coal

Monthly attended noise monitoring - October 2022

Ashton Coal Operations Pty Ltd

E211129 RP#10

October 2022

Version	Date	Prepared by	Approved by	Comments
1	21 October 2022	Lucas Adamson	Najah Ishac	

Approved by

Najah Ishac
Director
21 October 2022

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 13 October 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 13 October 2022);
- Environment Protection Authority (EPA), Environment Protection Licence 11879, as varied on 3 February 2020 (current as of 13 October 2022);
- Ashton Coal Project Noise Management Plan (NMP), approved by DPE on 23 September 2020 (current as of 13 October 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

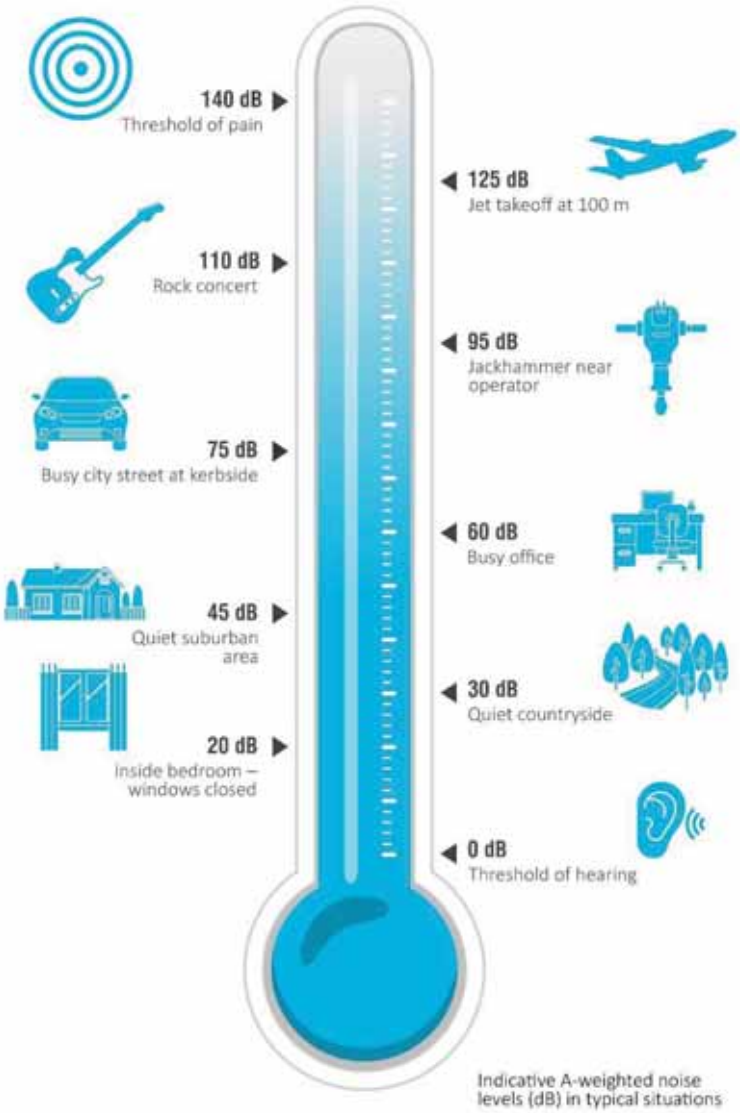


Figure 2.1 Common noise levels

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 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/100m.

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 ion 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 has 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 commencing. 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 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 79952). 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).

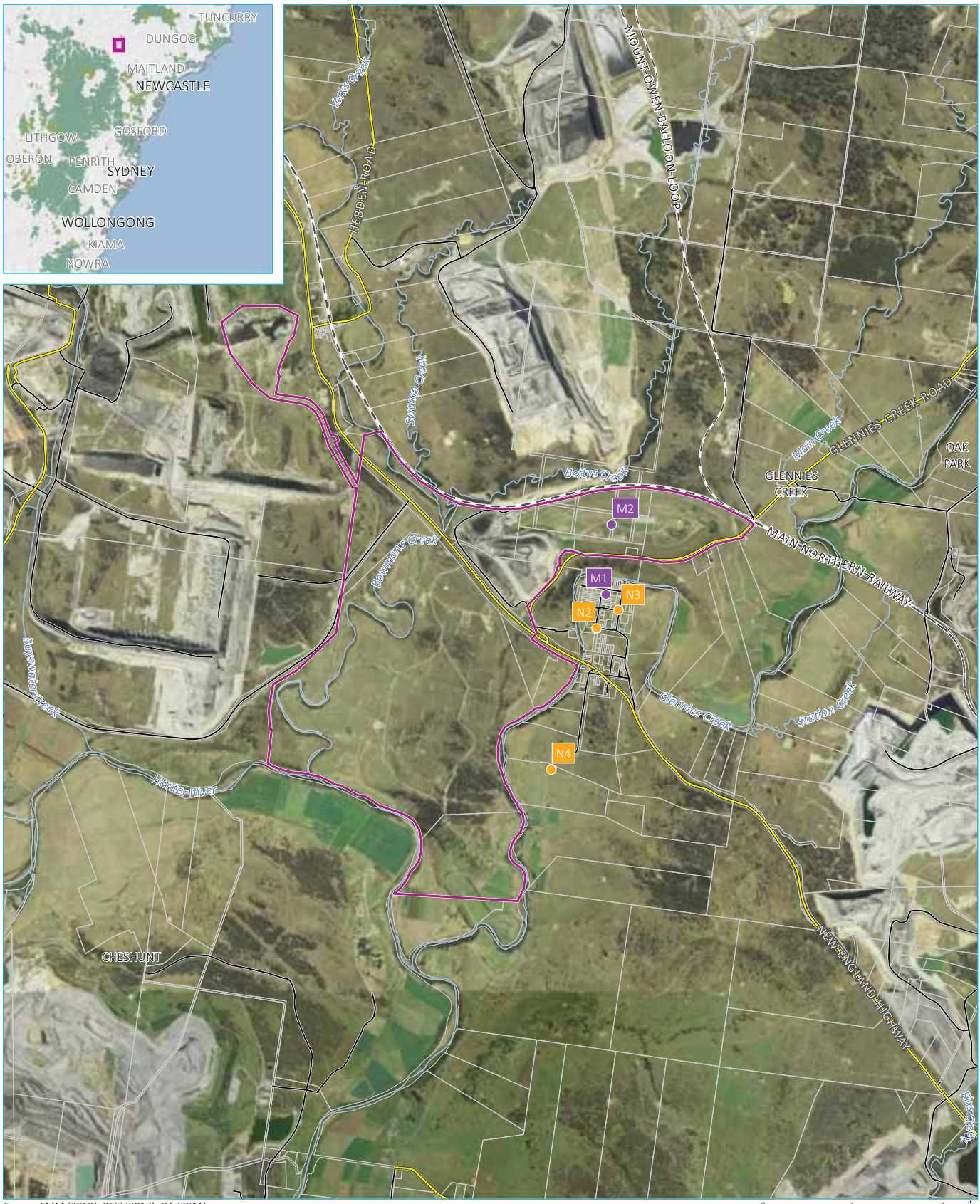
Table D2 of the NPfI (EPA 2017) is reproduced in Table 4.2 and presents the stability categories and associated ranges in temperature lapse rates.

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

N

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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 13 October 2022. Noise from Ashton Coal operations was inaudible during all three 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.

Given that Ashton Coal was not audible during any of the three measurements, LFN modifying factors were not applied to any of the measurements. Notwithstanding the preceding, it is noted that total measured noise levels negligibly exceeded the relevant LFN thresholds during all three measurements. However, these were influenced by road traffic on the New England Highway. Therefore, in accordance with the NPfI, LFN modifying factors were not applied to estimated cumulative mining noise levels at any of the locations.

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 – October 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	13/10	22:04	37	39	44	48	52	55	60	Nil	IA	IA	36	46	1.4 m/s @ 117° F class stability 3.0°C/100m VTG Y	Nil	Ashton Coal mine inaudible. Other mines in the vicinity (34 dB $L_{Aeq,15\ minute}$), traffic on the New England Highway, insects and frogs consistently audible. Distant dogs barking occasionally audible.
N3	13/10	22:21	36	38	43	47	50	60	60	Nil	IA	IA	36	46	1.1 m/s @ 123° F class stability 2.9°C/100m VTG Y	Nil	Ashton Coal mine inaudible. Other mines in the vicinity (35 dB $L_{Aeq,15\ minute}$), traffic on the New England Highway, insects and frogs consistently audible. Distant dogs barking, bird noise and a train on the main line (unrelated to Ashton Coal) occasionally audible.
N4	13/10	22:43	35	37	43	46	51	64	59	Nil	IA	IA	36	46	1.3 m/s @ 180° F class stability 2.1°C/100m VTG Y	Nil	Ashton Coal mine inaudible. Other mines in the vicinity (35 dB $L_{Aeq,15\ minute}$), traffic on the New England Highway, insects, frogs and powerline hum 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. N/A = not applicable.

5.2 N2 - Camberwell Village (west)

Ashton Coal operations were inaudible during the entire measurement. Typically, when a particular source is not audible above local ambient noise levels, the likely contribution of that source is at least 10 dB below the measured background (L_{A90}) level. Given this and the measured background noise level of 39 dB L_{A90}, the Ashton Coal $L_{Aeq,15\ minute}$ mine noise contribution was estimated to be <29 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 other mines in the vicinity, insects, frogs, traffic on the New England Highway and distant dogs barking.

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 31 dB $L_{Aeq,night}$ (ie Other mine noise of 34 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 .

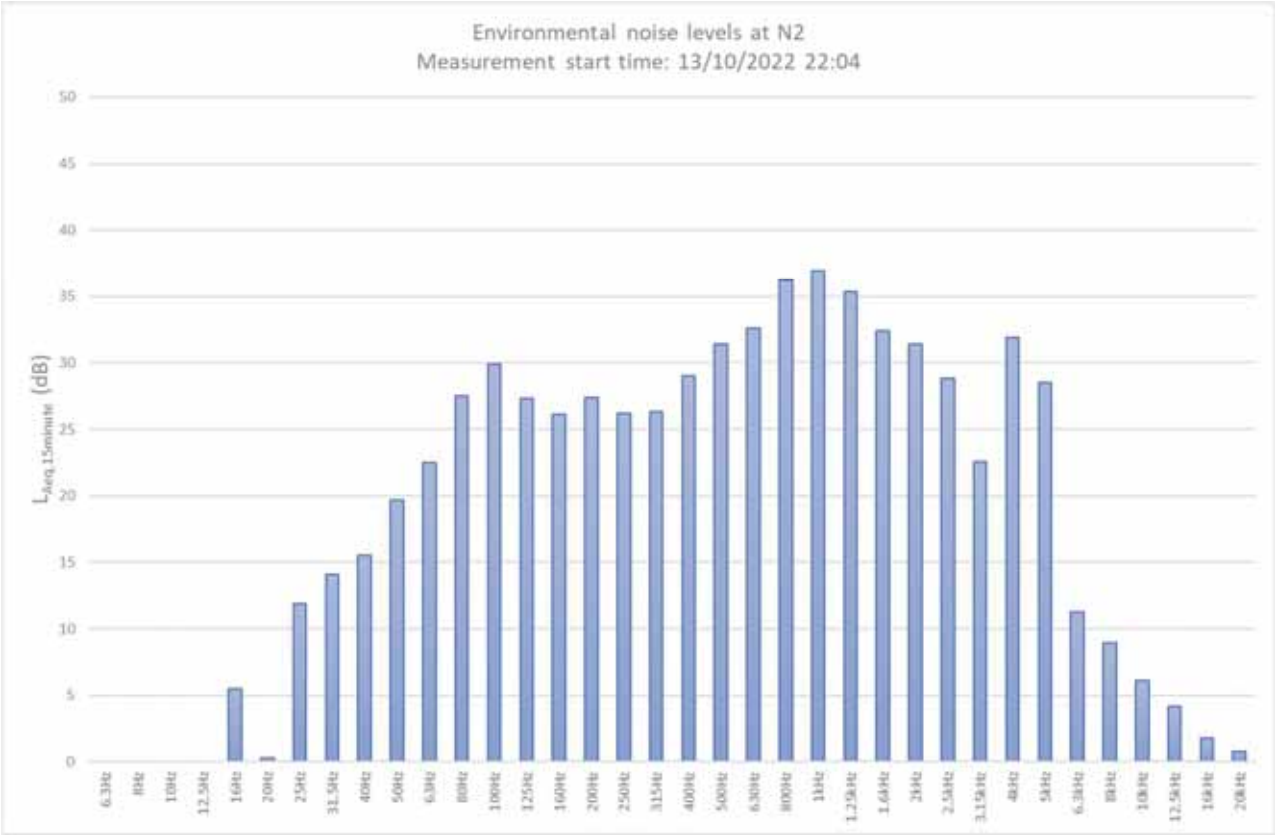

Figure 5.1 N2 total measured one-third octave band frequencies

5.3 N3 - Camberwell Village (north-east)

Ashton Coal operations were inaudible during the entire measurement. Given this and the measured background noise level of 38 dB L_{A90}, the Ashton Coal $L_{Aeq,15\ minute}$ mine noise contribution was estimated to be <28 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 other mines in the vicinity, insects, frogs, traffic on the New England Highway, distant dogs barking, bird noise and a train on the main line (unrelated to Ashton Coal).

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 32 dB $L_{Aeq,night}$ (ie Other mine noise of 35 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 .

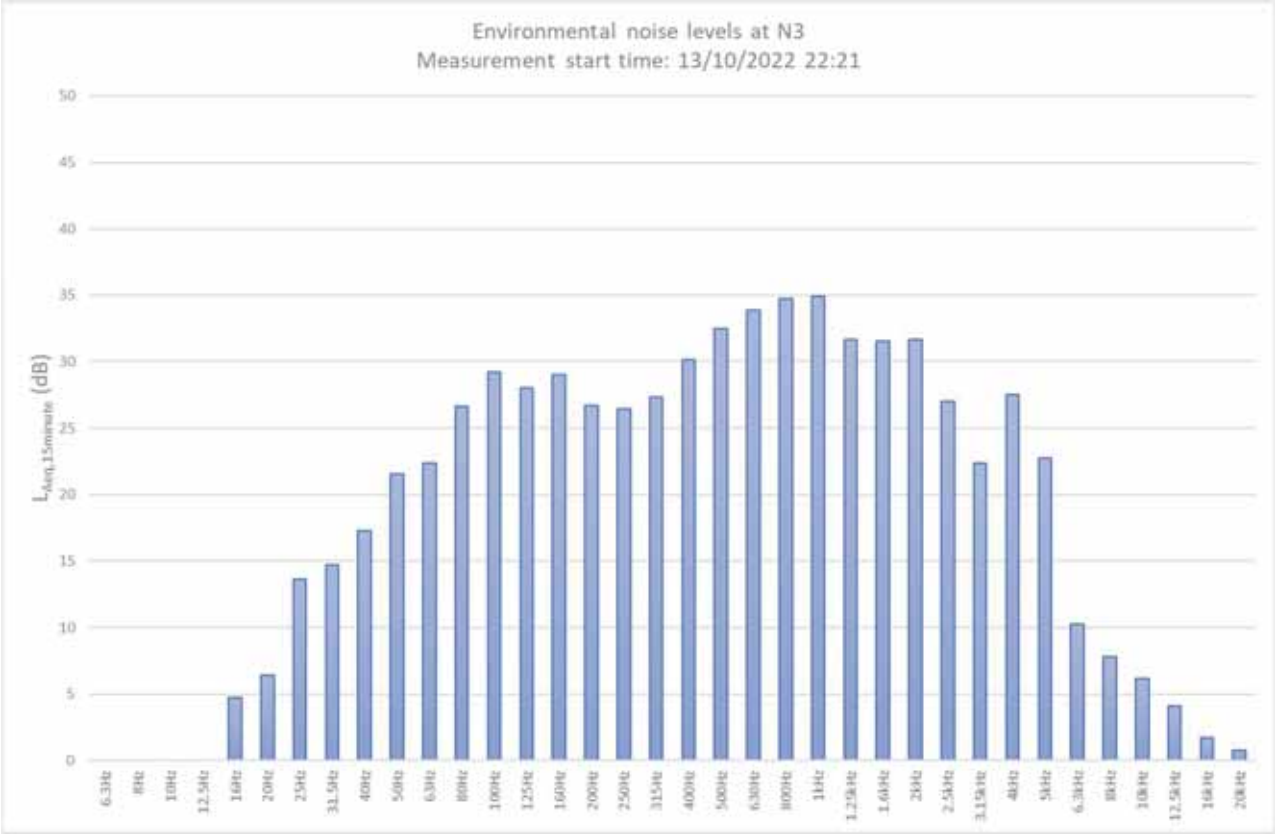

Figure 5.2 N3 total measured one-third octave band frequencies

5.4 N4 - South of New England Highway

Ashton Coal operations were inaudible during the entire measurement. 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 and frogs, other mines in the vicinity, traffic on the New England Highway and powerline hum.

Other mining operations in the vicinity were frequently audible during the operator-attended noise survey at monitoring location N4. The cumulative mining noise level was estimated to be 32 dB $L_{Aeq,night}$ (ie Other mine noise of 35 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 one-third octave frequency bands is shown below in .

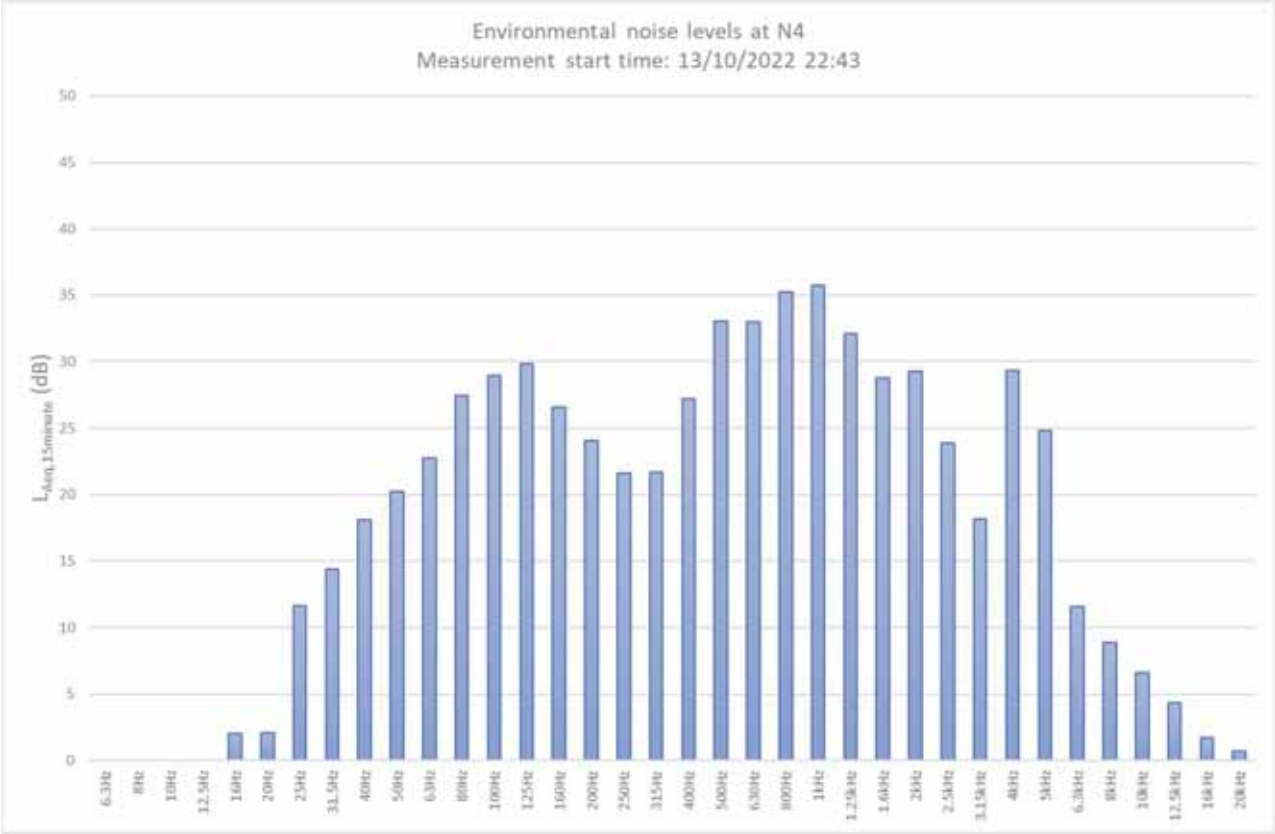

Figure 5.3 N4 total measured one-third octave band frequencies

6 Conclusion

EMM has completed a review of mine noise from Ashton Coal within the surrounding community based on attended measurements conducted on 13 October 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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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

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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Acoustic and Vibration Measurements

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ilac-MRA DANAK
CAL Reg.No. 307
Member of EA MLA

CERTIFICATE OF CALIBRATION

No: CDK2007931 Page 1 of 12

CALIBRATION OF

Sound Level Meter:	Brüel & Kjær Type 2250	No: 3029363	Id: -
Microphone:	Brüel & Kjær Type 4189	No: 3260501	
PreAmplifier:	Brüel & Kjær Type ZC-0032	No: 30109	
Supplied Calibrator:	None		
Software version:	BZ7222 Version 4.7.6	Pattern Approval:	-
Instruction manual:	BE1712-22		

CUSTOMER

EMM Consulting
Ground Floor, Suite 1
20 Chandos Street
2065 St Leonards
New South Wales, Australia

CALIBRATION CONDITIONS

Preconditioning: 4 hours at 23°C ± 3°C
Environment conditions: *See actual values in sections.*

SPECIFICATIONS

The Sound Level Meter Brüel & Kjær Type 2250 has been calibrated in accordance with the requirements as specified in IEC 61672-1:2013 class 1. Procedures from IEC 61672-3:2013 were used to perform the periodic tests. The accreditation assures the traceability to the international units system SI.

PROCEDURE

The measurements have been performed with the assistance of Brüel & Kjær Sound Level Meter Calibration System 3630 with application software type 7763 (version 8.2 - DB: 8.20) by using procedure B&K proc 2250, 4189 (IEC 61672:2013).

RESULTS

Calibration Mode: **Calibration as received.**

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ providing a level of confidence of approximately 95 %. The uncertainty evaluation has been carried out in accordance with EA-4/02 from elements originating from the standards, calibration method, effect of environmental conditions and any short time contribution from the device under calibration.

Date of calibration: 2020-11-26

Date of issue: 2020-11-26

Lene Petersen
Calibration Technician

Erik Bruus
Approved Signatory

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Appendix K

Monthly attended noise monitoring report – November 2022

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Ashton Coal

Monthly attended noise monitoring - November 2022

Prepared for Ashton Coal Operations Pty Ltd

December 2022

Ashton Coal

Monthly attended noise monitoring - November 2022

Ashton Coal Operations Pty Ltd

E211129 RP#11

December 2022

Version	Date	Prepared by	Approved by	Comments
1	5 December 2022	Harry Flick	Najah Ishac	

Approved by

Najah Ishac
Director
5 December 2022

Level 3 175 Scott Street
Newcastle NSW 2300

TABLE OF CONTENTS

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 23 November 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 23 November 2022);
- Environment Protection Authority (EPA), Environment Protection Licence 11879, as varied on 3 November 2022 (current as of 23 November 2022);
- Ashton Coal Project Noise Management Plan (NMP), approved by DPE on 23 September 2020 (current as of 23 November 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

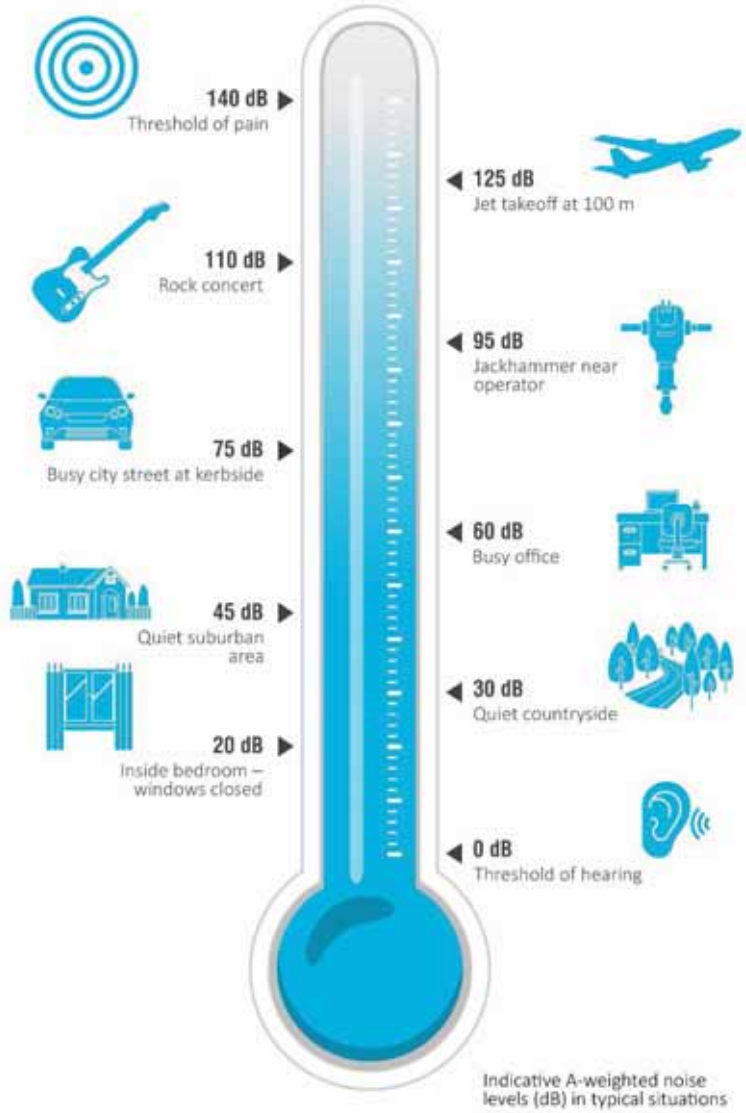


Figure 2.1 Common noise levels

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/100m.

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 has 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 commencing. 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 filtering).

4.2 Instrumentation

A Brüel & Kjær 2250 Type 1 sound analyser (s/n 2759405) 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 79952). 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).

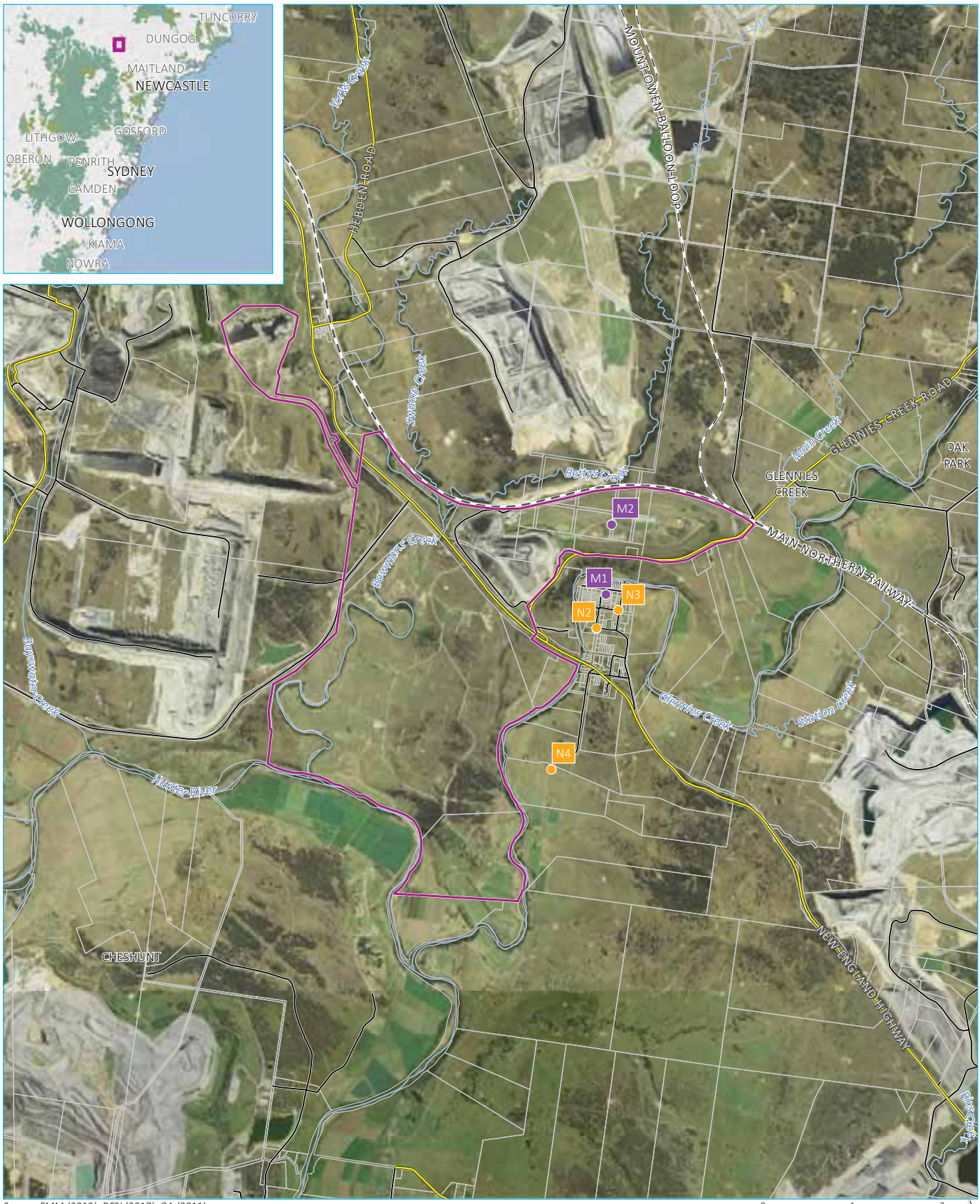
Table D2 of the NPfI (EPA 2017) is reproduced in Table 4.2 and presents the stability categories and associated ranges in temperature lapse rates.

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

N

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

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 23 November 2022. Noise from Ashton Coal operations was audible during measurements at locations N2 and N3, and inaudible at location N4.

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 not to be applicable during one of the three measurements due to the presence of temperature inversion conditions greater than 3°C/100m at the time of the measurement. Notwithstanding, site noise was not audible at this location.

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.

Total measured noise levels did not exceed the relevant LFN thresholds during any of the three measurements. Therefore, in accordance with the NPfI, LFN modifying factors were not applied to estimated site (or cumulative) noise levels at any of the monitoring locations.

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 – November 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	23/11	22:12	33	37	47	51	57	62	55	Nil	<30	33	36	46	1.9 m/s @ 272° E class stability 0.3°C/100m VTG Y	Nil	Ashton Coal mine rumble consistently audible in traffic lulls with engine revs and reverse clackers audible on occasion. Traffic on the New England Highway, and insects consistently audible. A nearby possum was frequently audible.
N3	23/11	22:31	34	37	44	47	52	56	53	Nil	<34	37	36	46	1.6 m/s @ 293° F class stability 2.7°C/100m VTG Y	Nil	Ashton Coal mine rumble consistently audible with engine revs and dozer in stockpile audible on occasion. Traffic on the New England Highway and insects consistently audible. Distant dogs barking and bird noise occasionally audible.
N4	23/11	22:53	30	32	37	39	43	65	51	Nil	IA	IA	36	46	0.9 m/s @ 295° F class stability 3.2°C/100m VTG N	N/A	Ashton Coal mine inaudible. Traffic on the New England Highway, insects, and frogs consistently audible. Other mines in the vicinity (<27 dB $L_{Aeq,15\ minute}$) frequently audible. Birds occasionally audible. A brief plane flyover was also 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. N/A = not applicable.

5.2 N2 - Camberwell Village (west)

Ashton Coal operations were consistently audible in traffic lulls during the measurement. The Ashton Coal mine noise contribution was estimated at up to <30 dB $L_{Aeq,15\ minute}$. Engine revs from site generated an estimated 33 dB L_{Amax}. Ashton Coal noise contributions complied with the DC and EPL noise limits.

Other noise sources included insects, traffic on the New England Highway and a nearby possum.

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 <27 dB $L_{Aeq,night}$ (ie Ashton mine noise of <30 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.

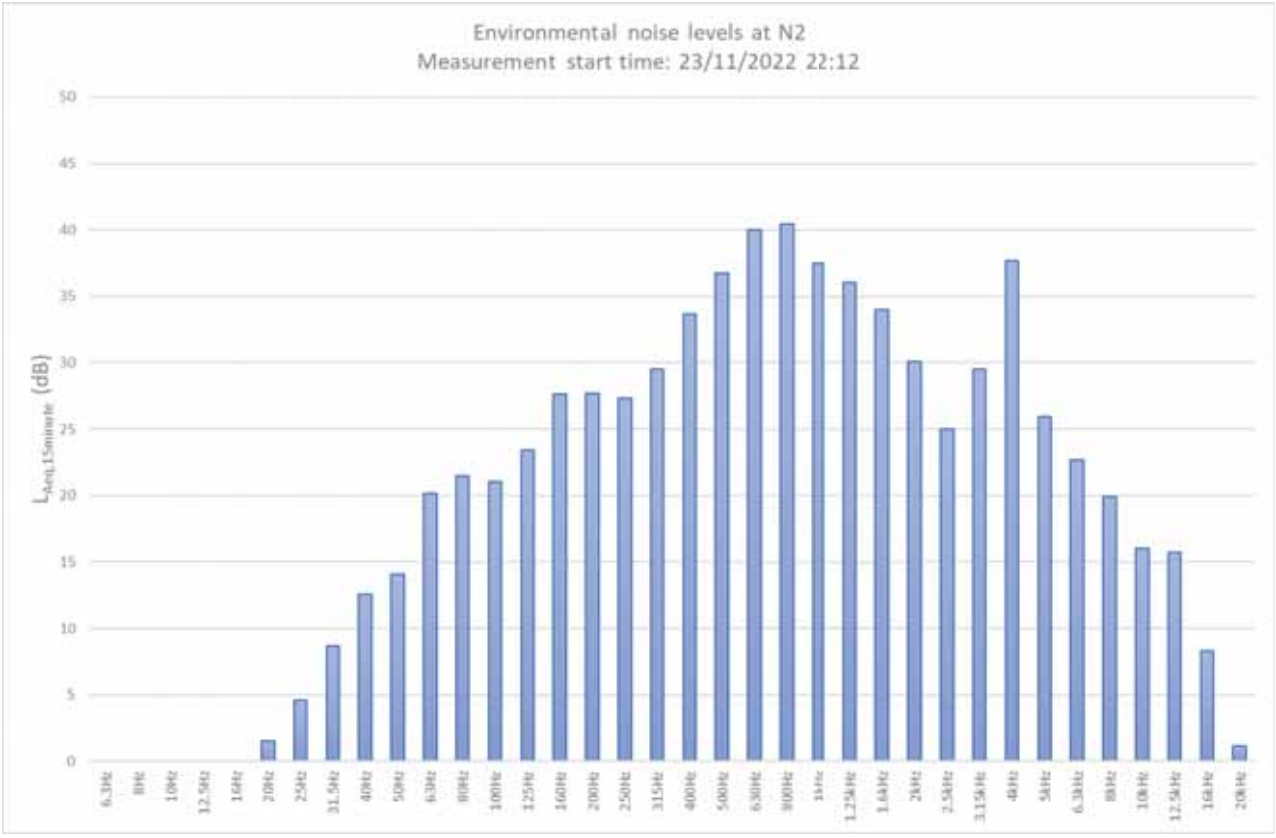

Figure 5.1 N2 total measured one-third octave band frequencies

5.3 N3 - Camberwell Village (north-east)

Ashton Coal operations were consistently audible in traffic lulls during the measurement. The Ashton Coal mine noise contribution was estimated at up to <34 dB $L_{Aeq,15\ minute}$. Engine revs from site generated an estimated 37 dB L_{Amax}. Ashton Coal noise contributions complied with the DC and EPL noise limits.

Other noise sources included insects, traffic on the New England Highway, dogs barking, and bird noise.

Other mining operations in the vicinity were inaudible during the operator-attended noise survey at monitoring location N3. The cumulative mining noise level was estimated to be <31 dB $L_{Aeq,night}$ (ie Ashton mine noise of <34 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.

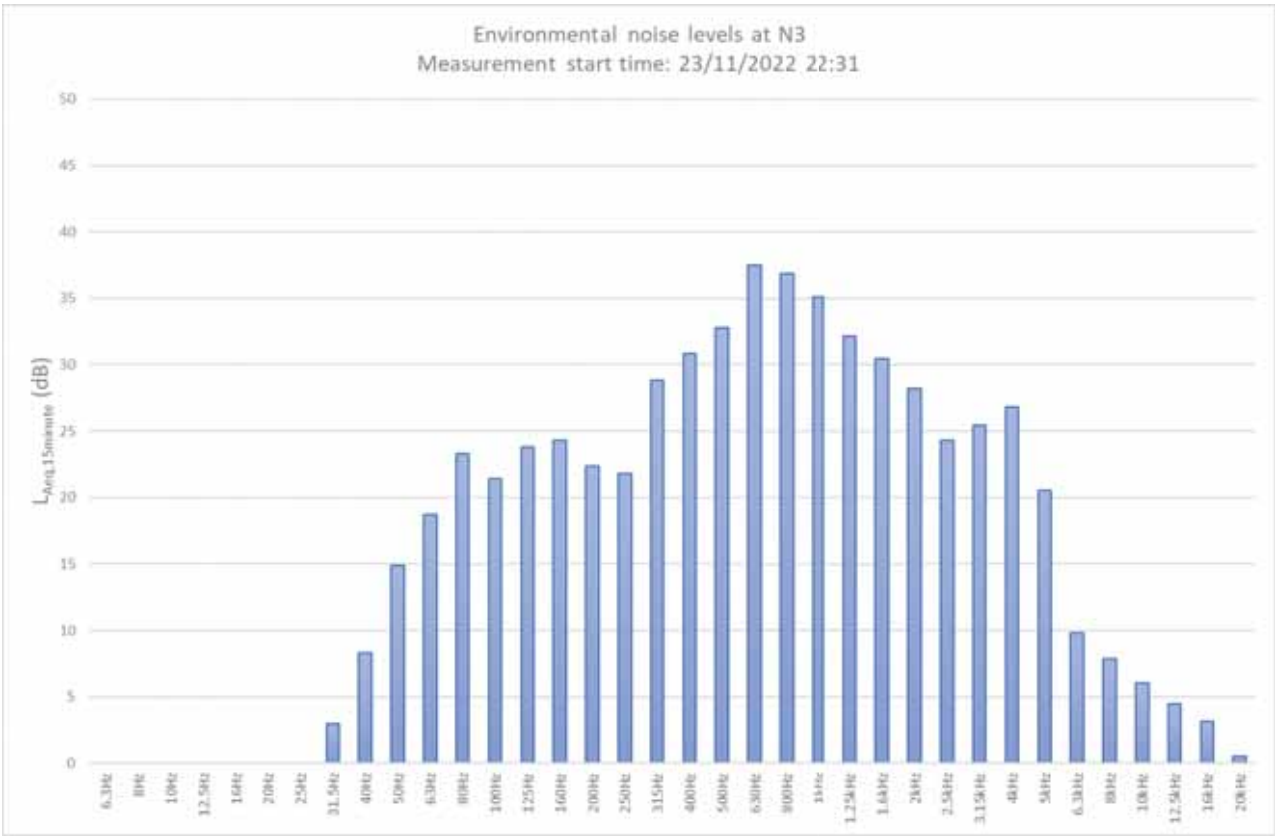

Figure 5.2 N3 total measured one-third octave band frequencies

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, other mines in the vicinity, traffic on the New England Highway and powerline hum.

Other mining operations in the vicinity were frequently audible during the operator-attended noise survey at monitoring location N4. The cumulative mining noise level was estimated to be <24 dB $L_{Aeq,night}$ (ie Other mine noise of <27 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 one-third octave frequency bands is shown below in Figure 5.3.

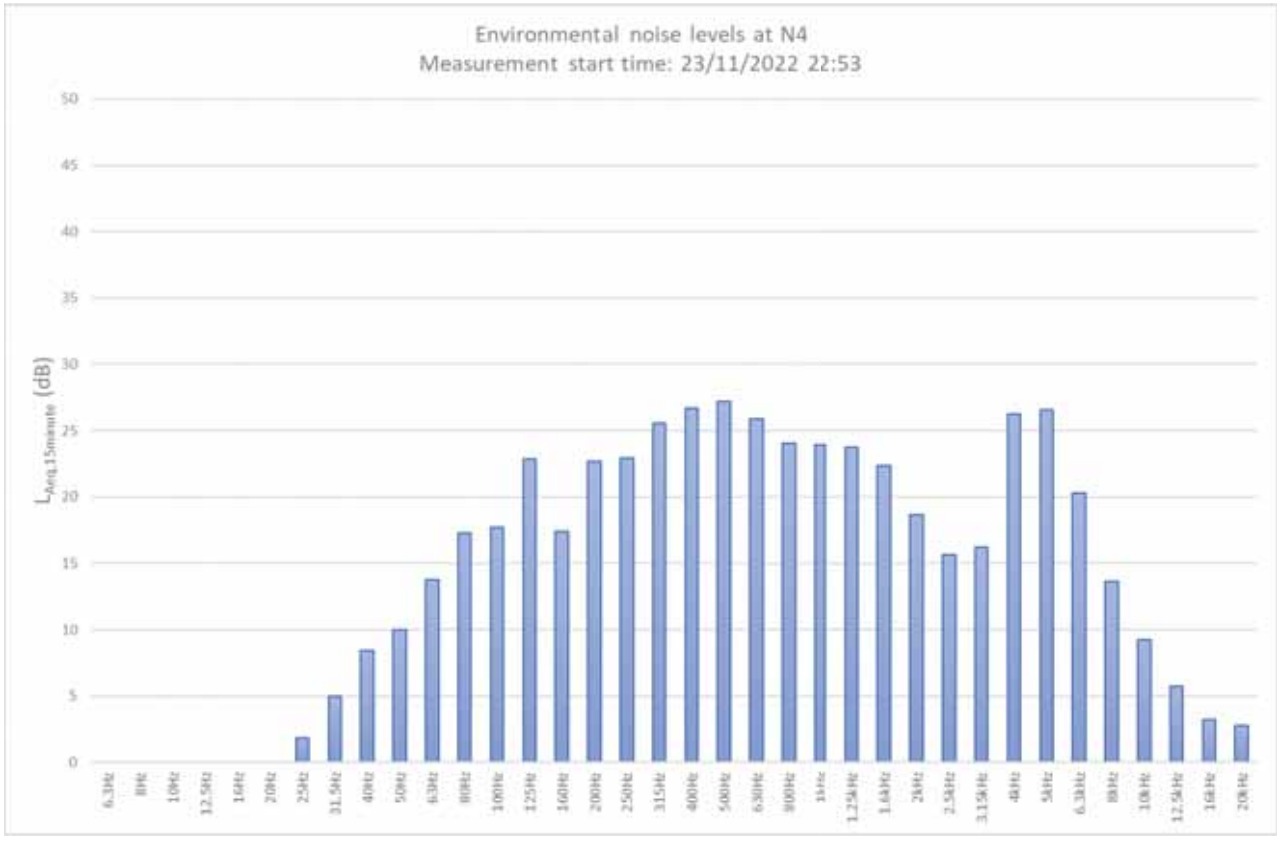

Figure 5.3 N4 total measured one-third octave band frequencies

6 Conclusion

EMM has completed a review of mine noise from Ashton Coal within the surrounding community based on attended measurements conducted on 23 November 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 not to be applicable during one of the three measurements due to the presence of temperature inversion conditions greater than 3°C/100m at the time of the measurement.

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: SLM31670

Equipment Tested: Sound Level Meter

Manufacturer:	B & K	**Serial No:**	2759405
Type No:	2250	**Serial No:**	2983733
Mic. Type:	4189	**Serial No:**	22666
Pre-Amp. Type:	ZC0032		
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.

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: 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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Vancouver BC V5Y 1K1

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Appendix L

Monthly attended noise monitoring report – December 2022

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Ashton Coal

Monthly attended noise monitoring - December 2022

Prepared for Ashton Coal Operations Pty Ltd

December 2022

Ashton Coal

Monthly attended noise monitoring - December 2022

Ashton Coal Operations Pty Ltd

E211129 RP#12

December 2022

Version	Date	Prepared by	Approved by	Comments
1	23 December 2022	Harry Flick	Najah Ishac	

Approved by

Najah Ishac
Director
23 December 2022

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 14 December 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 14 December 2022);
- Environment Protection Authority (EPA), Environment Protection Licence 11879, as varied on 3 November 2022 (current as of 14 December 2022);
- Ashton Coal Project Noise Management Plan (NMP), approved by DPE on 23 September 2020 (current as of 14 December 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

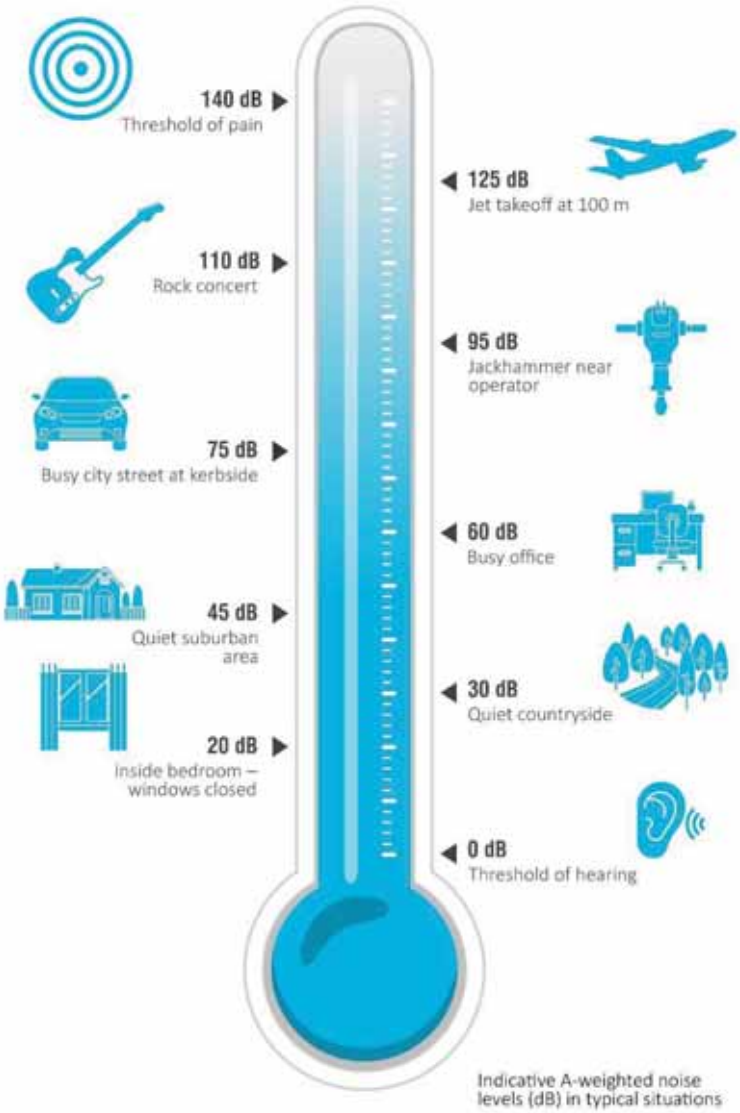


Figure 2.1 Common noise levels

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/100m.

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 has 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 Rion NA-28 sound level meter (s/n 00701424) 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 Pulsar 106 acoustic calibrator (s/n 79631). 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).

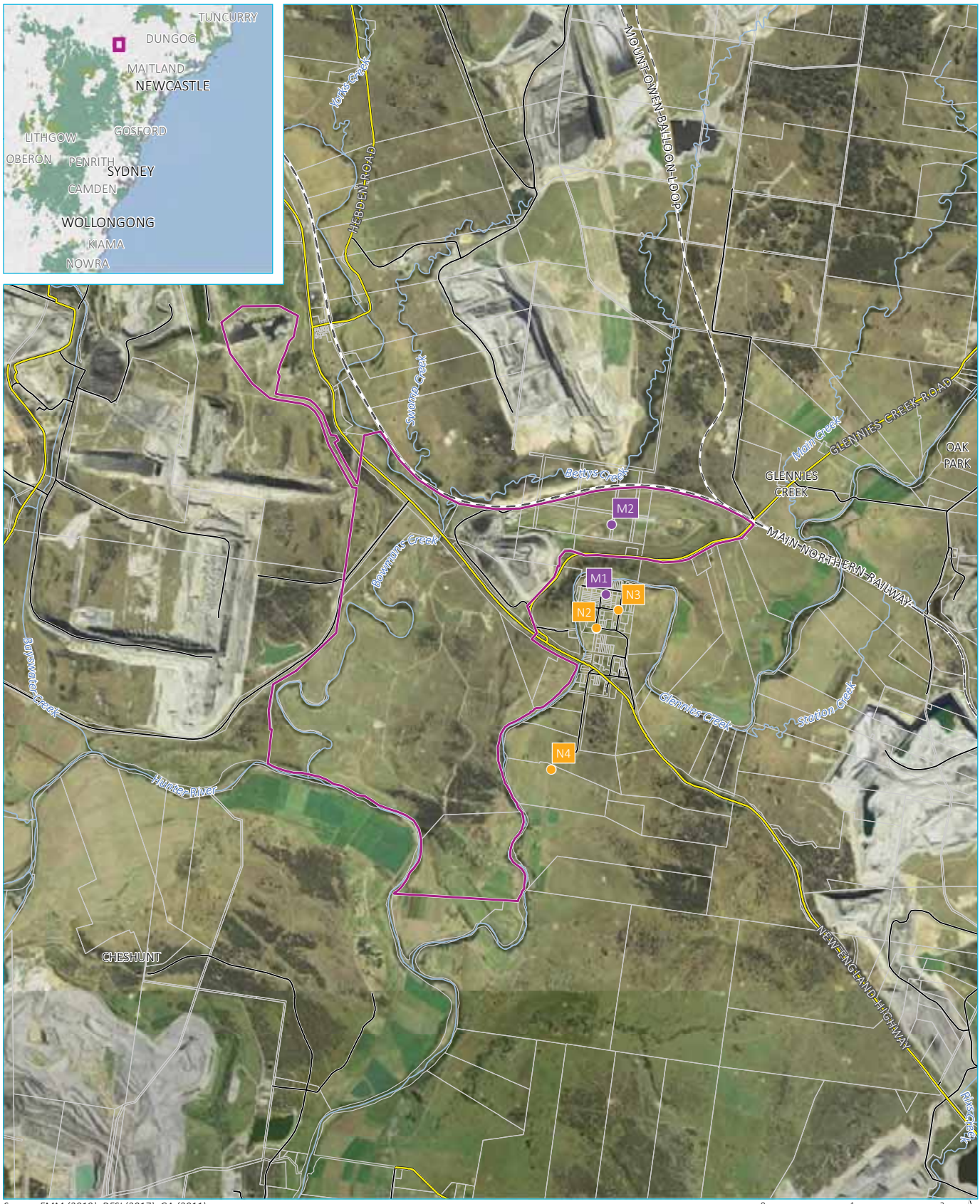
Table D2 of the NPfI (EPA 2017) is reproduced in Table 4.2 and presents the stability categories and associated ranges in temperature lapse rates.

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

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 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 14 December 2022. Noise from Ashton Coal operations was audible 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 – December 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	14/12	22:08	35	41	50	54	58	61	59	Nil	<34	35	36	46	1.4 m/s @ 215° E class stability 1.4°C/100m VTG Y	Nil	**Ashton Coal mine rumble audible in traffic lulls with engine revs, reverse clackers and dozer tracks audible on occasion.** Traffic on the New England Highway, insects and frogs consistently audible.
N3	14/12	22:29	35	37	43	47	52	55	54	Nil	NM (<36)	37	36	46	0.4 m/s @ 226° E class stability 0.4°C/100m VTG Y	Nil	**Ashton Coal mine rumble audible in periods of lower traffic with dropping of material and the dozer in stockpile audible on occasion.** Traffic on the New England Highway, insects and frogs consistently audible. Noise from livestock occasionally audible.
N4	14/12	22:55	24	27	32	35	40	48	50	Nil	<30	34	36	46	1.8 m/s @ 250° F class stability 1.8°C/100m VTG Y	Nil	**Ashton Coal mine rumble consistently audible during traffic lulls with dozer exhaust and engine surges audible on occasion.** Insects, and frogs consistently audible. Traffic on the New England Highway frequently audible. Dogs barking occasionally 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 consistently audible in traffic lulls during the measurement. The Ashton Coal mine noise contribution was estimated at up to <34 dB $L_{Aeq,15\ minute}$. Dozer tracks from site generated an estimated 35 dB L_{Amax}. Ashton Coal noise contributions complied with the DC and EPL noise limits.

Other noise sources included insects, frogs, and traffic on the New England Highway.

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 <31 dB $L_{Aeq,night}$ (ie Ashton mine noise of <34 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.

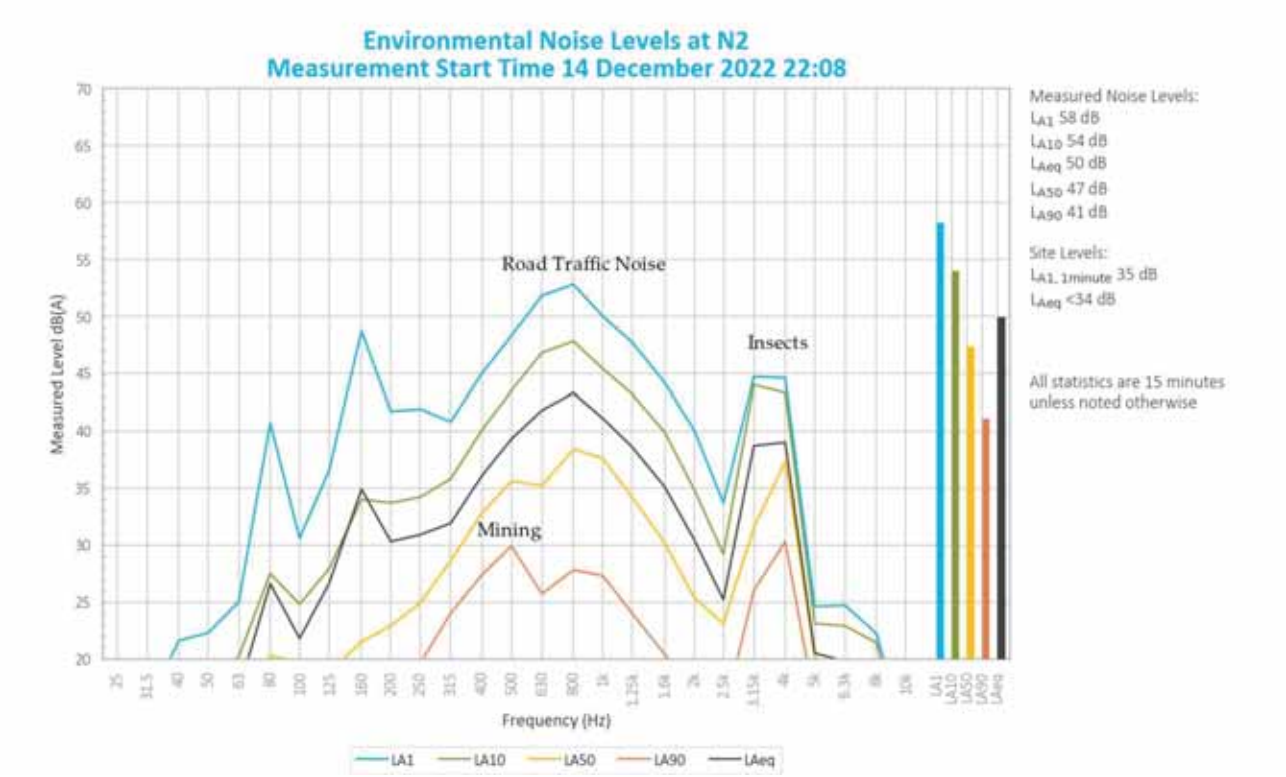

Figure 5.1 N2 total measured one-third octave band frequencies

5.3 N3 - Camberwell Village (north-east)

Ashton Coal operations were audible during lower periods of road traffic noise during the measurement. However, road traffic noise was persistent during the entire measurement, and a noise contribution for Ashton Coal was not measurable. Engine revs from site generated an estimated 37 dB L_{Amax}. Given the measured site related L_{Amax} noise level, Ashton Coal average noise was lower (ie less than 36dB $L_{Aeq,15\ minute}$) and therefore contributions complied with the DC and EPL noise limits.

Other noise sources included insects, frogs, traffic on the New England Highway, and noise from livestock.

Other mining operations in the vicinity were inaudible during the operator-attended noise survey at monitoring location N3. The cumulative mining noise level was estimated to be <33 dB $L_{Aeq,night}$ (ie Ashton mine noise of <36 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.

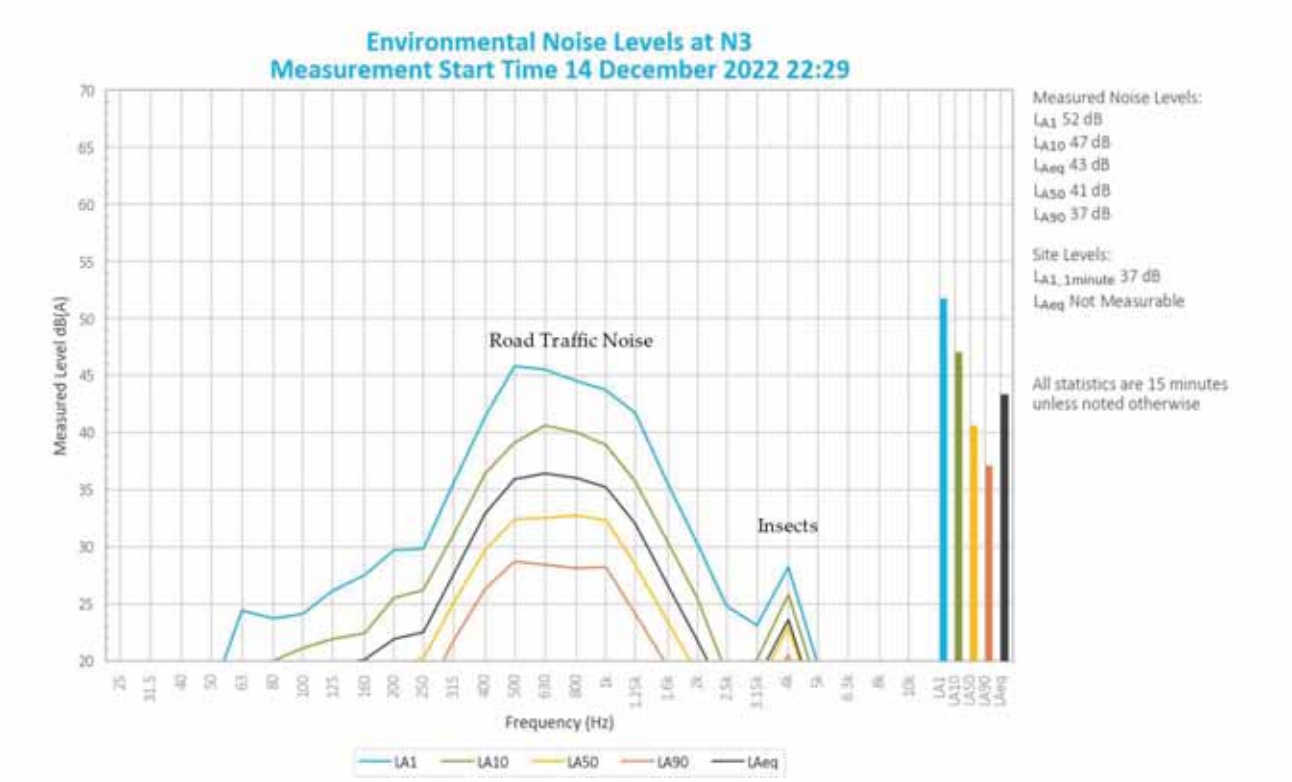

Figure 5.2 N3 total measured one-third octave band frequencies

5.4 N4 - South of New England Highway

Ashton Coal operations were consistently audible in traffic lulls during the measurement. The Ashton Coal mine noise contribution was estimated at up to <30 dB $L_{Aeq,15\ minute}$. Dozer exhaust noise from site generated an estimated 34 dB L_{Amax}. 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 dogs barking.

Other mining operations in the vicinity were inaudible during the operator-attended noise survey at monitoring location N3. The cumulative mining noise level was estimated to be <27 dB $L_{Aeq,night}$ (ie Ashton mine noise of <30 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.

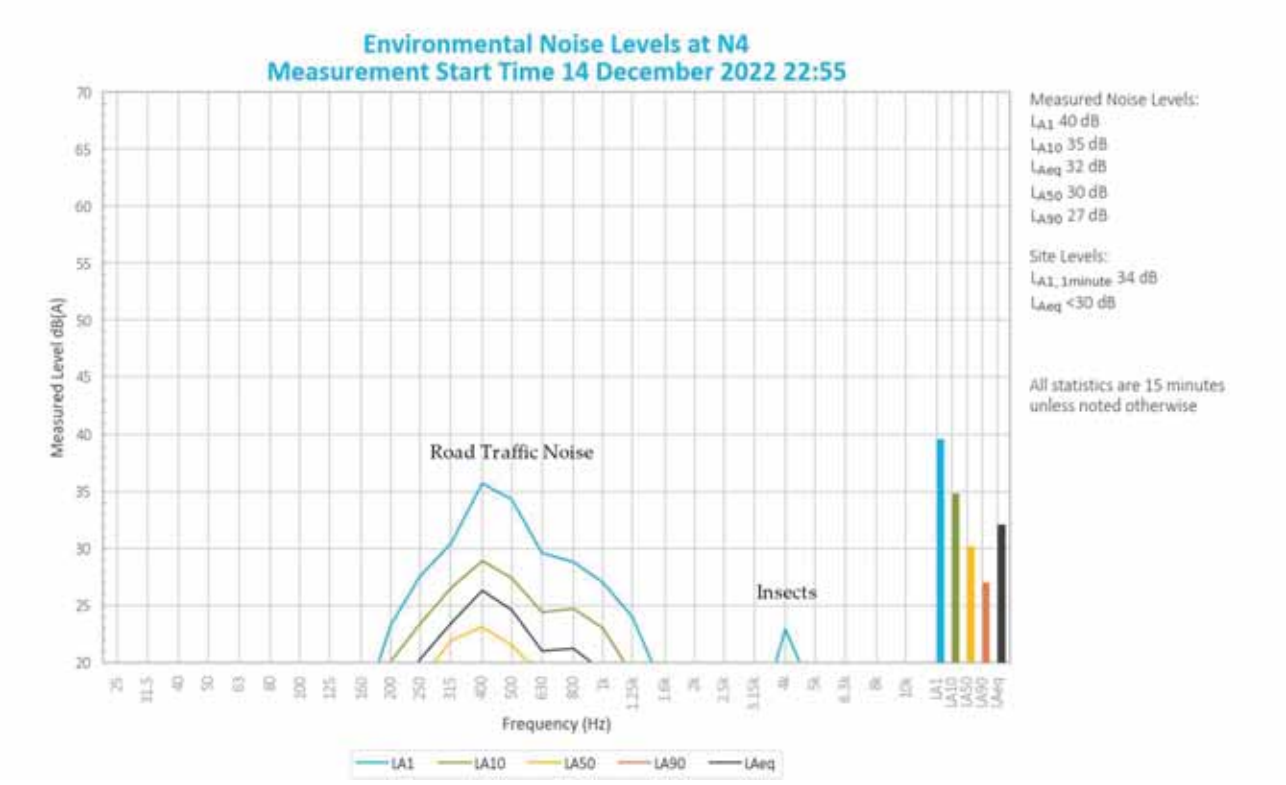

Figure 5.3 N4 total measured one-third octave band frequencies

6 Conclusion

EMM has completed a review of mine noise from Ashton Coal within the surrounding community based on attended measurements conducted on 14 December 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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www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3.2013
Calibration Certificate

Calibration Number C21344

Client Details	Global Acoustics Pty Ltd 12/16 Huntingdale Drive Thornton NSW 2322
Equipment Tested/ Model Number :	Rion NA-28
Instrument Serial Number :	00701424
Microphone Serial Number :	01916
Pre-amplifier Serial Number :	01463

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	20.6°C	**Ambient Temperature :**	22.4°C
Relative Humidity :	47%	**Relative Humidity :**	44%
Barometric Pressure :	101.05kPa	**Barometric Pressure :**	100.91kPa

Calibration Technician :	Jeff Yu	**Secondary Check:**	Harrison Kim
Calibration Date :	2 Jun 2021	**Report Issue Date :**	2 Jun 2021

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.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2013.

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
125Hz	*±0.12dB*	*Temperature*	*±0.2°C*
1kHz	*±0.11dB*	*Relative Humidity*	*±2.4%*
8kHz	*±0.13dB*	*Barometric Pressure*	*±0.013kPa*
Electrical Tests	*±0.10dB*		

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.

NATA
WORLD RECOGNISED ACCREDITATION

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 C21341

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

Equipment Tested/ Model Number : Pulsar Model 106
Instrument Serial Number : 79631

Atmospheric Conditions
Ambient Temperature : 22.7°C
Relative Humidity : 47.5%
Barometric Pressure : 100.64kPa

Calibration Technician : Jeff Yu
Calibration Date : 26 May 2021
Secondary Check: Harrison Kim
Report Issue Date : 26 May 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	94.02	1000.40

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..

Least Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	*±0.14dB*	*Temperature*	*±0.2°C*
Frequency	*±0.09%*	*Relative Humidity*	*±2.4%*
Distortion	*±0.09%*	*Barometric Pressure*	*±0.015kPa*

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

* The tests <1000 kHz are not covered by Acoustic Research Labs Pty Ltd NATA accreditation.

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 2

Annual Groundwater Monitoring Review 2022

(No. of pages including blank pages = 114)

Australasian Groundwater & Environmental Consultants

Report on

Yancoal – Ashton Coal Annual Groundwater Monitoring Review 2022

Prepared for
Ashton Coal Operations Pty Ltd

Project No. ASH5005.001
March 2023

ageconsultants.com.au

ABN 64 080 238 642

Document details and history

Document details

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Document status and review

Edition	Comments	Author	Authorised by	Date
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Yancoal – Ashton Coal
Annual Groundwater Monitoring Review 2022

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 Pike's Gully Seam (PG), the Upper Liddell (ULD) and the Upper Lower Liddell Seams (ULLD). Mining of the Upper Lower Liddell Seam (ULLD) commenced July 2017, extraction of longwall panel LW206A (within the ULLD) commenced in early January 2022 and was completed in early October 2022. Mining in LW206B commenced in mid-November 2022.

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

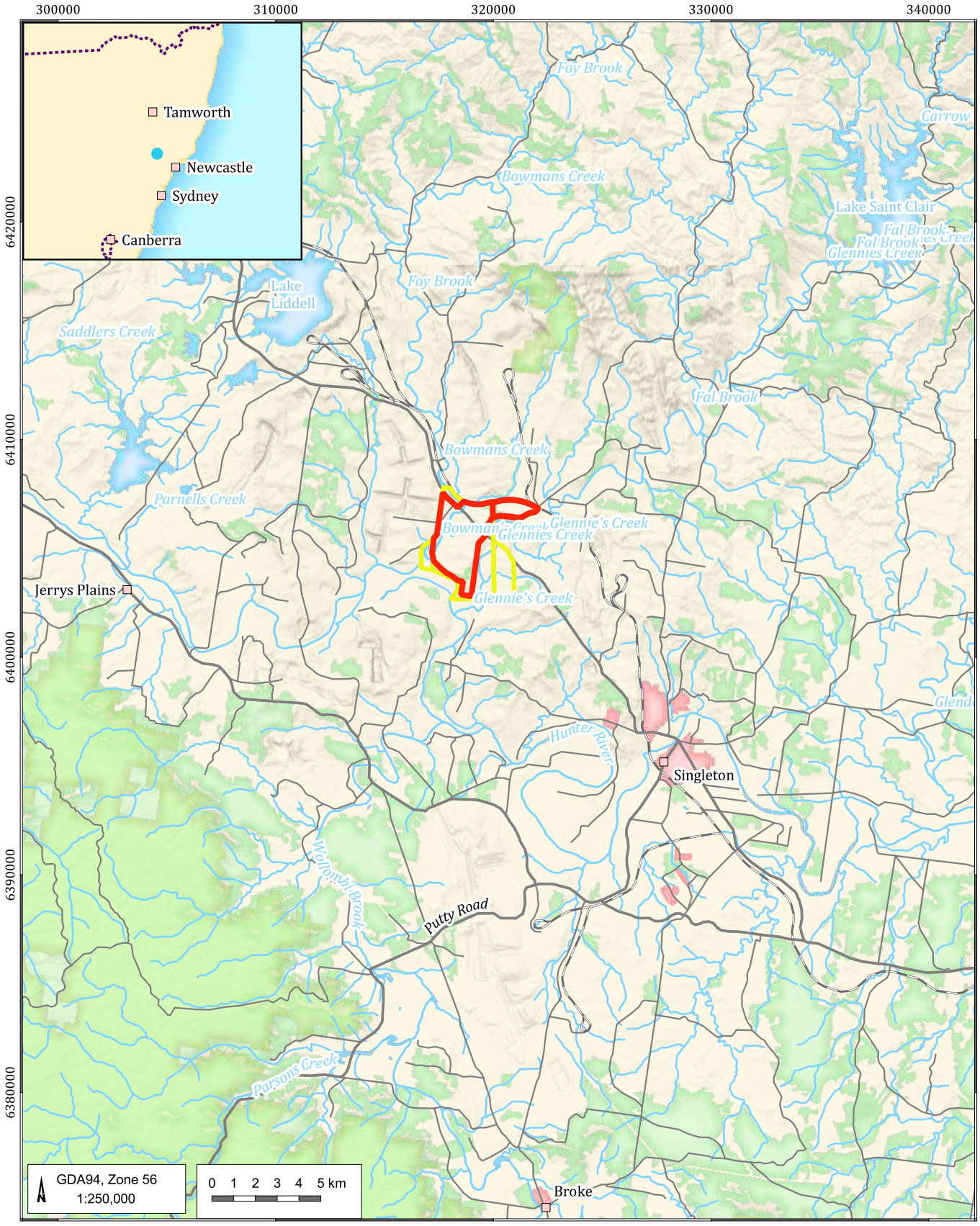
The ACOL development consent (DA 309-11-2001-i) last modified July 2022 requires that groundwater be monitored for potential impacts from mining. In 2018, the Department of Planning and Environment (DPE) approved the current Water Management Plan (WMP; Ashton document HSEC Management System Plan Doc. 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 2022 to December 2022. The aim of this report is to provide a consolidated summary of groundwater conditions at ACP throughout 2022.

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 (ASH5005.001)

Study area location

AGE

DATE 09/02/2023

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 LW206A began in January 2022 and ended in October 2022. Mining is currently in LW206B, which began in November 2022. LW206 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 LW206, 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 18 years of rainfall data for the period 1 July 2005 to present, while the Bulga (South Wambo) station has 64 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 2022 is presented in Table 2.1. Rainfall at Ashton increased in 2022 compared to the previous year, with above average rainfall recorded for all months, with the exception of April, June and December (Table 2.1). Rainfall at the Bulga (South Wambo) station was below average for five months during 2022 (January, February, April, June, and December).

Table 2.1 Average Monthly Rainfall 2022 – 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	66.6	105%	74.9	92.80
Feb	112.8	132%	62.2	69.45
Mar	393.6	338%	340.6	361.60
Apr	37.8	69%	38.5	81.57
May	38.8	116%	55.6	237.42
Jun	22.4	34%	9.6	14.39
Jul	250.8	603%	203.6	737.35
Aug	251.8	574%	61.4	204.24
Sep	252.8	480%	67.3	159.83
Oct	144.4	264%	112.6	226.96
Nov	85.2	100%	121.2	149.31
Dec	117.4	167%	16	20.13

An evapotranspiration (ET) rate of 1301.8 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 above average rainfall for 2022, 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 LW206A/LW206B 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	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.

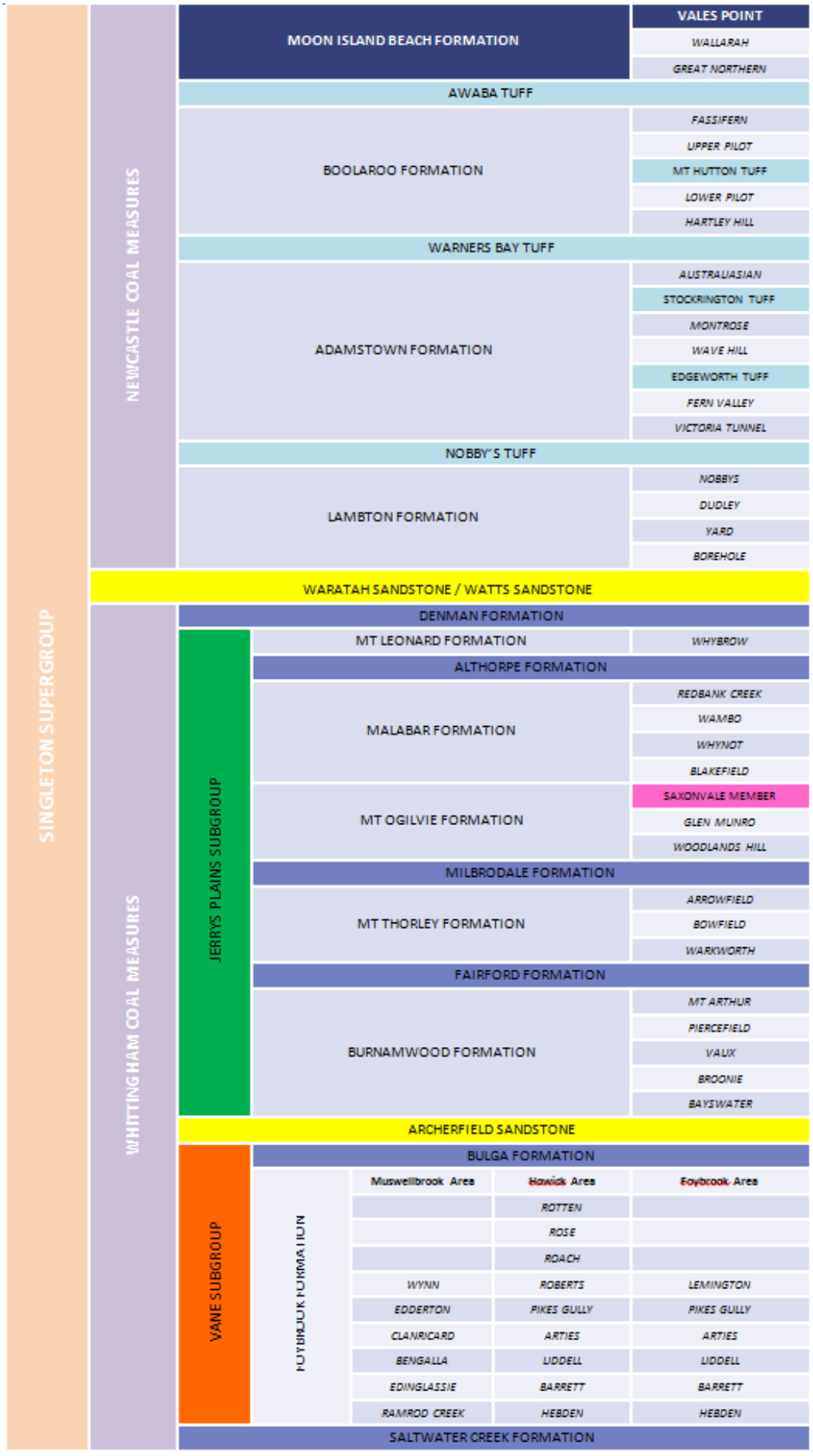


Figure 2.2 Singleton Super Group sequence stratigraphy (AGE, 2016)

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.

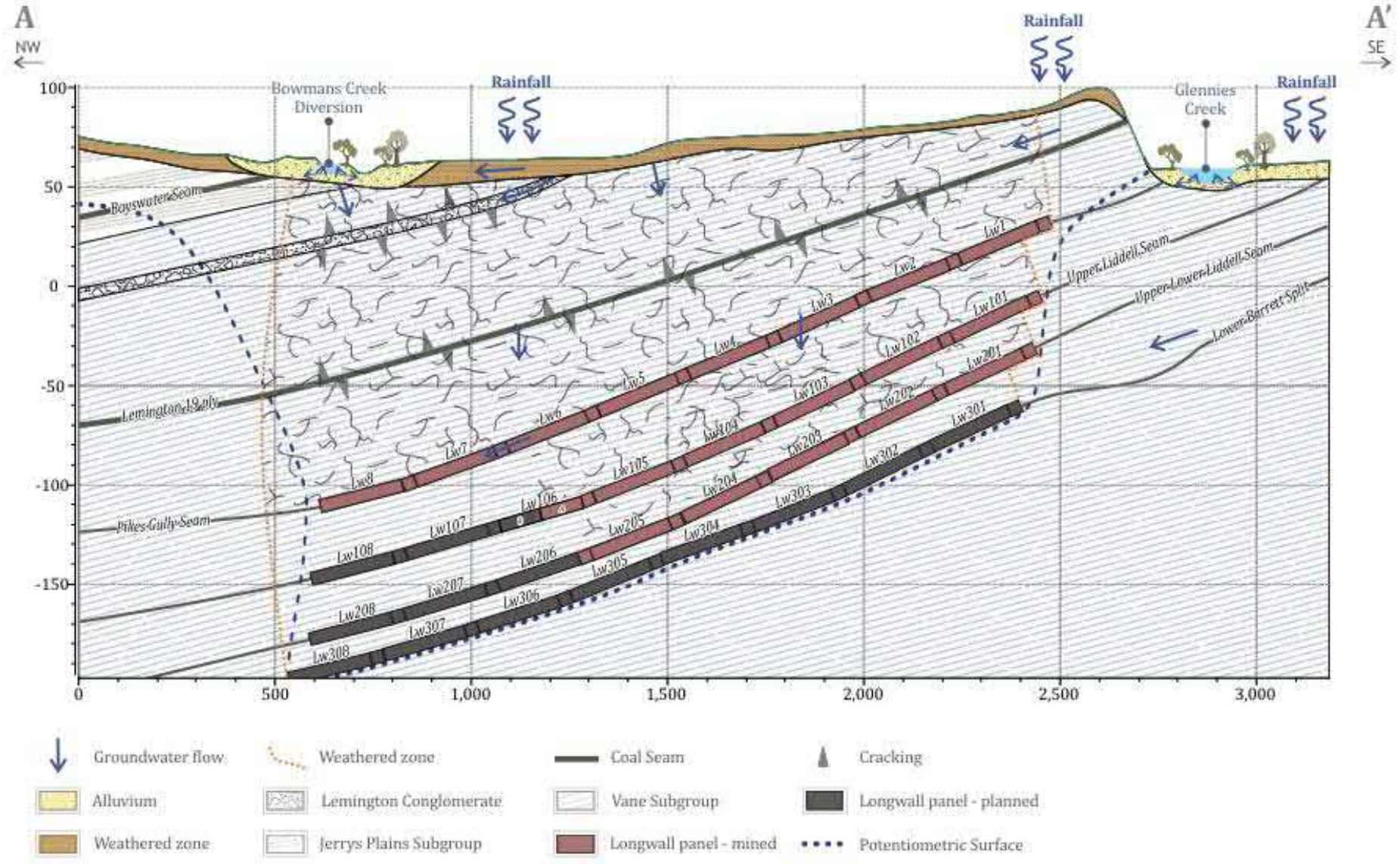


Figure 2.3 Conceptual hydrogeology – north-west to south-east – not to scale

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).

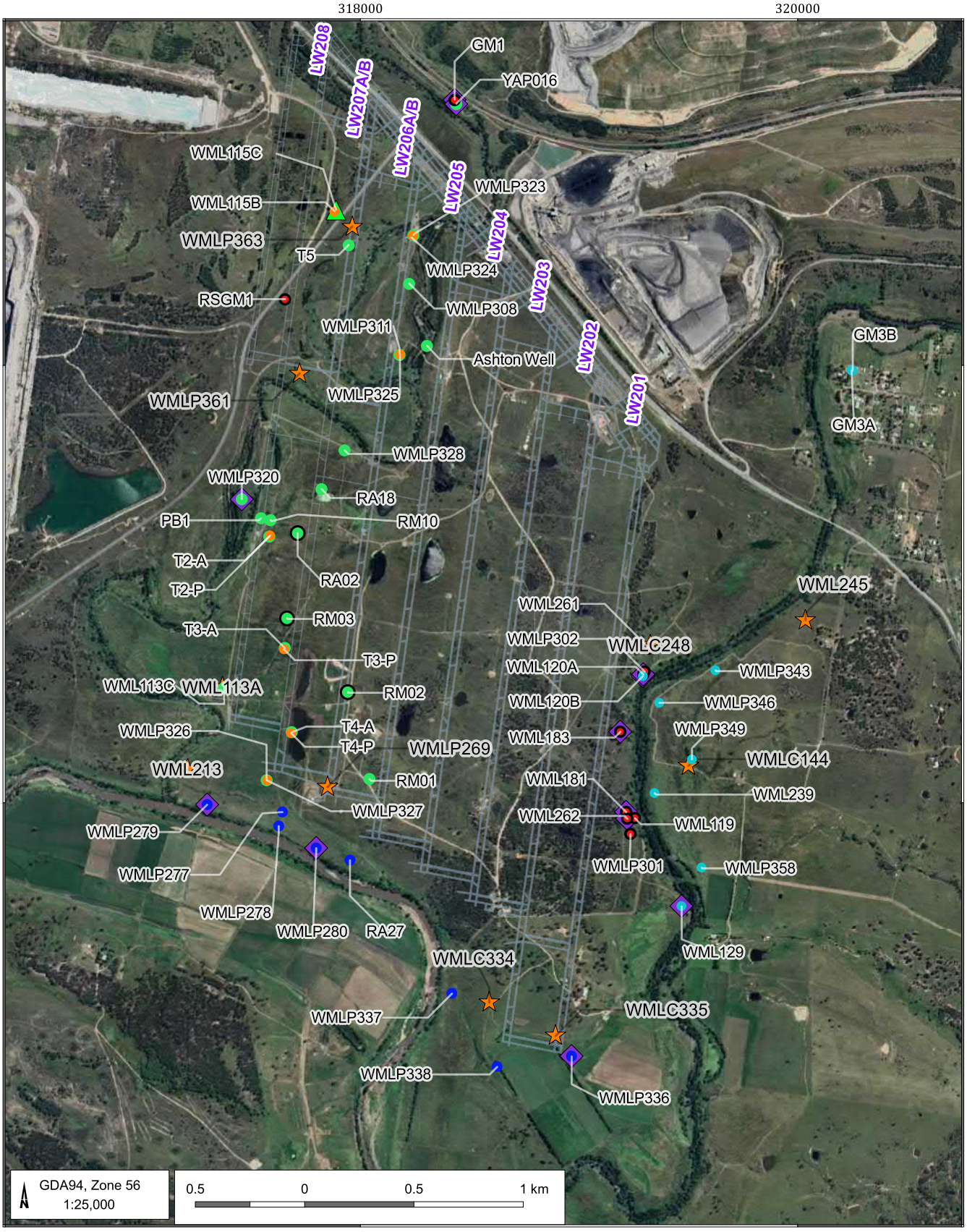
The groundwater monitoring program includes the monitoring of:

- 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 - AGMR 2022 (ASH5005.001)

WMP groundwater monitoring network

AGE

DATE 09/02/2023

FIGURE No: **3.1**

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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 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 2022 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 2022 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 2022, groundwater sampling was conducted by AGE Hydrogeologists Jordan Reeds and Edward Hunt.

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 2022:

- Excepting an increase in March and June, BCA regulatory bore groundwater elevations were stable throughout 2022 (Figure 4.1). All BCA groundwater elevations remained above established triggers in 2022. 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;
- Excepting an increase during the March and August monitoring period, GCA groundwater elevations were generally stable throughout the year (Figure 4.2 and Figure 4.3). Increases in groundwater elevation followed higher than average rainfall, indicated by an increasing CRD. All GCA groundwater elevations remained above established triggers in 2022;
- HRA regulatory bore groundwater elevations were relatively steady throughout the year. Increased water elevations in HRA regulatory bores were recorded in the March, June, and October monitoring periods, following heavy rainfall (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 2022; and
- Surface water elevation has continuously been recorded in Bowmans Creek throughout 2022. Large increases in surface water elevation during March and the August to mid-November period can be attributed to heavy rainfall in the region (Figure 4.5). The Glennies Creek water elevation was relatively stable throughout the year, with sharp increases in water elevation recorded after heavy rainfall. Hunter River recorded large increases in water elevation in March and the August to mid-November period following high rainfall. Hunter River water elevation remained stable throughout periods of low rainfall.

The site area experienced average rainfall from March to June 2022, as indicated by a stable CRD. An increasing CRD from January to March and July to November 2022 indicates periods of significant rainfall in the region. Increased groundwater elevation in BCA, GCA and HRA regulatory bores in the April and August monitoring periods is attributed to these periods of above 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

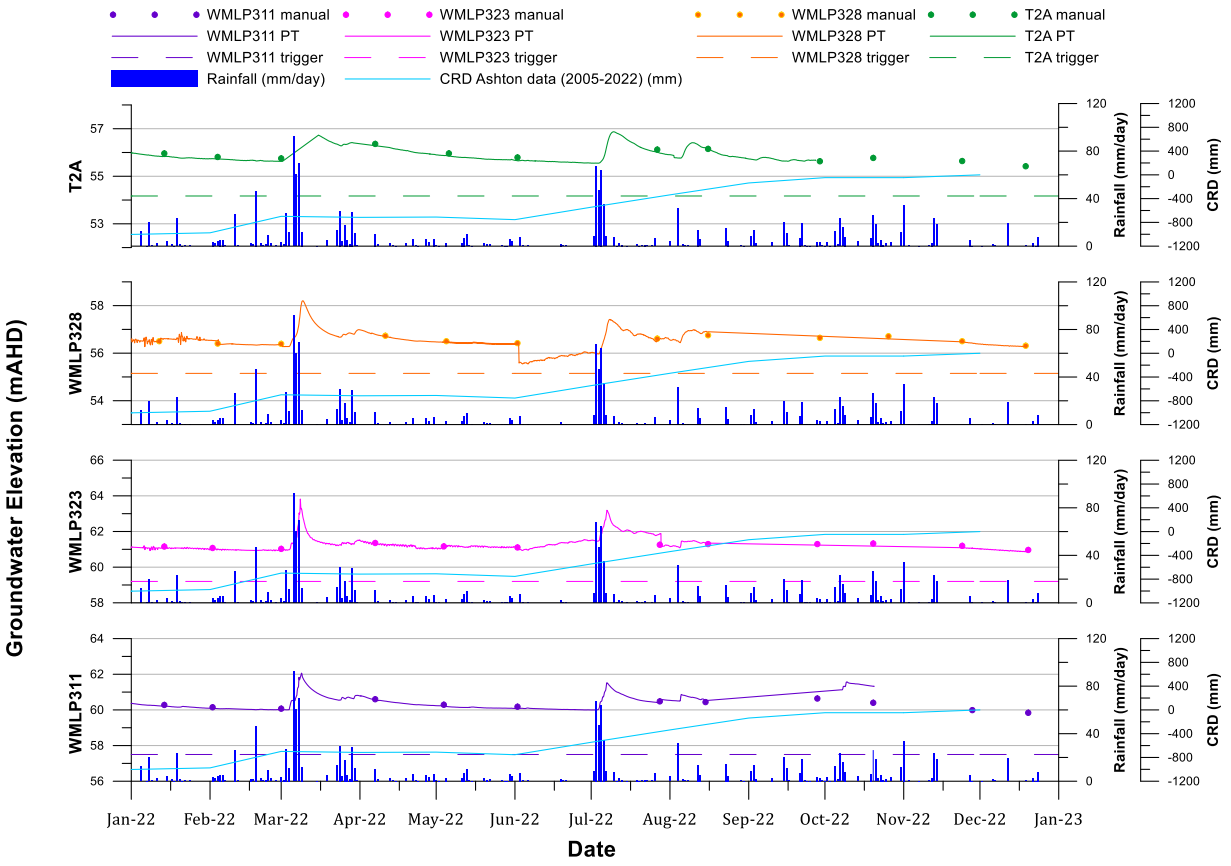

Figure 4.1 Bowmans Creek alluvium trigger bore hydrographs

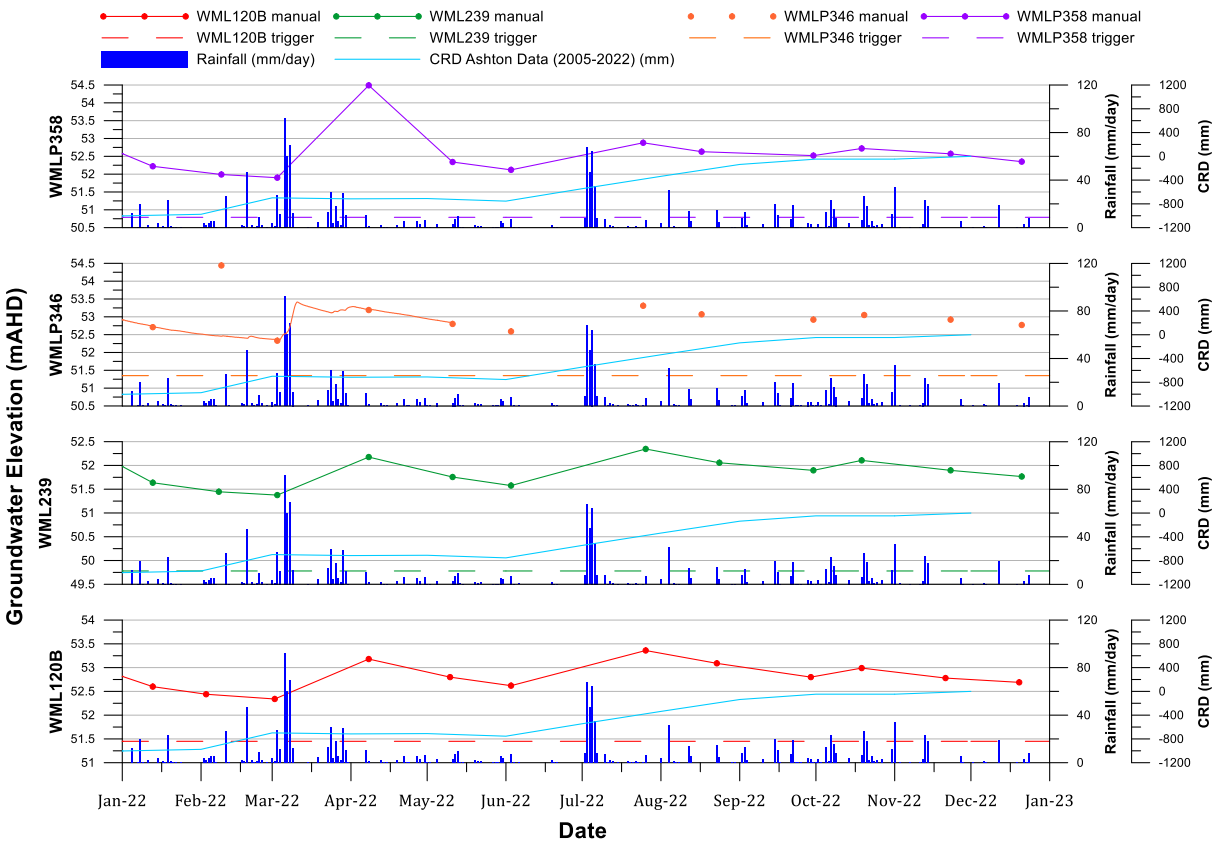

Figure 4.2 Glennies Creek alluvium trigger bore hydrographs (1)

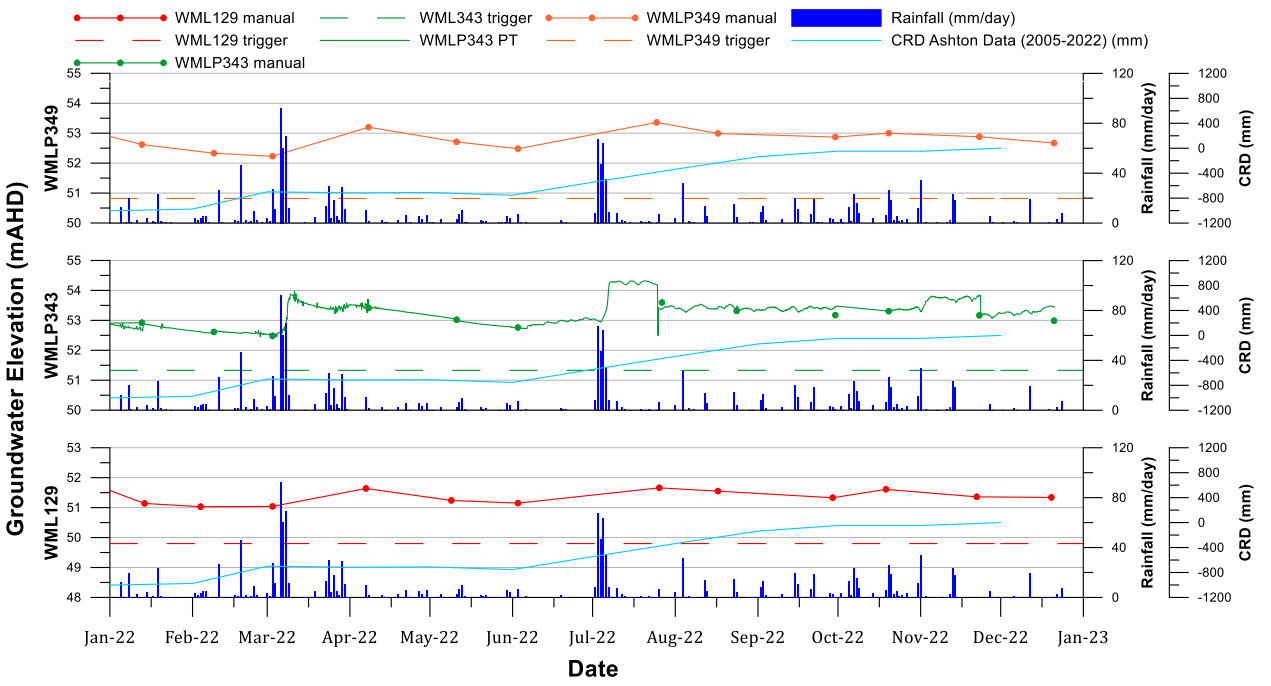

Figure 4.3 Glennies Creek alluvium trigger bore hydrographs (2)

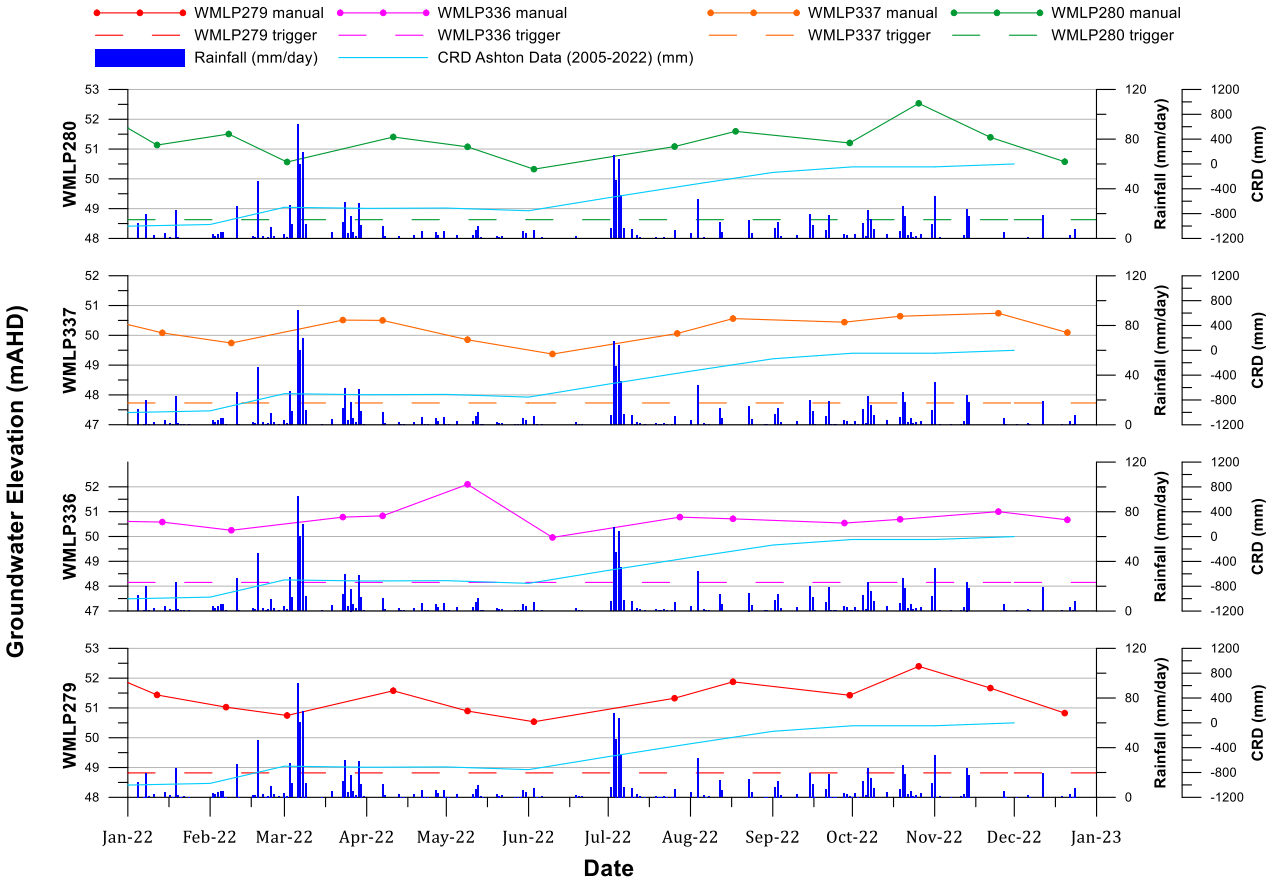

Figure 4.4 Hunter River alluvium trigger bore hydrographs

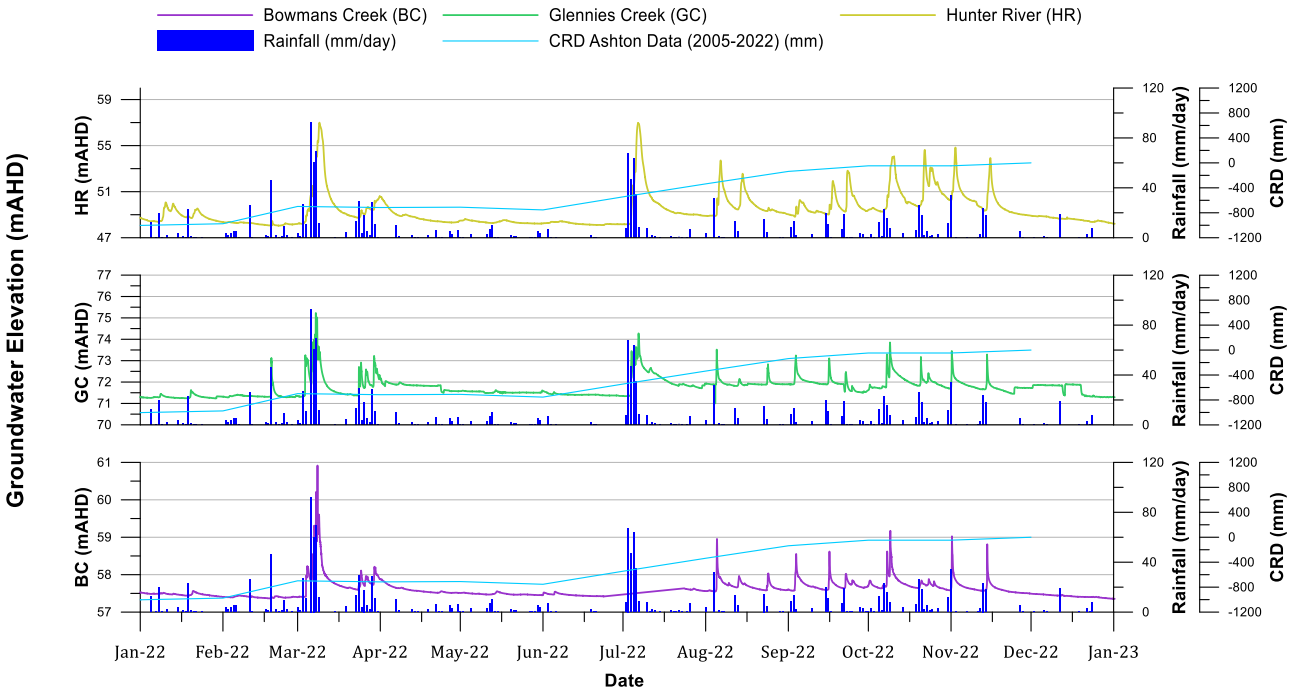

Figure 4.5 Surface water level hydrographs

4.1.2 Other alluvium groundwater levels

Groundwater elevation trends observed in 2022 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 generally stable groundwater elevations. Increased groundwater elevation was observed in March, July, and the August to mid-November period in response to increased rainfall. Bores RA18, RM02 and T4A were intermittently inaccessible due to ponded surface water. Non-regulatory HRA bores varied in response to increased rainfall throughout 2022, but remained stable overall. No mining impacts outside of predictions are noted.

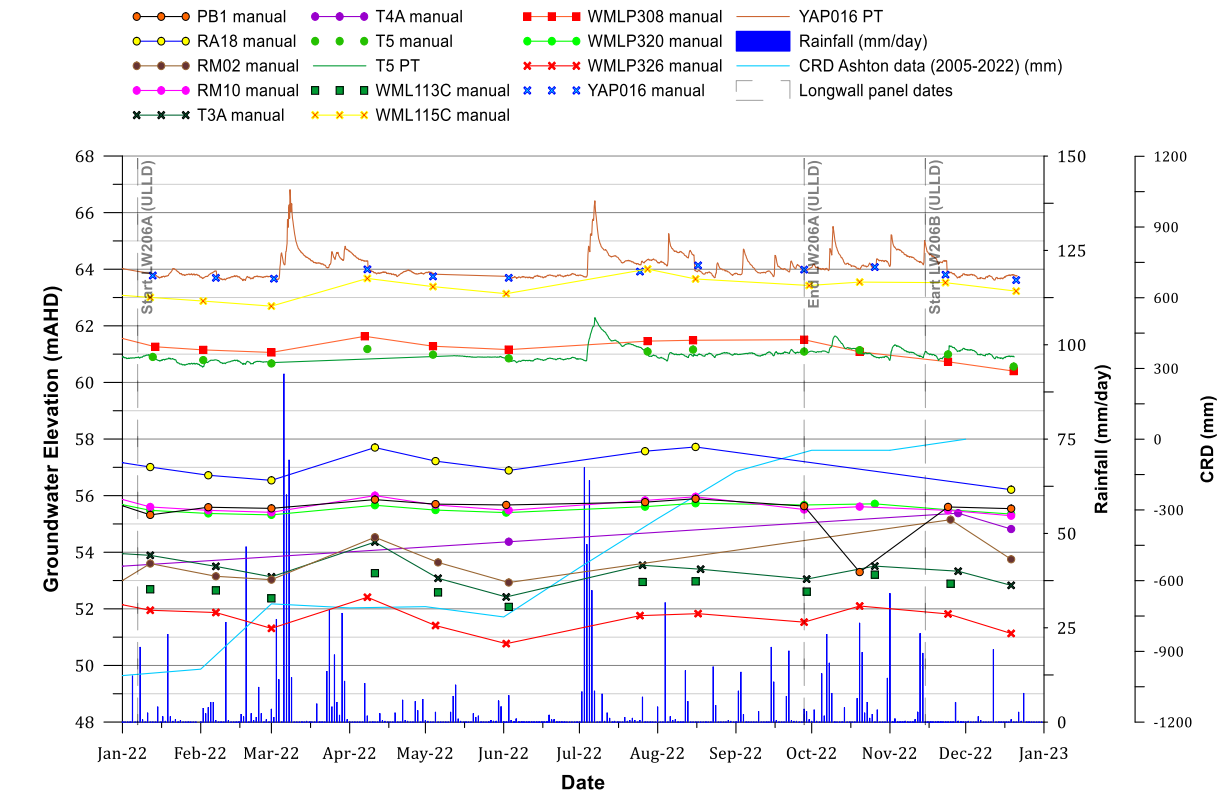

Figure 4.6 Other Bowmans Creek alluvium monitoring bore hydrographs

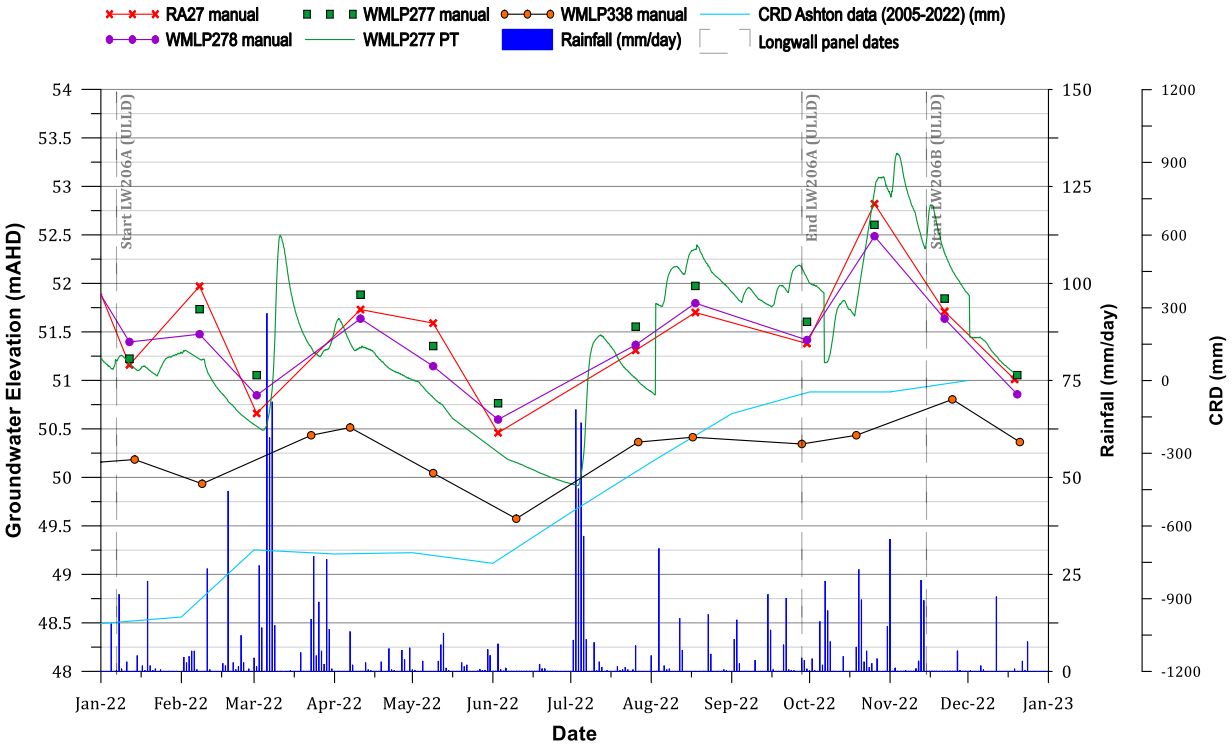

Figure 4.7 Other Hunter River alluvium monitoring bore hydrographs

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 2022, 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 2022. 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 2022. Multiple bores recorded an exceedance of pH trigger values throughout the year.

- WMLP328 in January;
- WMLP323 in March;
- WMLP311 in May;
- WMLP343 in January, February and March;
- WML129 in January to April;
- WMLP358 in January and February; and
- WMLP349 in January through to July.

WML129, WMLP343, WMLP349 and WMLP358 all exceeded pH trigger criteria on three or more consecutive occasions (the first exceedance for WMLP358 occurring in December 2021) and the cause of the exceedances were investigated (AGE, 2022). 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 2022, 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 2022 were:

- BCA – pH 6.38 (T5) to pH 7.19 (WMLP326);
- GCA – pH 6.18 (WMLP358) to pH 7.45 (WML129); and
- HRA – pH 6.21 (WMLP336) to pH 7.26 (WMLP337).

Groundwater EC was fresh to slightly brackish across the BCA, GCA and HRA regulatory monitoring network in 2022; mirroring the conditions in previous years. Two bores exceeded EC trigger criteria in 2022, WMLP279 in May and June (two consecutive exceedances only); and WMLP358 from July to December (>3 consecutive exceedances). Investigations into EC (and pH) trigger levels and EC exceedances for 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.

BCA monitoring bores recorded overall stable EC values during 2022 with a few exceptions. WML113C and WMLP311 recorded steadily declining trends in EC throughout the monitoring period. YAP016 recorded steadily increasing EC values throughout 2022 until December, where EC sharply decreased. Monitoring bore WMLP308 and WMLP320 EC values steadily decreased throughout the year.

Groundwater EC in GCA monitoring bores was relatively stable in 2022, the exception being WML120B, WMLP346 and WMLP358 in which EC values slightly increased throughout the year. A rapid increase in groundwater EC in WML120B occurred in July 2022 following heavy rainfall, with EC values rapidly declining thereafter.

HRA monitoring bores recorded varying trends in EC values throughout 2022. Groundwater EC in WMLP337 and WMLP278 steadily decreased throughout the year while EC values in WMLP338 increased in 2022. EC values in remaining HRA monitoring bores remained overall stable over the past year. EC values in

WMLP279 exceeded the derived trigger value for EC in May and June 2022 (two exceedances), remaining below the trigger threshold for the rest of the year.

For alluvial bores, the observed EC ranges in 2022 were:

- BCA – 507 µS/cm (WMLP323) to 3,561 µS/cm (T3A);
- GCA – 323 µS/cm (WMLP358) to 1,363 µS/cm (WML120B); and
- HRA – 444 µS/cm (WMLP280) to 3,124 µS/cm (WMLP337).

River and creek EC levels (sourced from the WaterNSW online database) were also examined during 2022. Bowmans Creek, Glennies Creek, and the Hunter River recorded stable EC values from mid-April to late June. EC values dropped sharply following multiple heavy rainfall events throughout January to April and August to mid-November, recovering rapidly thereafter. Hunter River EC oscillated over the course of 2022, with fluctuations remaining within historic ranges.

The major ion content of each alluvial system was also assessed in 2022 as shown in the classification table and Piper diagram from August 2022 (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.

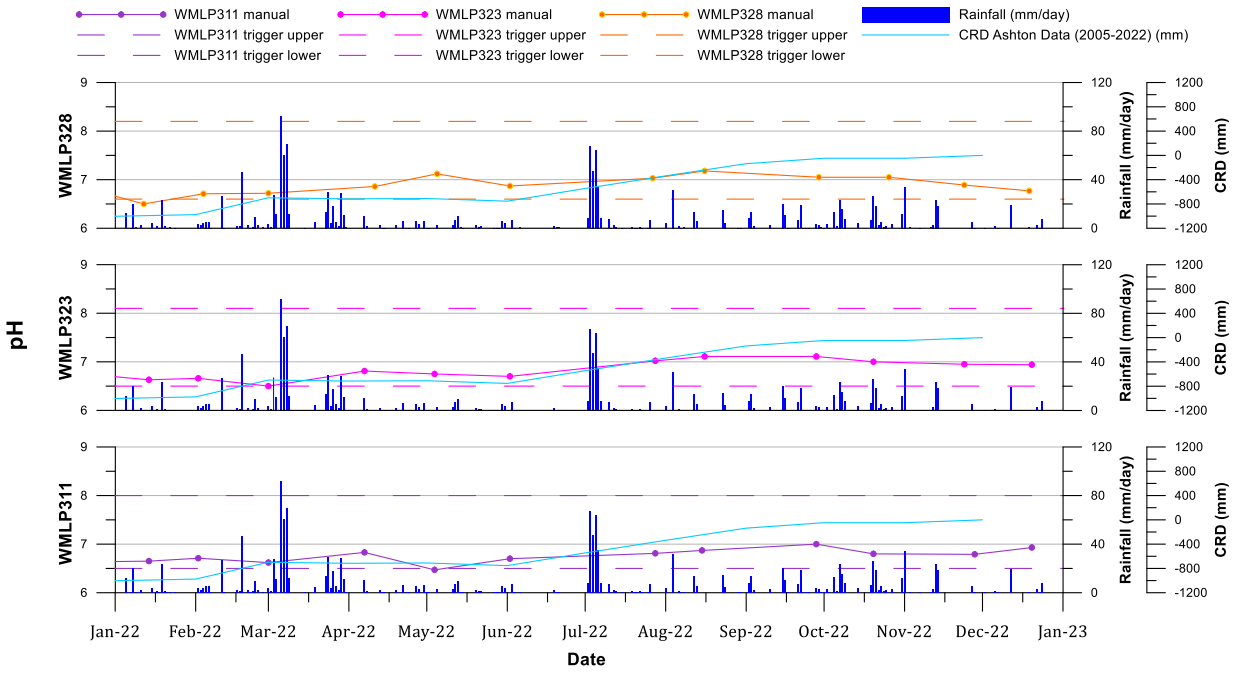

Figure 4.8 Bowmans Creek alluvium trigger bore pH trends (1)

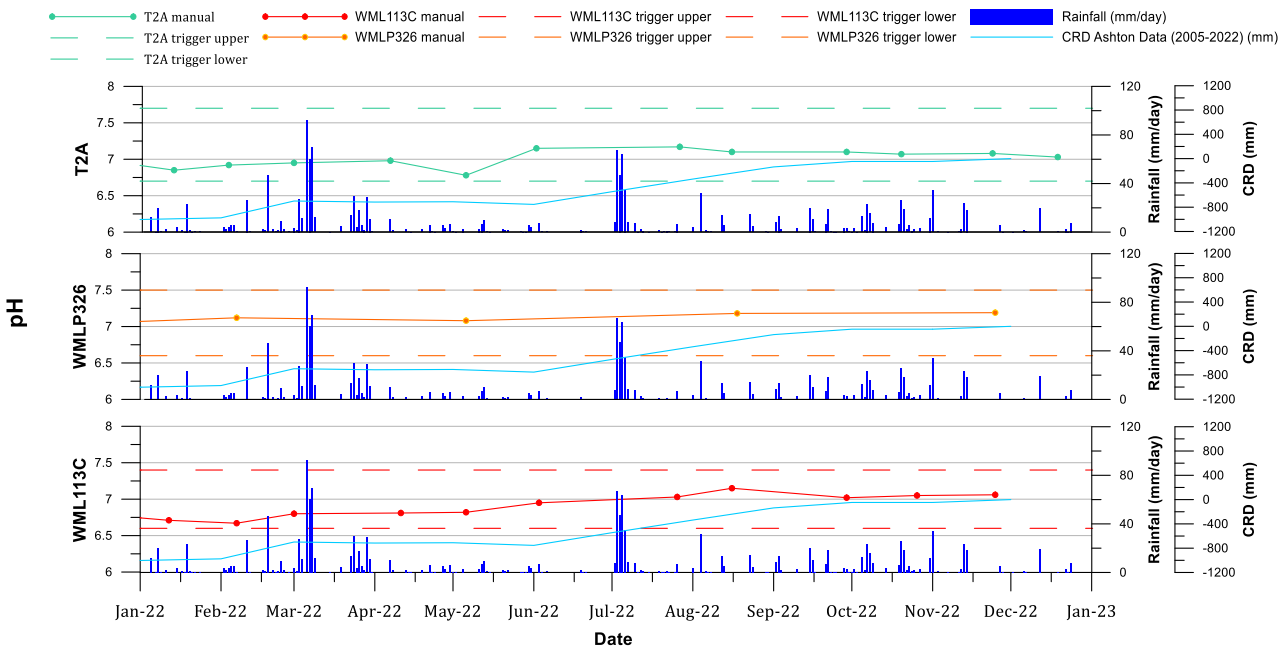

Figure 4.9 Bowmans Creek alluvium trigger bore pH trends (2)

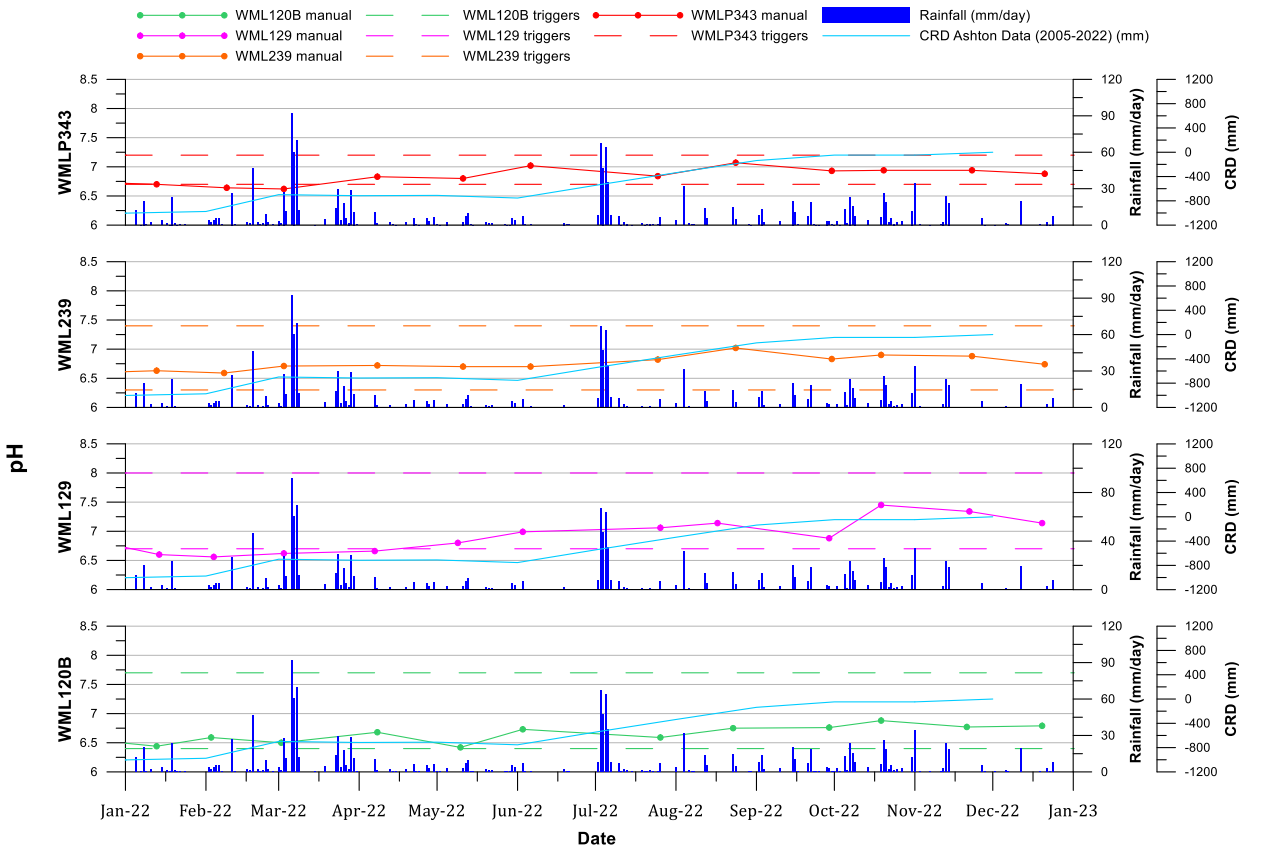

Figure 4.10 Glennies Creek alluvium trigger bore pH trends (1)

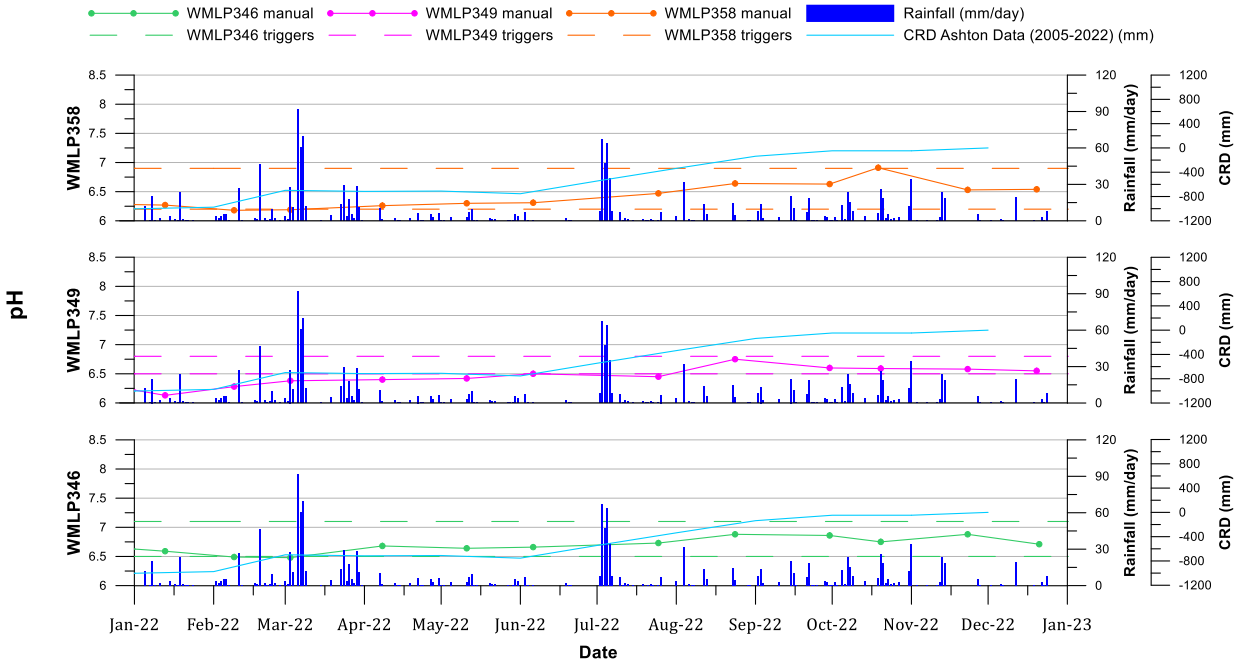

Figure 4.11 Glennies Creek alluvium trigger bore pH trends (2)

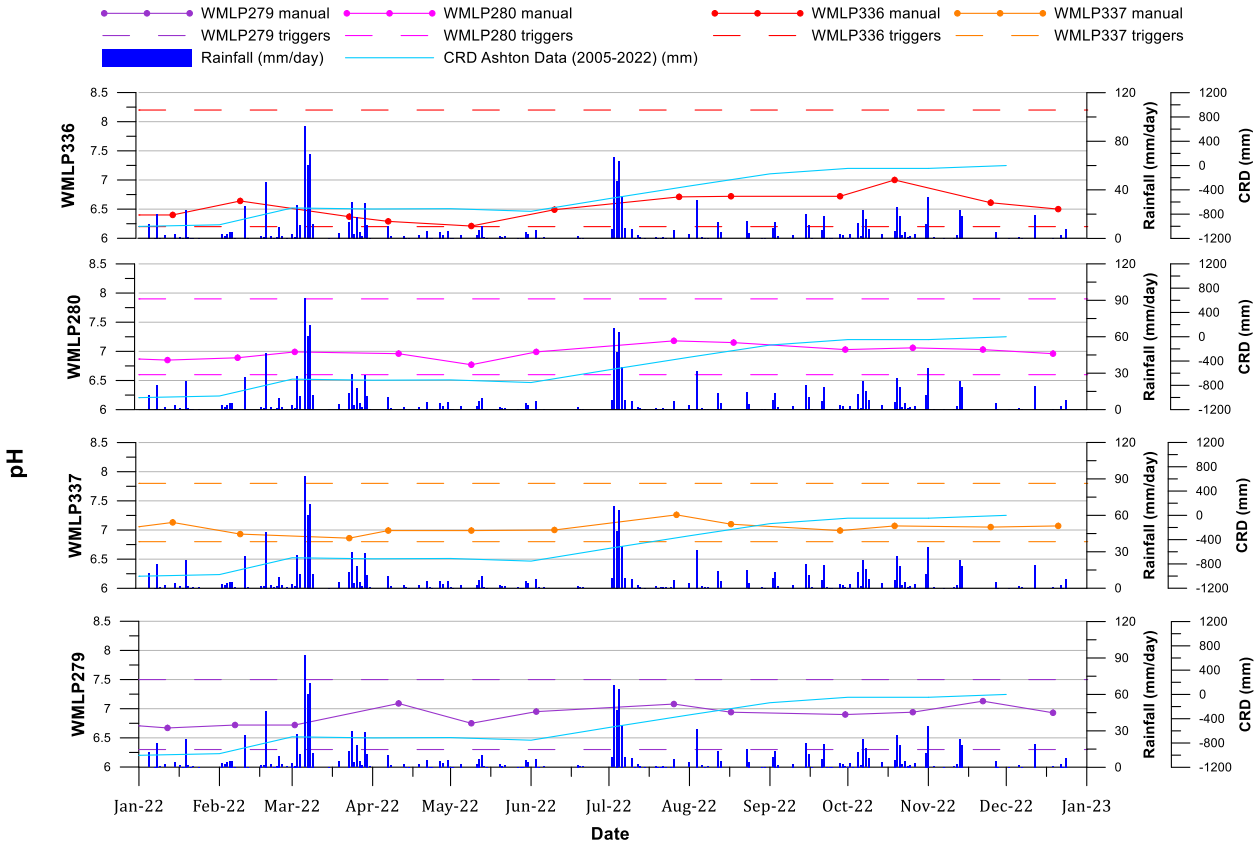

Figure 4.12 Hunter River alluvium trigger bore pH trends

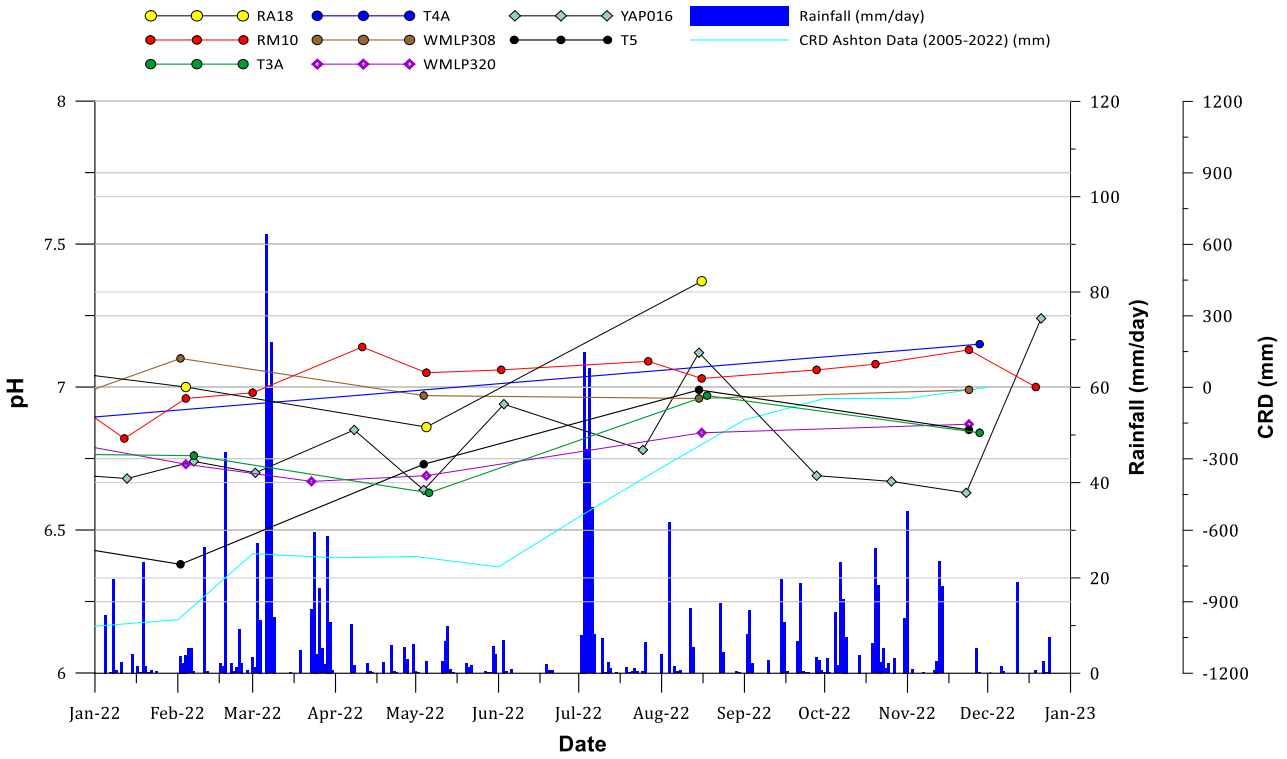

Figure 4.13 Other Bowmans Creek alluvium bore pH trends

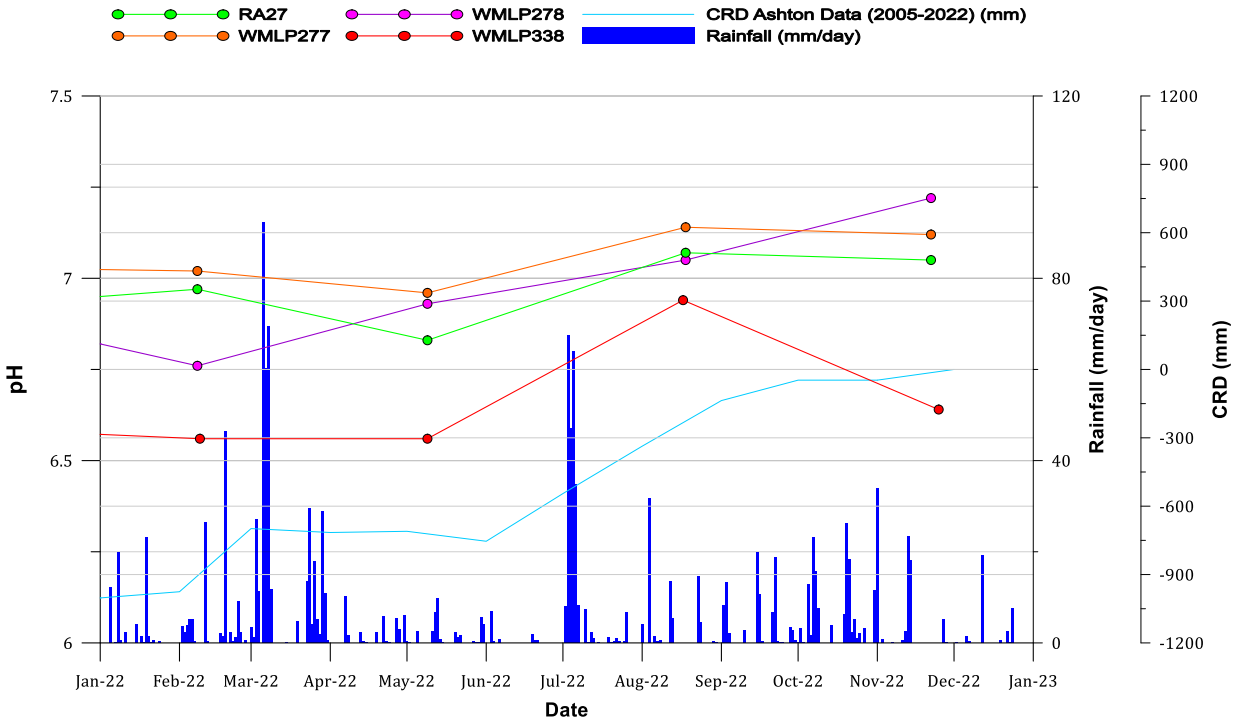

Figure 4.14 Other Hunter River alluvium bore pH trends

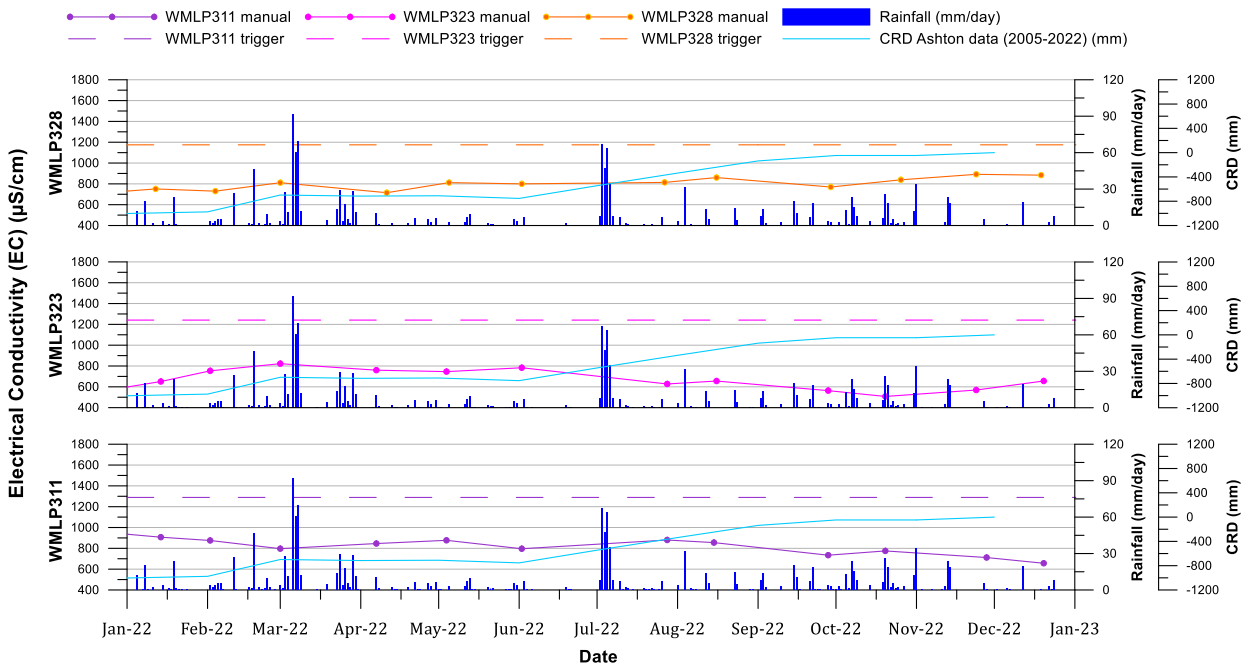

Figure 4.15 Bowmans Creek alluvium trigger bore EC trends (1)

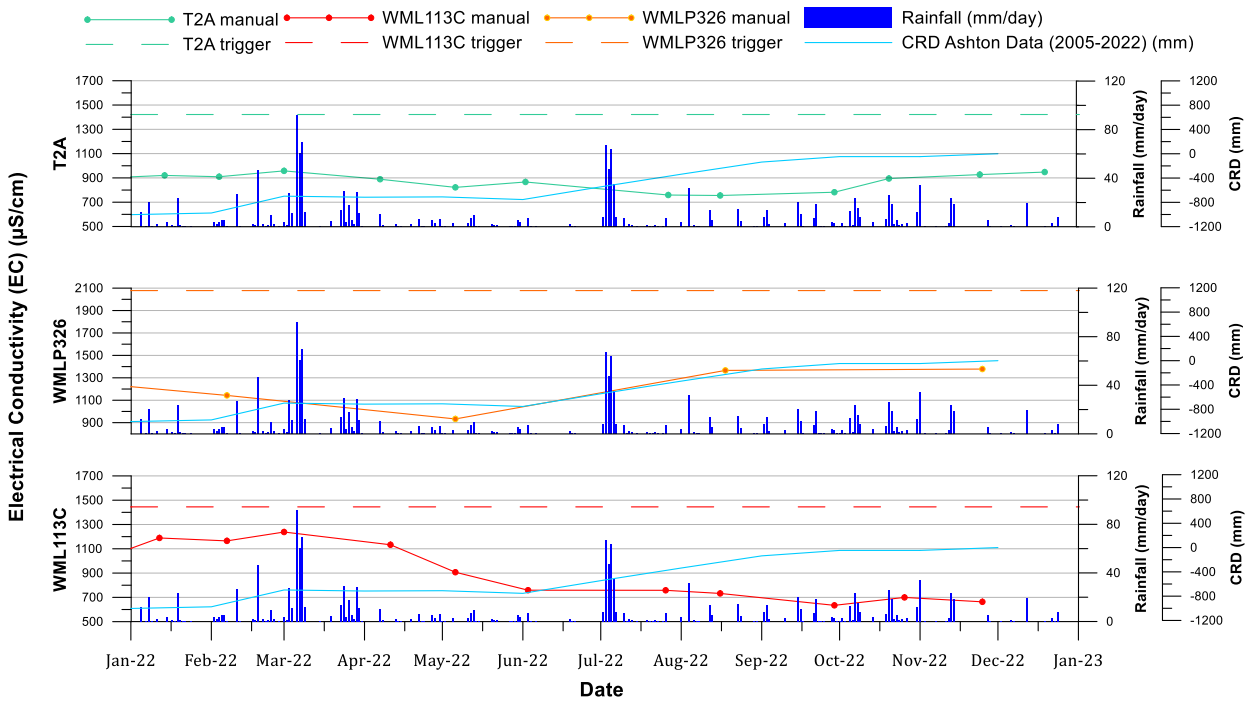

Figure 4.16 Bowmans Creek alluvium trigger bore EC trends (2)

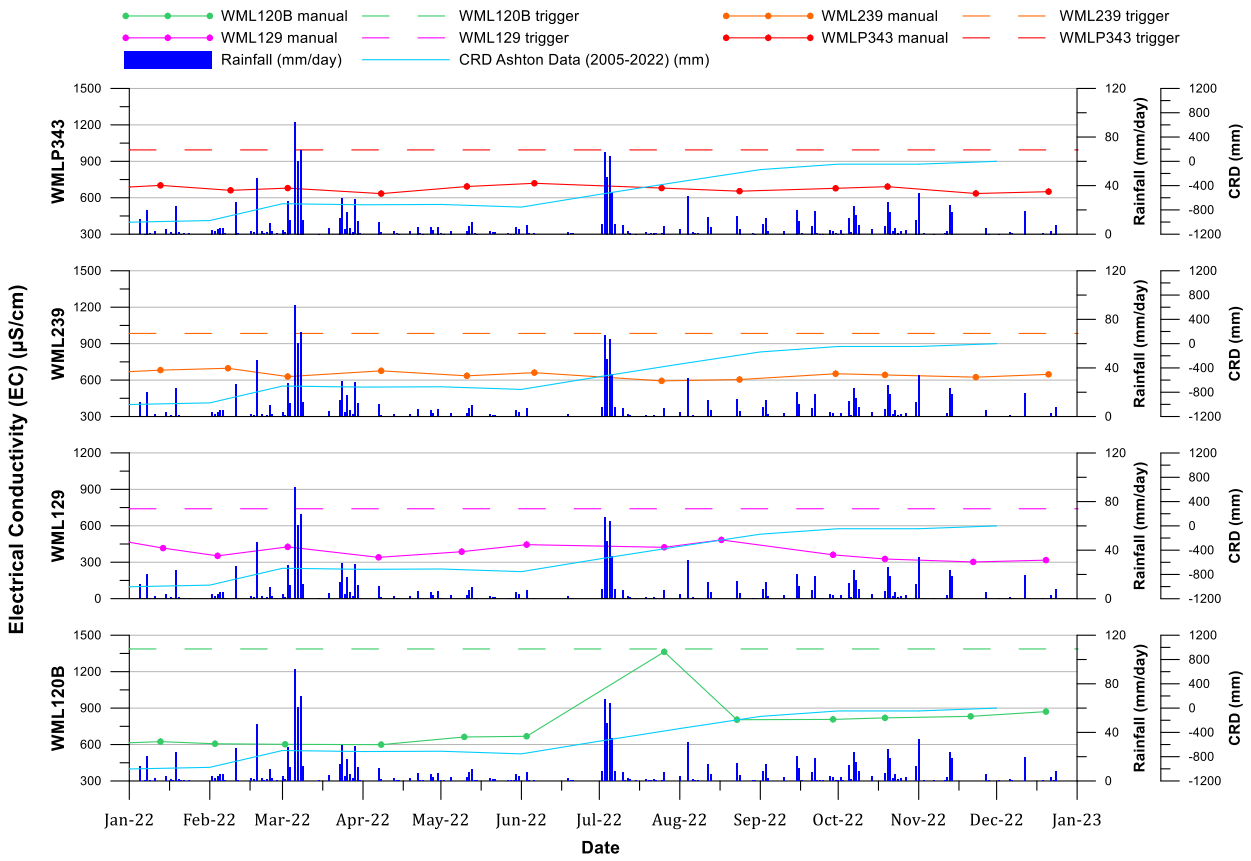

Figure 4.17 Glennies Creek alluvium trigger bore EC trends (1)

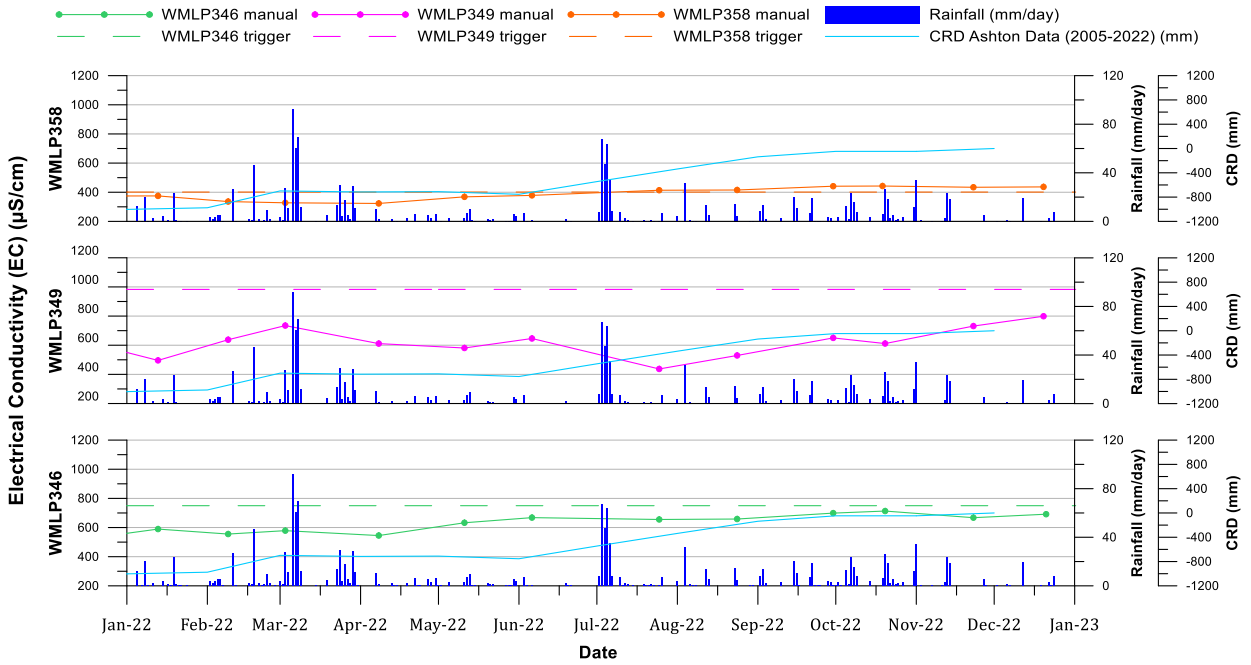

Figure 4.18 Glennies Creek alluvium trigger bore EC trends (2)

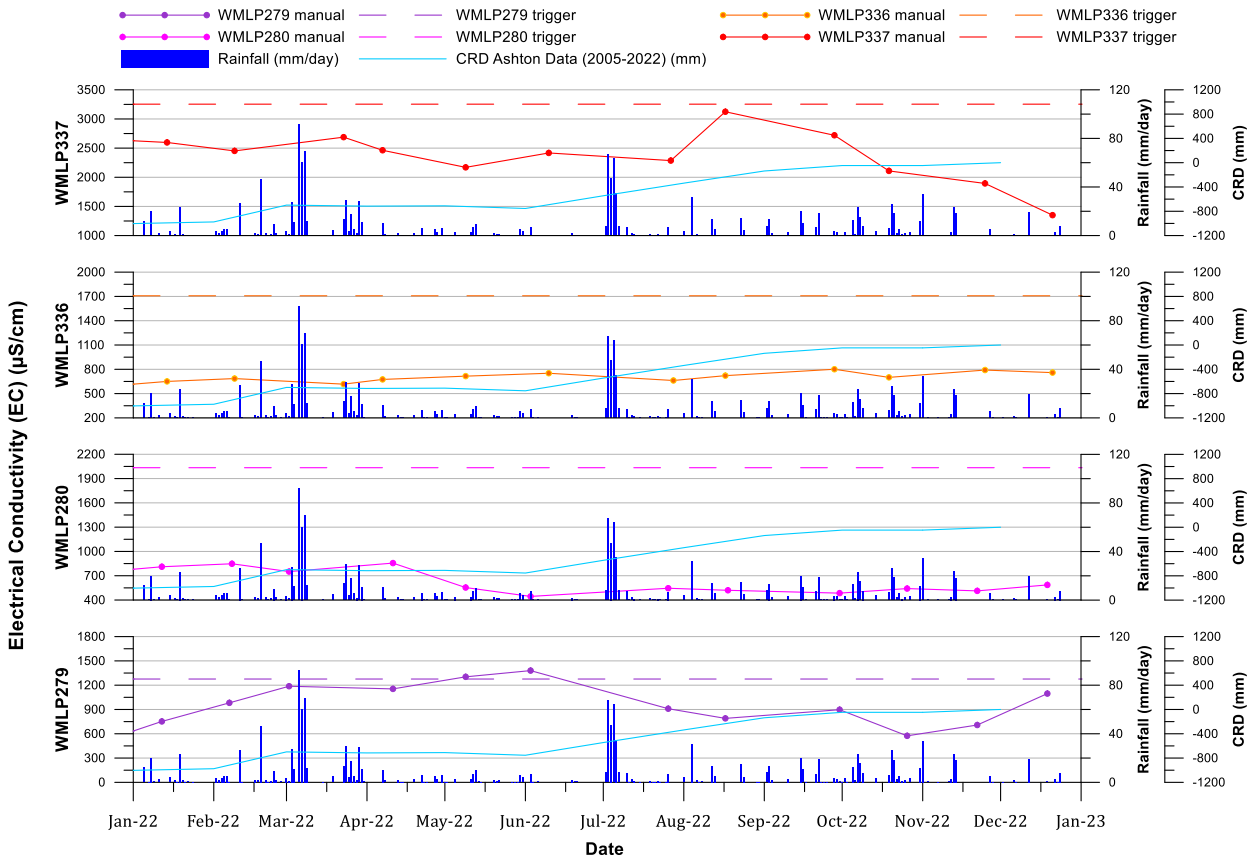

Figure 4.19 Hunter River alluvium trigger bore EC trends

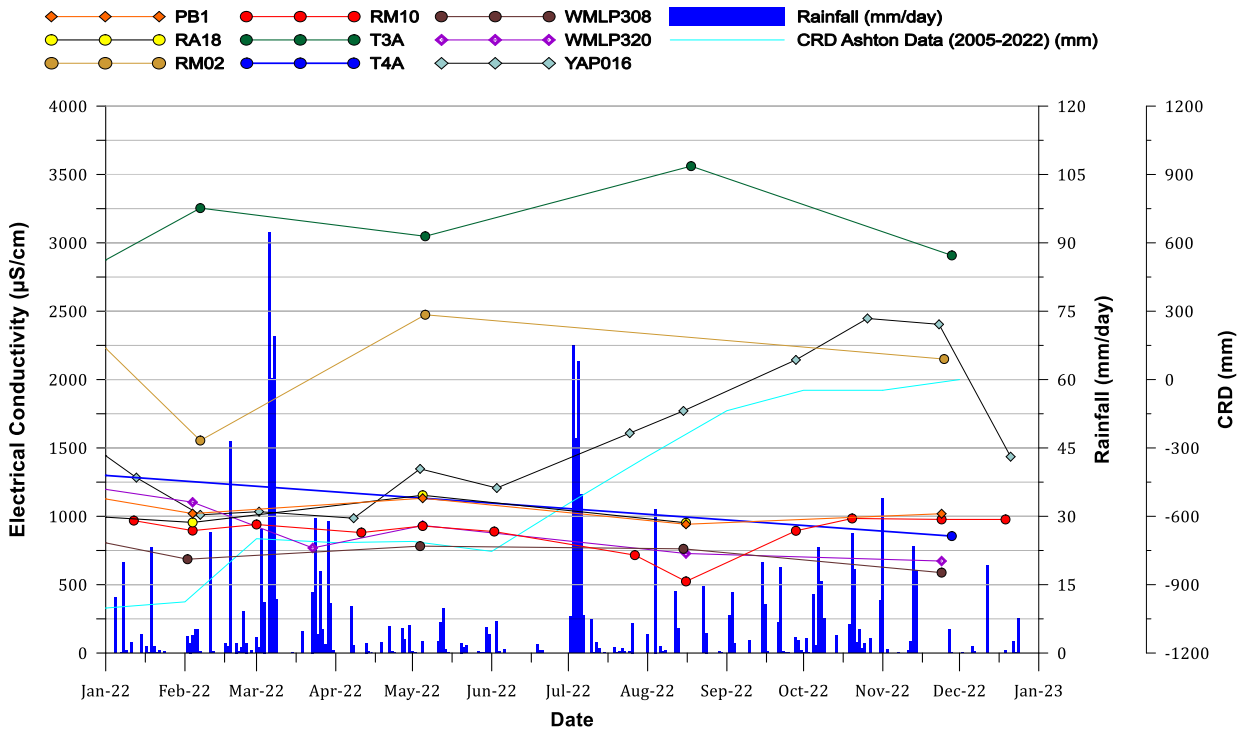

Figure 4.20 Other Bowmans Creek alluvium bore EC trends

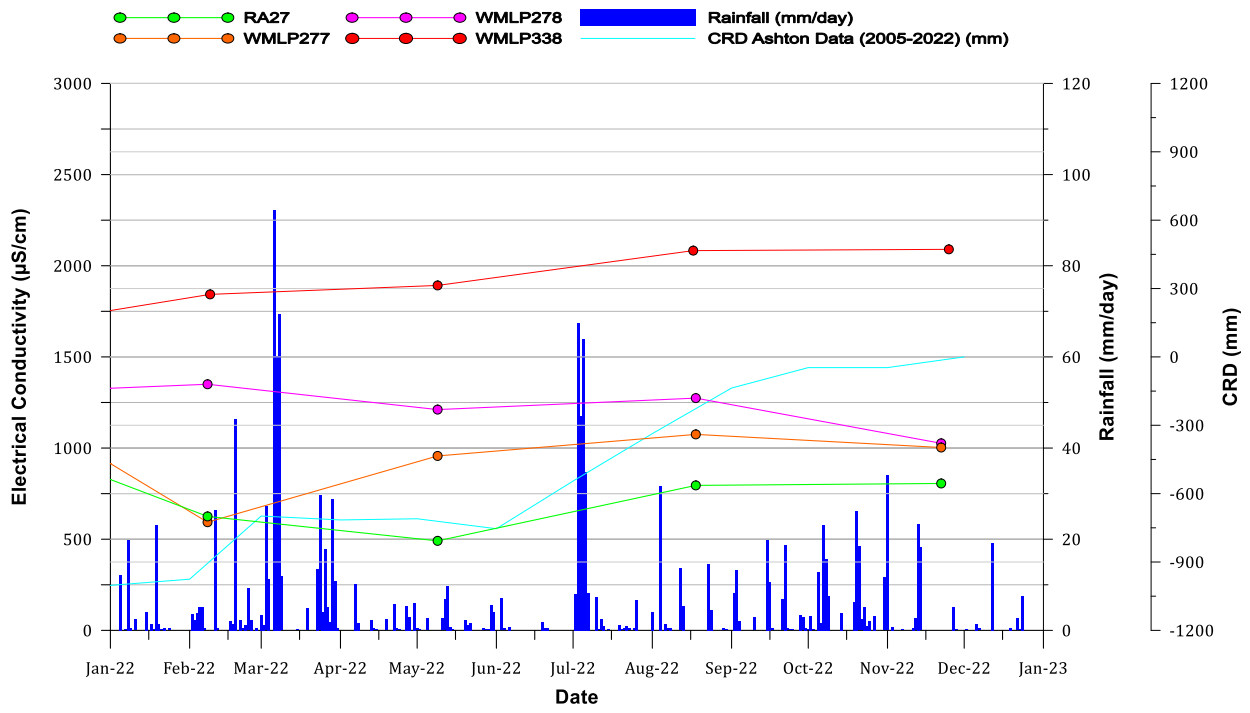

Figure 4.21 Other Hunter River alluvium bore EC trends

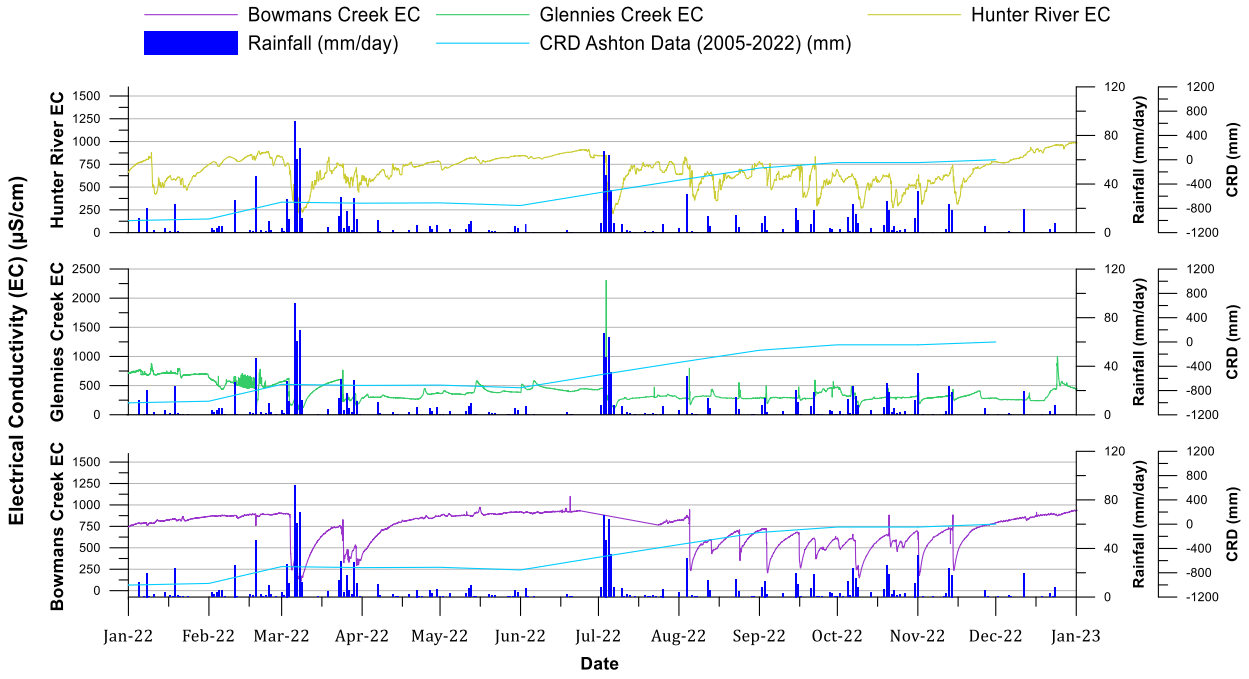

Figure 4.22 Surface water EC trends

4.1.4 Dissolved metals, select nutrients, turbidity and cyanide

Comprehensive lab analysis during August 2022 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. WMLP336 exceeded the P concentration trigger (0.8-12 mg/L), 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 2022. 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 2022:

- groundwater elevations were stable in coal measure bores throughout the year (Figure 4.23);
- groundwater elevation in CMOB bores generally remained stable in 2022. The increase in groundwater elevation correlates with the CRD trend (Figure 4.24);
- excepting WMLP325 in which groundwater elevations began to decline between October and December 2022, groundwater elevations in monitoring bores within the vicinity of LW206A/206B remained stable throughout the year (Figure 4.25);
- VWP measurements in WMLP269 (adjacent LW206A/206B) sensors at 30 m and 59 m were stable throughout the 2022 monitoring period. No pressure head in the remaining sensors (70 m, 97 m, 127 m and 147 m) has been recorded since July 2021. A replacement VWP nearby WMLP269 is planned in 2023 to record pressure head data down to the Lower Barrett Coal Seam; and
- coal measure and CMOB bores were not impacted by mining outside of predictions in 2022.

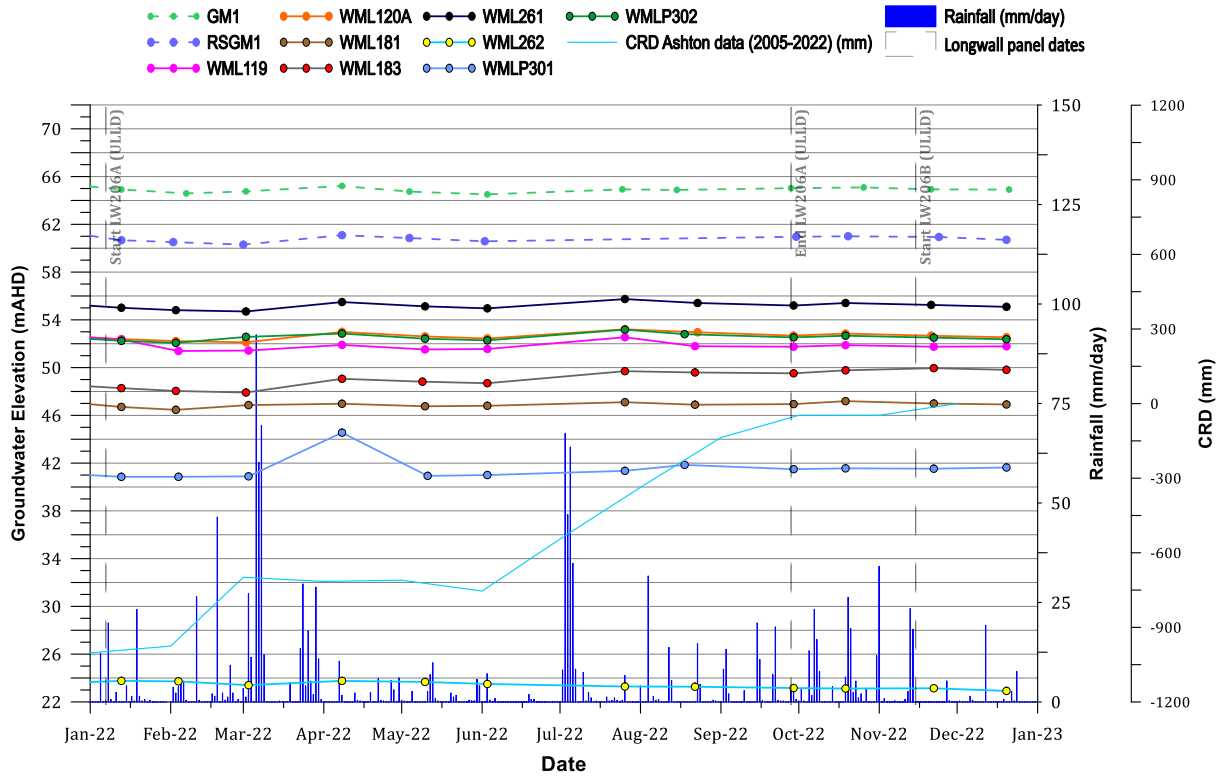

Figure 4.23 Coal measure bore hydrographs

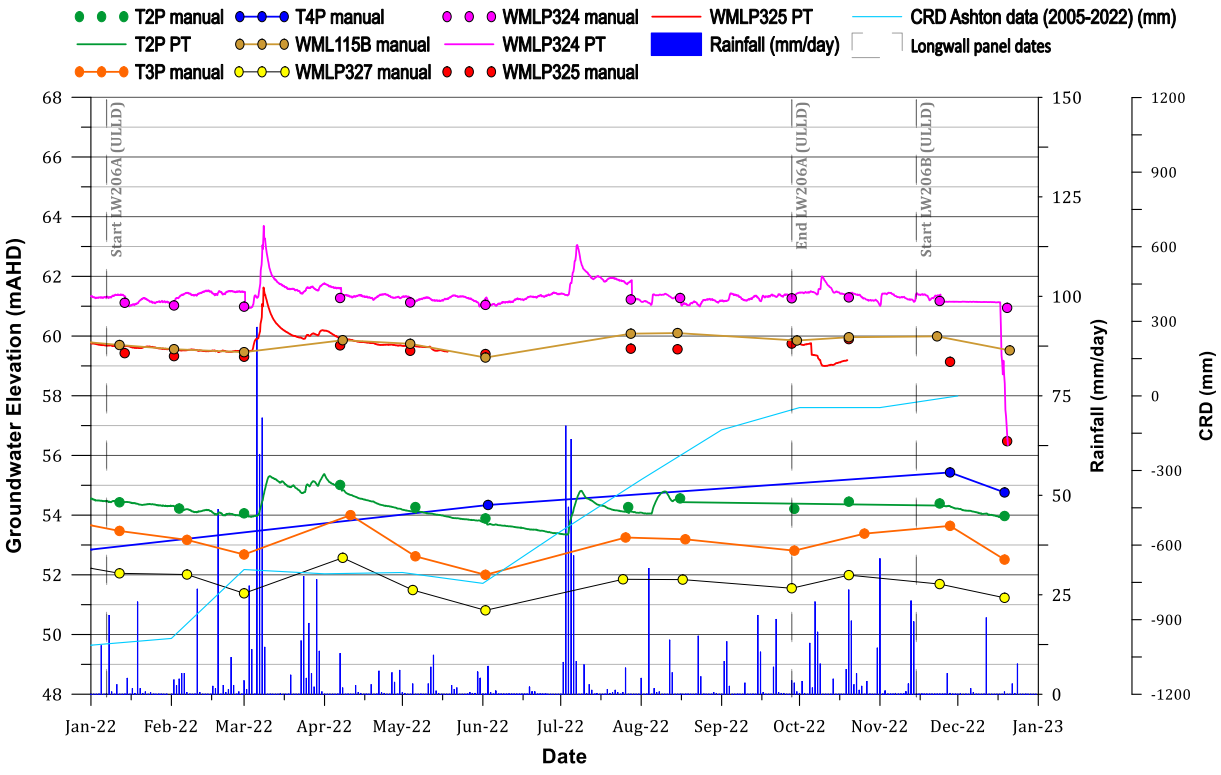

Figure 4.24 Coal measure overburden bore hydrographs

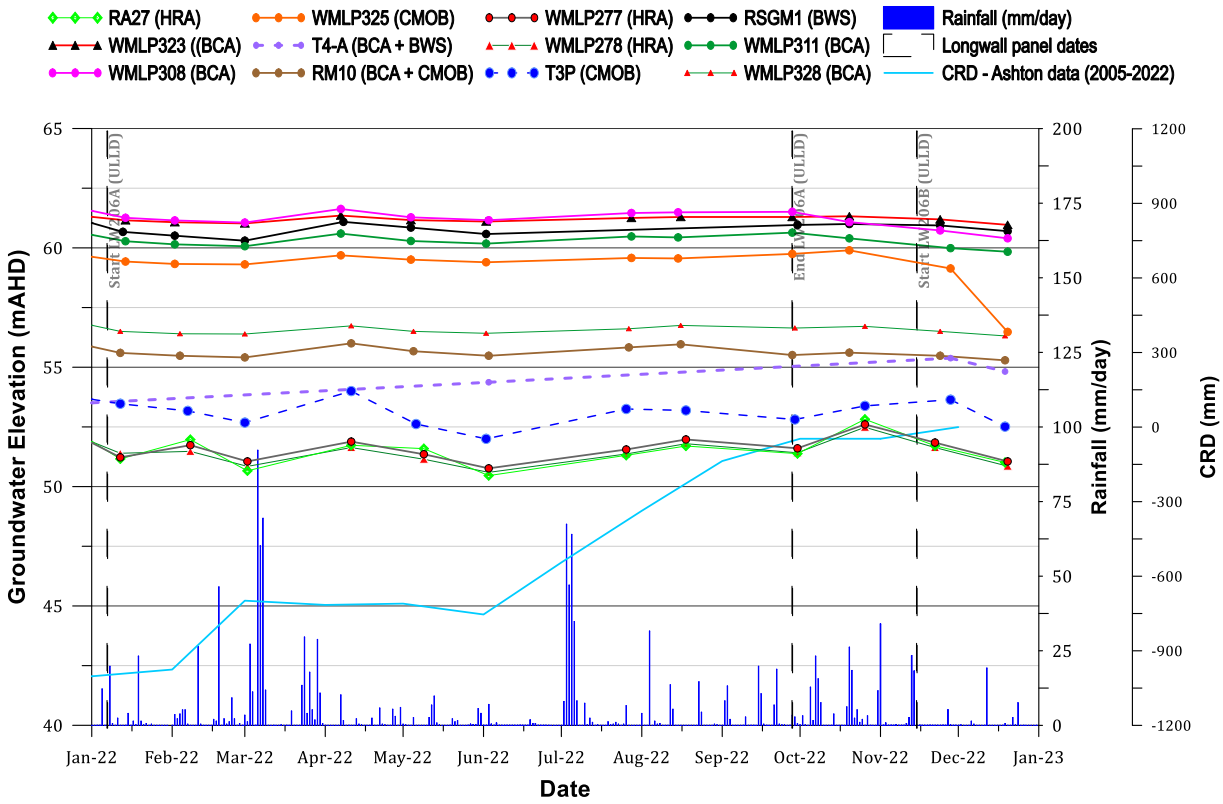

Figure 4.25 Hydrographs for monitoring bores in vicinity of LW206A/206B

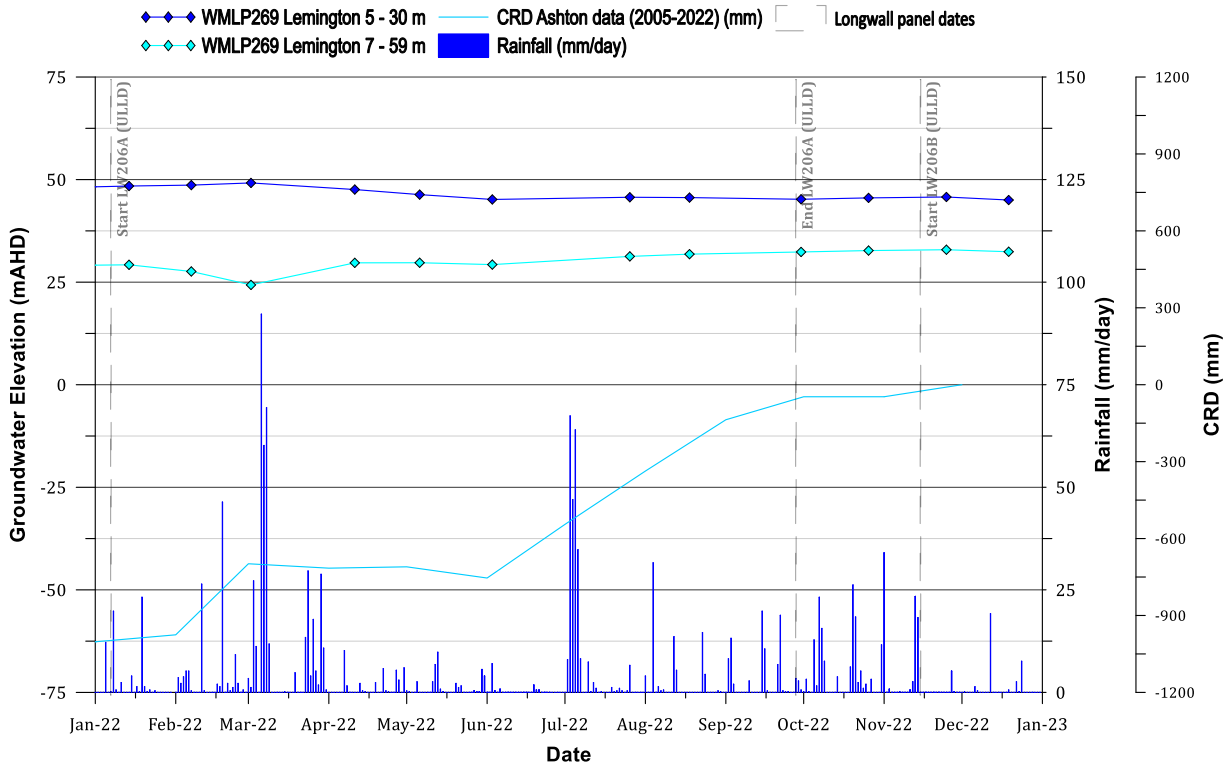

Figure 4.26 Hydrographs for VWP WMLP269 in vicinity of LW206A/LW206B

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 2022, 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 2022. 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 2022, as has been the case in previous years. pH readings were broadly stable over 2022, 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 2022 were:

- Coal measure – pH 6.19 (WMLP302) to pH 7.99 (WML262); and
- CMOB – pH 6.4 (T2P) to pH 7.4 (WMLP324).

Groundwater EC was fresh to brackish across the coal measure and CMOB monitoring network in 2022. Trends in groundwater EC varied throughout 2022. Monitoring bore WML183 EC decreased throughout the year, whilst RSGM1 EC decreased from the beginning of the year until May, increasing until November. EC in WML115B increased from the start of the year until August, where it continued to decrease, but at a lower rate. Groundwater EC in T3P also increased from the beginning of the year, declining after August. All remaining bores were relatively stable throughout 2022 and no other prevailing trends were evident. Minor fluctuations occurred during the year, though the overall EC trend was stable. EC ranges for coal measure and CMOB bores in 2022 were:

- Coal measure – 322.7 µS/cm (WML120A) to 5,648 µS/cm (RSGM1); and
- CMOB – 672.2 µS/cm (WMLP324) to 4,490 µS/cm (T3P).

The major ion content for coal measure and CMOB bores was also assessed in 2022 (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.

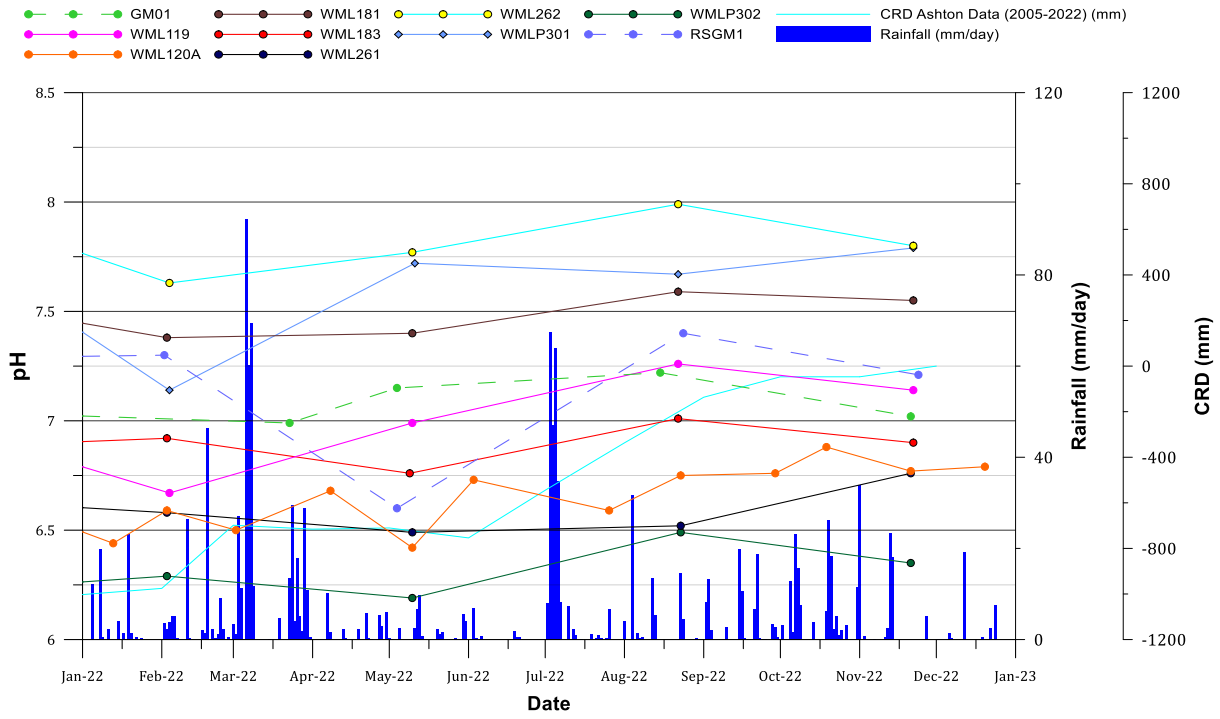

Figure 4.27 Coal measure bore pH trends

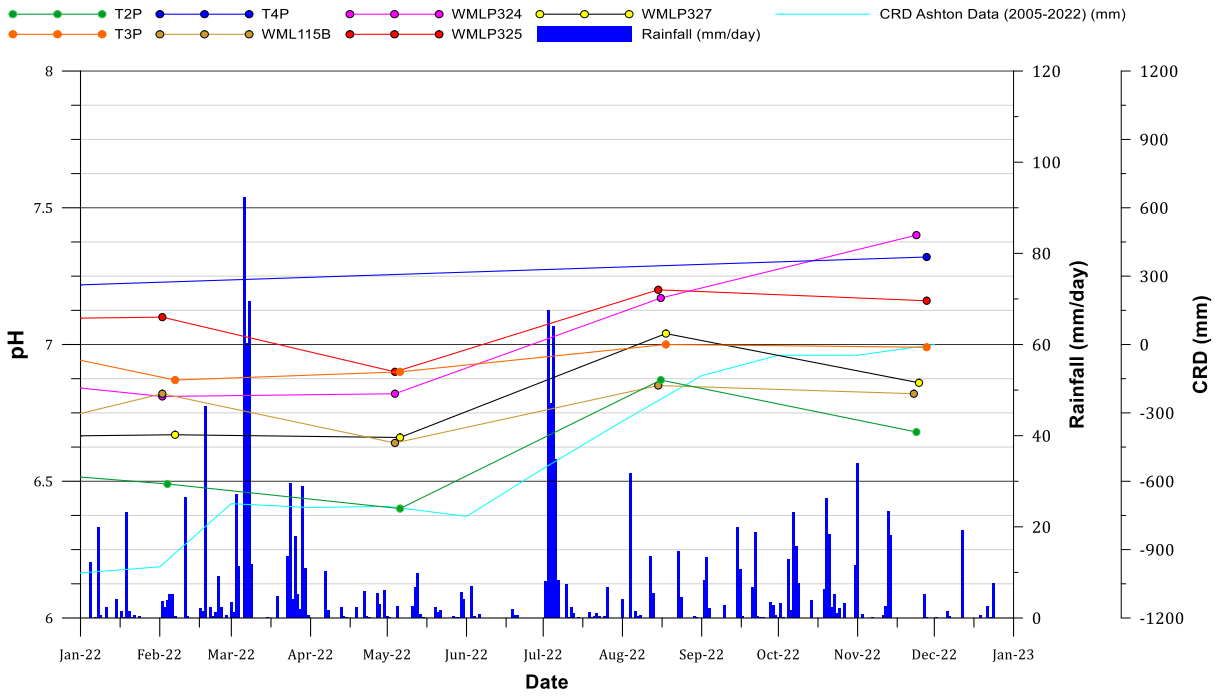

Figure 4.28 Coal measure overburden bore pH trends

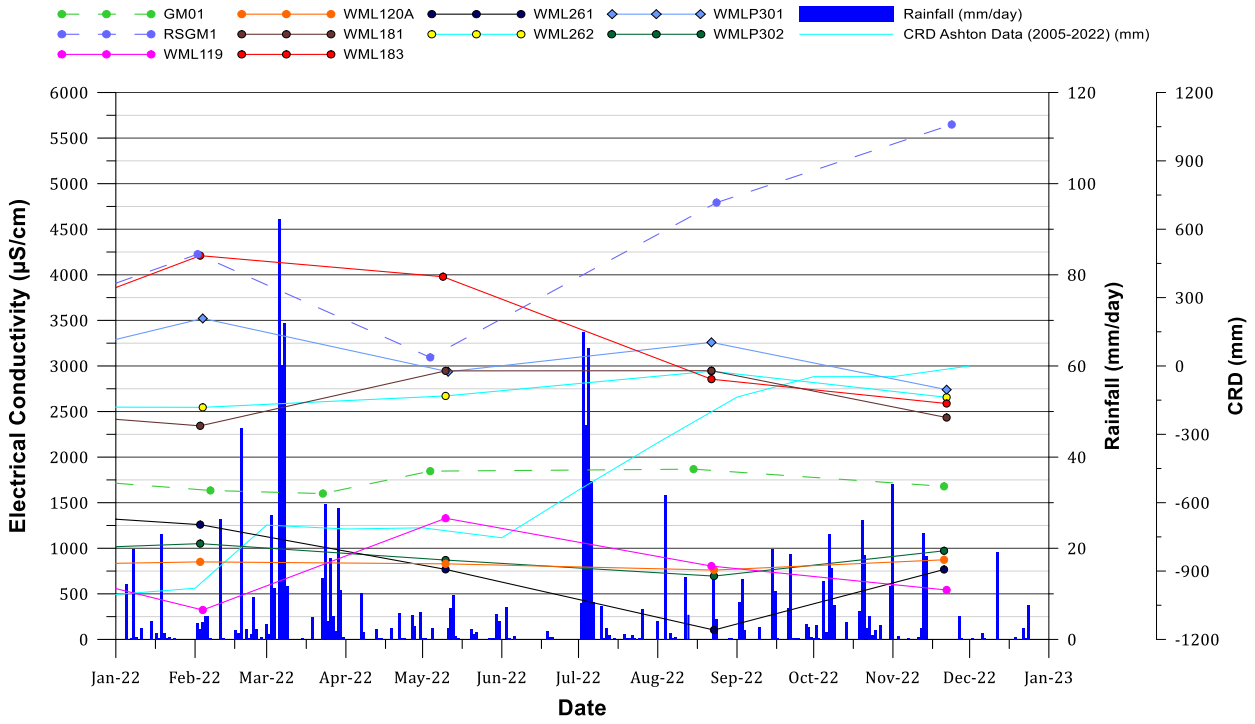

Figure 4.29 Coal measure bore EC trends

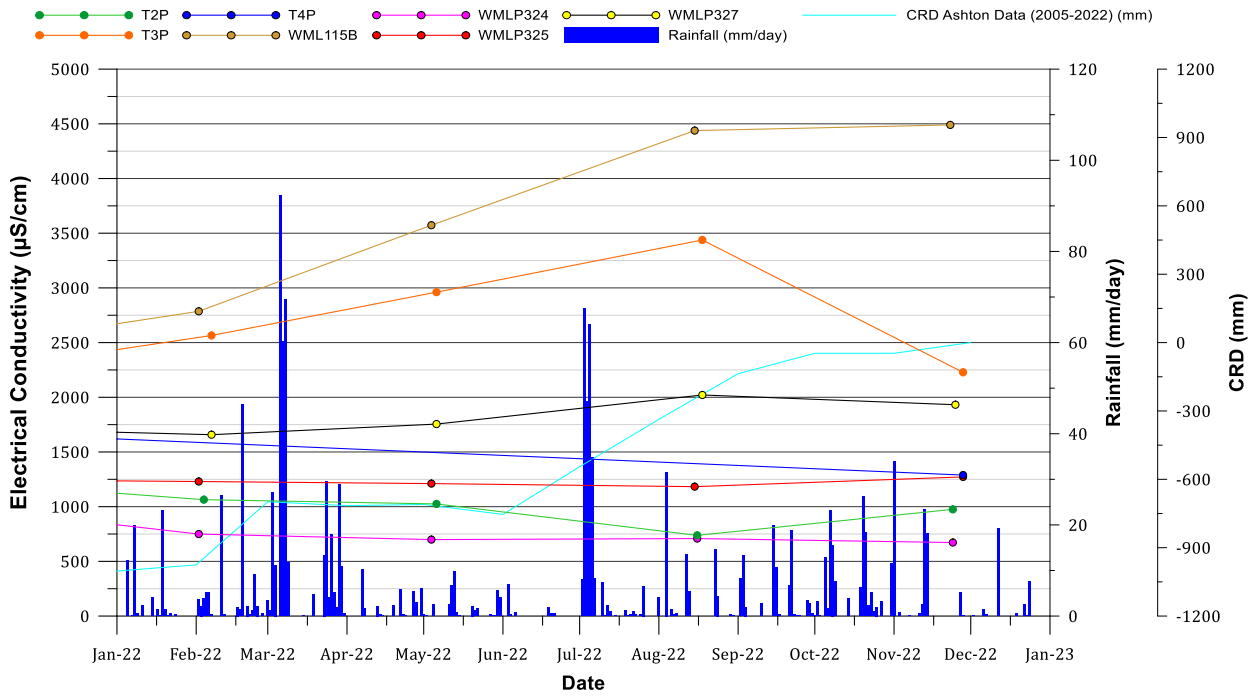

Figure 4.30 Coal measure overburden bore EC trends

4.2.3 Dissolved metals, select nutrients, turbidity and cyanide

Comprehensive lab analysis during August 2022 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 significantly less than the short-term trigger range of 25 to 125 mg/L. WMLP336 exceeded the lower trigger of P concentration (0.8-12 mg/L), however it is outlined in the guidelines that the value or range for P needs to be determined specific to a site. 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 2022 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 (2022)

Bore ID	Feb-22	May-22	Aug-22	Nov-22
	Groundwater levels (mTOC)			
YAP016	3.6	3.55	3.16	3.49
WMLP320	6.59	6.47	6.23	6.46
WMLP279	11.17	11.3	10.32	10.53
WMLP280	9.02	9.45	8.93	9.13
WML120B	8.07	7.71	7.42	7.73
WML129	4.31	4.1	3.79	3.98
WMLP336	10.55	8.7	10.09	9.8
GM1	8.85	8.7	8.56	8.51
WML120A	8.73	8.34	7.99	8.28
WML262	36.0	36.05	36.45	36.58
WML181	17.84	17.54	17.41	17.31
WML183	28.68	27.9	27.13	26.77

Note: mtoc = metres top of casing.

Table 5.2 EPL 11879 monitoring bore groundwater EC measurements (2022)

Bore ID	Feb-22	May-22	Aug-22	Nov-22
	Groundwater EC (µS/cm)			
YAP016	1011	1347	1771	2404
WMLP320	1103	933	728	672.8
WMLP279	981.8	1303	790	708
WMLP280	847.7	554	520.1	512.9
WML120B	606.3	662.3	804.3	832
WML129	352.3	386.6	483.5	302
WMLP336	685.6	715.5	721.6	790.7
GM1	1634	1846	1868	1679
WML120A	850.7	829.2	760.8	873.6
WML262	2546	2671	2943	2656
WML181	2343	2946	2948	2434
WML183	4210	3979	2855	2588

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 2022 and was stored temporarily in the goaf. A proportion of the 2022 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 2022, Ashton abstracted 854.5 ML of water via borehole 6 (BH6), borehole 7 (BH7) and the underground portal. Of that volume, 205.19 ML was introduced into the mine as operational water; therefore, the difference of 649.3 ML is considered a portion of the incidental water take. The remainder of the predicted incidental water (86.9 ML) 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.

During Q4 2021, ACOL engaged AGE to conduct an assessment to determine the potential sources of water for anomalously high-water inflow rates into a particular part of the underground workings (AGE, 2021a). Water samples were taken from three underground locations, as well as from a flooded surface dam overlying the affected part of the workings. The results from these samples were compared to those collected during the August 2021 annual groundwater monitoring round to determine if the inflows could be attributed to the overlying dam. The report concluded that the inflow source water was not from the dam and 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 2022 at 23.3 L/sec. The average 2022 water abstraction rate was 27.1 L/sec.

Table 6.1 Breakdown of abstracted water volumes (2022)

Total water abstracted from mine via BH6, BH7 and Portal	854.5 ML	Mine water input (metered)	205.19 ML		
		Estimate of abstracted water considered inflow water	649.3 ML	736.2 ML	Total predicted incidental water-take for 2022 (from 2022 GW)
		Portion of incidental water take considered stored in underground and/or lost via coal moisture and water vapour in out-by air	86.9 ML		

7 Summary

Groundwater monitoring over the 2022 reporting period was consistent with the requirements outlined in the WMP. A summary of the findings of this report is as follows:

- Except for an increase in March and November, BCA regulatory bore groundwater elevations were stable throughout 2022. All BCA groundwater elevations remained above established triggers in 2022. 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 generally stable groundwater elevations, except during March and August where increased groundwater elevation was recorded. RA18, RM02 and T4A were regularly inaccessible due to ponded surface water.
- Excepting an increase to groundwater level during the March and August monitoring period, GCA groundwater elevations were generally stable throughout the year. The increase in groundwater elevation followed higher than average rainfall, indicated by an inclining CRD. All GCA groundwater elevations remained above established triggers in 2022.
- HRA regulatory bore groundwater elevations were relatively steady throughout the year. Increased groundwater elevations in HRA regulatory bores were recorded in March, June and October monitoring periods, following heavy rainfall. All HRA groundwater elevations remained above established triggers in 2022.
- The other HRA bores responded to periods of increased rainfall throughout 2022 with groundwater elevations varying throughout the year.
- Surface water elevation in Hunter River, Glennies Creek and Bowmans Creek were stable throughout 2022 with increases to water elevation recorded following heavy rainfall events. Bowmans Creek held water for the duration of 2022.
- Groundwater elevations were stable in coal measure bores throughout the year. Groundwater elevation in CMOB bores were relatively stable throughout the year, with increases recorded in correlation with the CRD trend.
- VWP measurements in WMLP269 (adjacent LW206A/206B) sensors at 30 m and 59 m were stable throughout the 2022 monitoring period. Pressure head in the remaining sensors (70 m, 97 m, 127 m and 147 m) have recorded erroneous data since July. Erroneous data is likely due to fracturing of strata in which the deeper sensors are positioned.
- Groundwater pH measurements in alluvial bores were stable during 2022 with values typically ranging from pH 6.5 to pH 7.5. Discrepancies in pH were minor and considered within natural variation. WML129, WMLP328, WMLP323, WMLP311, WMLP343, WMLP349, and WMLP358 recorded exceedances throughout the year. The exceedances in WMLP311, WMLP323, and WMLP328 were not consecutive for three months and as such did not require a response under the WMP. An 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 2022, 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.
- Two bores exceeded EC trigger criteria in 2022, WMLP279 and WMLP358. However, only the exceedance in WMLP358 was 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 2022 were steady overall, except for GCA bores WML120B, WMLP346 and WMLP358 in which EC increased throughout the monitoring period. 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 WMLP358 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 2022, except for RSGM1 which recorded a continuous increase 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. WMLP336 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 2022 monitoring period.
- Underground mine inflows were slightly above predictions. An investigation into the source of the inflows concluded it is likely from deep Permian strata and not from surficial water.

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

8 References

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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 2022

Table D1 Ashton August 2022 water quality results – field and laboratory

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
Ashton well	BCA	ES2229440003	15/08/2022	7.20	7.18	0.28	321.1	332	-3.34	----
GM1	Coal	ES2229440007	15/08/2022	7.22	7.28	-0.83	1868	1770	5.39	1090
GM3A	GCA	ES2230311007	24/08/2022	7.12	7.37	-3.45	5179	5050	2.52	----
PB1	BCA	ES2229440014	16/08/2022	6.92	7.03	-1.58	941.8	939	0.30	----
RA18	BCA	ES2229440017	16/08/2022	7.37	7.43	-0.81	952.5	953	-0.05	----
RA27	HRA	ES2229658008	18/08/2022	7.07	7.18	-1.54	795.2	639	21.78	438
RM01	BCA	ES2229658010	18/08/2022	6.95	6.84	1.60	3141	1100	96.25	----
RM03	BCA	ES2229658001	18/08/2022	7.35	7.39	-0.54	929.3	736	23.22	----
RM10	CMOB	ES2229440015	16/08/2022	7.03	7.17	-1.97	523.7	522	0.33	----
RSGM1	Coal	ES2235297001	30/09/2022	7.40	7.74	-4.49	4792	5160	-7.40	2880
T2A	BCA	ES2229440012	16/08/2022	7.10	7.17	-0.98	755.2	760	-0.63	428
T2P	CMOB	ES2229440013	16/08/2022	6.87	7.00	-1.87	737.9	747	-1.23	410
T3A	BCA	ES2229658003	18/08/2022	6.97	7.02	-0.71	3561	3340	6.40	1940
T3P	CMOB	ES2229658002	18/08/2022	7.00	7.20	-2.82	3438	2420	34.76	1880
T5	BCA	ES2229440001	15/08/2022	6.99	6.94	0.72	980.6	1070	-8.72	626
WML113C	BCA	ES2229440019	16/08/2022	7.15	7.12	0.42	732.4	736	-0.49	436
WML115B	CMOB	ES2229440002	15/08/2022	6.85	7.00	-2.17	4438	4410	0.63	----
WML115C	BCA	ES2229440011	16/08/2022	6.95	7.01	-0.86	382.7	383	-0.08	----
WML119	Coal	ES2230100002	22/08/2022	7.26	7.14	1.67	804.6	782	2.85	437
WML120A	Coal	ES2230100007	23/08/2022	6.92	6.97	-0.72	760.8	812	-6.51	410
WML120B	GCA	ES2230100006	23/08/2022	6.75	6.86	-1.62	804.3	902	-11.45	525
WML129	GCA	ES2229440023	17/08/2022	7.14	7.14	0.00	483.5	364	28.20	217
WML181	Coal	ES2230100001	22/08/2022	7.59	7.77	-2.34	2948	2910	1.30	1760
WML183	Coal	ES2230100005	22/08/2022	7.01	7.05	-0.57	2855	2840	0.53	1610

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
WML239	GCA	ES2230311003	24/08/2022	7.02	7.05	-0.43	604.3	569	6.02	457
WML261	Coal	ES2230100009	23/08/2022	6.52	6.58	-0.92	103.1	109	-5.56	103
WML262	Coal	ES2230100003	22/08/2022	7.99	7.95	0.50	2943	2900	1.47	1710
WMLP277	HRA	ES2229658007	18/08/2022	7.14	7.33	-2.63	1075	820	26.91	594
WMLP278	HRA	ES2229658006	18/08/2022	7.05	7.26	-2.94	1274	1220	4.33	692
WMLP279	HRA	ES2229440024	17/08/2022	6.94	7.08	-2.00	790	746	5.73	434
WMLP 279 DUPLICATE	HRA	ES2229440025	17/08/2022	6.94	7.10	-2.28	790	754	4.66	448
WMLP280	HRA	ES2229658009	18/08/2022	7.15	7.14	0.14	520.1	504	3.14	306
WMLP301	Coal	ES2230100004	22/08/2022	7.67	7.90	-2.95	3259	3300	-1.25	1930
WMLP302	Coal	ES2230100008	23/08/2022	6.49	6.58	-1.38	694.7	766	-9.76	386
WMLP308	BCA	ES2229440004	15/08/2022	6.96	7.04	-1.14	762.1	769	-0.90	420
WMLP311	BCA	ES2229440008	15/08/2022	6.87	6.90	-0.44	855.1	865	-1.15	490
WMLP320	BCA	ES2229440018	16/08/2022	6.84	6.98	-2.03	728	743	-2.04	440
WMLP323	BCA	ES2229440009	16/08/2022	7.11	7.09	0.28	655.5	672	-2.49	371
WMLP324	CMOB	ES2229440010	16/08/2022	7.17	7.15	0.28	708.4	709	-0.08	400
WMLP325	CMOB	ES2229440005	15/08/2022	7.20	7.35	-2.06	1183	1160	1.96	685
WMLP326	BCA	ES2229658005	18/08/2022	7.18	7.41	-3.15	1366	1140	18.04	----
WMLP327	CMOB	ES2229658004	18/08/2022	7.04	7.04	0.00	2021	1740	14.94	----
WMLP328	BCA	ES2229440016	16/08/2022	7.18	7.07	1.54	860.5	855	0.64	476
WMLP336	HRA	ES2229440020	17/08/2022	6.72	6.79	-1.04	721.6	685	5.20	412
WMLP337	HRA	ES2229440022	17/08/2022	7.10	7.20	-1.40	3124	2880	8.13	1650
WMLP338	HRA	ES2229440021	17/08/2022	6.94	6.99	-0.72	2083	1920	8.14	1130
WMLP343	GCA	ES2230311006	24/08/2022	7.07	7.17	-1.40	654.1	614	6.32	486
WMLP346	GCA	ES2230311004	24/08/2022	6.88	6.98	-1.44	658.4	617	6.49	432
WMLP349	GCA	ES2230311002	24/08/2022	6.75	6.79	-0.59	529.6	504	4.95	374

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
WMLP358	GCA	ES2230311001	24/08/2022	6.64	6.74	-1.49	415.3	395	5.01	364
WMLP358 DUPLICATE	GCA	ES2230311008	24/08/2022	6.64	6.68	-0.60	415.3	419	-0.89	357
YAP016	BCA	ES2229440006	15/08/2022	7.12	6.92	2.85	1771	1720	2.92	1050

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								
Ashton well	BCA	ES2229440003	15/08/2022	20	8	31	4	37
GM1	Coal	ES2229440007	15/08/2022	67	49	269	4	388
GM3A	GCA	ES2230311007	24/08/2022	26	24	1160	5	1190
PB1	BCA	ES2229440014	16/08/2022	39	22	142	3	129
RA18	BCA	ES2229440017	16/08/2022	26	17	168	1	198
RA27	HRA	ES2229658008	18/08/2022	26	22	106	<1	81
RM01	BCA	ES2229658010	18/08/2022	23	22	430	11	758
RM03	BCA	ES2229658001	18/08/2022	54	43	243	1	386
RM10	CMOB	ES2229440015	16/08/2022	18	10	81	2	68
RSGM1	Coal	ES2235297001	30/09/2022	65	79	850	1	1200
T2A	BCA	ES2229440012	16/08/2022	32	17	105	2	100
T2P	CMOB	ES2229440013	16/08/2022	39	18	92	2	90
T3A	BCA	ES2229658003	18/08/2022	76	70	520	<1	967
T3P	CMOB	ES2229658002	18/08/2022	102	91	460	4	821
T5	BCA	ES2229440001	15/08/2022	49	22	135	2	153

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								
WML113C	BCA	ES2229440019	16/08/2022	42	17	88	1	105
WML115B	CMOB	ES2229440002	15/08/2022	220	96	554	3	1030
WML115C	BCA	ES2229440011	16/08/2022	13	6	65	6	33
WML119	Coal	ES2230100002	22/08/2022	18	11	124	3	103
WML120A	Coal	ES2230100007	23-Aug-22	39	27	86	1	113
WML120B	GCA	ES2230100006	23-Aug-22	47	29	88	<1	130
WML129	GCA	ES2229440023	17/08/2022	22	12	38	2	34
WML181	Coal	ES2230100001	22/08/2022	28	27	584	4	520
WML183	Coal	ES2230100005	22/08/2022	73	92	410	6	522
WML239	GCA	ES2230311003	24/08/2022	36	16	67	1	96
WML261	Coal	ES2230100009	23-Aug-22	6	2	8	6	10
WML262	Coal	ES2230100003	22/08/2022	7	5	638	3	504
WMLP277	HRA	ES2229658007	18/08/2022	26	18	174	<1	157
WMLP278	HRA	ES2229658006	18/08/2022	48	25	180	<1	196
WMLP279	HRA	ES2229440024	17/08/2022	43	21	85	<1	102
WMLP 279 DUPLICATE	HRA	ES2229440025	17/08/2022	44	21	85	<1	103
WMLP280	HRA	ES2229658009	18/08/2022	13	8	88	<1	44
WMLP301	Coal	ES2230100004	22/08/2022	8	5	707	3	548
WMLP302	Coal	ES2230100008	23-Aug-22	23	24	101	3	140
WMLP308	BCA	ES2229440004	15/08/2022	33	21	99	2	113
WMLP311	BCA	ES2229440008	15/08/2022	33	22	123	2	125
WMLP320	BCA	ES2229440018	16/08/2022	39	19	89	2	89
WMLP323	BCA	ES2229440009	16/08/2022	32	19	82	2	87
WMLP324	CMOB	ES2229440010	16/08/2022	33	19	91	2	98
WMLP325	CMOB	ES2229440005	15/08/2022	57	28	164	2	240
WMLP326	BCA	ES2229658005	18/08/2022	48	25	200	<1	240
WMLP327	CMOB	ES2229658004	18/08/2022	71	40	292	3	412
WMLP328	BCA	ES2229440016	16/08/2022	43	25	104	2	135
WMLP336	HRA	ES2229440020	17/08/2022	45	23	51	22	85

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								
WMLP337	HRA	ES2229440022	17/08/2022	106	127	378	5	601
WMLP338	HRA	ES2229440021	17/08/2022	90	59	235	1	470
WMLP343	GCA	ES2230311006	24/08/2022	39	18	74	<1	78
WMLP346	GCA	ES2230311004	24/08/2022	36	20	70	<1	119
WMLP349	GCA	ES2230311002	24/08/2022	21	10	77	<1	70
WMLP358	GCA	ES2230311001	24/08/2022	33	15	30	<1	54
WMLP358 DUPLICATE	GCA	ES2230311008	24/08/2022	34	15	35	<1	59
YAP016	BCA	ES2229440006	15/08/2022	39	29	303	3	340

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
Ashton well	BCA	ES2229440003	15/08/2022	<1	<1	86	86	26
GM1	Coal	ES2229440007	15/08/2022	<1	<1	280	280	195
GM3A	GCA	ES2230311007	24/08/2022	<1	<1	1120	1120	3
PB1	BCA	ES2229440014	16/08/2022	<1	<1	196	196	108
RA18	BCA	ES2229440017	16/08/2022	<1	<1	172	172	53
RA27	HRA	ES2229658008	18/08/2022	<1	<1	227	227	34
RM01	BCA	ES2229658010	18/08/2022	<1	<1	172	172	17
RM03	BCA	ES2229658001	18/08/2022	<1	<1	232	232	135
RM10	CMOB	ES2229440015	16/08/2022	<1	<1	114	114	42
RSGM1	Coal	ES2235297001	30/09/2022	<1	<1	451	451	318
T2A	BCA	ES2229440012	16/08/2022	<1	<1	169	169	71
T2P	CMOB	ES2229440013	16/08/2022	<1	<1	162	162	84
T3A	BCA	ES2229658003	18/08/2022	<1	<1	172	172	152

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
T3P	CMOB	ES2229658002	18/08/2022	<1	<1	364	364	208
T5	BCA	ES2229440001	15/08/2022	<1	<1	205	205	94
WML113C	BCA	ES2229440019	16/08/2022	<1	<1	150	150	76
WML115B	CMOB	ES2229440002	15/08/2022	<1	<1	598	598	472
WML115C	BCA	ES2229440011	16/08/2022	<1	<1	104	104	35
WML119	Coal	ES2230100002	22/08/2022	<1	<1	232	232	6
WML120A	Coal	ES2230100007	23/08/2022	<1	<1	182	182	59
WML120B	GCA	ES2230100006	23/08/2022	<1	<1	191	191	64
WML129	GCA	ES2229440023	17/08/2022	<1	<1	124	124	16
WML181	Coal	ES2230100001	22/08/2022	<1	<1	733	733	122
WML183	Coal	ES2230100005	22/08/2022	<1	<1	573	573	223
WML239	GCA	ES2230311003	24/08/2022	<1	<1	156	156	18
WML261	Coal	ES2230100009	23/08/2022	<1	<1	29	29	<1
WML262	Coal	ES2230100003	22/08/2022	<1	<1	871	871	<1
WMLP277	HRA	ES2229658007	18/08/2022	<1	<1	234	234	68
WMLP278	HRA	ES2229658006	18/08/2022	<1	<1	258	258	98
WMLP279	HRA	ES2229440024	17/08/2022	<1	<1	171	171	68
WMLP 279 DUPLICATE	HRA	ES2229440025	17/08/2022	<1	<1	170	170	68
WMLP280	HRA	ES2229658009	18/08/2022	<1	<1	178	178	18
WMLP301	Coal	ES2230100004	22/08/2022	<1	<1	980	980	<1
WMLP302	Coal	ES2230100008	23/08/2022	<1	<1	156	156	25
WMLP308	BCA	ES2229440004	15/08/2022	<1	<1	157	157	75
WMLP311	BCA	ES2229440008	15/08/2022	<1	<1	191	191	86
WMLP320	BCA	ES2229440018	16/08/2022	<1	<1	186	186	69
WMLP323	BCA	ES2229440009	16/08/2022	<1	<1	154	154	59
WMLP324	CMOB	ES2229440010	16/08/2022	<1	<1	160	160	65
WMLP325	CMOB	ES2229440005	15/08/2022	<1	<1	220	220	82

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
WMLP326	BCA	ES2229658005	18/08/2022	<1	<1	241	241	119
WMLP327	CMOB	ES2229658004	18/08/2022	<1	<1	332	332	151
WMLP328	BCA	ES2229440016	16/08/2022	<1	<1	165	165	90
WMLP336	HRA	ES2229440020	17/08/2022	<1	<1	166	166	47
WMLP337	HRA	ES2229440022	17/08/2022	<1	<1	722	722	124
WMLP338	HRA	ES2229440021	17/08/2022	<1	<1	372	372	44
WMLP343	GCA	ES2230311006	24/08/2022	<1	<1	192	192	32
WMLP346	GCA	ES2230311004	24/08/2022	<1	<1	159	159	12
WMLP349	GCA	ES2230311002	24/08/2022	<1	<1	124	124	36
WMLP358	GCA	ES2230311001	24/08/2022	<1	<1	108	108	21
WMLP358 DUPLICATE	GCA	ES2230311008	24/08/2022	<1	<1	113	113	21
YAP016	BCA	ES2229440006	15/08/2022	<1	<1	266	266	225

Bore ID	Geology	Laboratory ID	Date	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Nickel	Selenium	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
Ashton well	BCA	ES2229440003	15/08/2022	----	----	----	----	----	----	----	----	----	----
GM1	Coal	ES2229440007	15/08/2022	0.001	<0.0001	<0.001	<0.001	0.90	<0.001	0.465	<0.001	<0.01	0.054
GM3A	GCA	ES2230311007	24/08/2022	----	----	----	----	----	----	----	----	----	----
PB1	BCA	ES2229440014	16/08/2022	----	----	----	----	----	----	----	----	----	----
RA18	BCA	ES2229440017	16/08/2022	----	----	----	----	----	----	----	----	----	----

Bore ID	Geology	Laboratory ID	Date	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Nickel	Selenium	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
RA27	HRA	ES2229658008	18/08/2022	<0.001	<0.0001	0.002	<0.001	<0.05	<0.001	0.010	0.002	<0.01	0.069
RM01	BCA	ES2229658010	18/08/2022	----	----	----	----	----	----	----	----	----	----
RM03	BCA	ES2229658001	18/08/2022	----	----	----	----	----	----	----	----	----	----
RM10	CMOB	ES2229440015	16/08/2022	----	----	----	----	----	----	----	----	----	----
RSGM1	Coal	ES2235297001	30/09/2022	0.003	<0.0001	0.012	0.001	0.18	<0.001	0.029	0.047	<0.01	0.006
T2A	BCA	ES2229440012	16/08/2022	<0.001	<0.0001	0.001	0.001	<0.05	<0.001	0.011	0.003	<0.01	0.011
T2P	CMOB	ES2229440013	16/08/2022	0.003	<0.0001	<0.001	<0.001	1.33	<0.001	0.157	0.002	<0.01	0.012
T3A	BCA	ES2229658003	18/08/2022	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.008	0.002	<0.01	0.012
T3P	CMOB	ES2229658002	18/08/2022	<0.001	<0.0001	<0.001	<0.001	0.71	<0.001	0.092	0.001	<0.01	0.013
T5	BCA	ES2229440001	15/08/2022	<0.001	<0.0001	<0.001	0.002	<0.05	<0.001	0.009	0.001	<0.01	0.018
WML113C	BCA	ES2229440019	16/08/2022	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.006	0.001	<0.01	0.009
WML115B	CMOB	ES2229440002	15/08/2022	----	----	----	----	----	----	----	----	----	----
WML115C	BCA	ES2229440011	16/08/2022	----	----	----	----	----	----	----	----	----	----
WML119	Coal	ES2230100002	22/08/2022	<0.001	<0.0001	0.001	<0.001	0.37	0.001	0.207	0.004	<0.01	0.022
WML120A	Coal	ES2230100007	23/08/2022	<0.001	<0.0001	0.012	<0.001	1.60	<0.001	0.211	0.018	<0.01	0.020
WML120B	GCA	ES2230100006	23/08/2022	<0.001	<0.0001	0.003	<0.001	<0.05	<0.001	0.049	0.020	<0.01	0.026
WML129	GCA	ES2229440023	17/08/2022	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.097	0.001	<0.01	0.010
WML181	Coal	ES2230100001	22/08/2022	0.001	<0.0001	0.026	<0.001	<0.05	<0.001	0.042	0.005	<0.01	0.009
WML183	Coal	ES2230100005	22/08/2022	<0.001	<0.0001	<0.001	<0.001	0.22	<0.001	0.131	0.002	<0.01	0.011

Bore ID	Geology	Laboratory ID	Date	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Nickel	Selenium	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
WML239	GCA	ES2230311003	24/08/2022	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.023	<0.001	<0.01	0.010
WML261	Coal	ES2230100009	23/08/2022	<0.001	<0.0001	<0.001	0.001	0.23	<0.001	0.012	0.001	<0.01	0.189
WML262	Coal	ES2230100003	22/08/2022	<0.001	<0.0001	<0.001	<0.001	0.12	0.001	0.051	<0.001	<0.01	0.012
WMLP277	HRA	ES2229658007	18/08/2022	<0.001	<0.0001	0.001	<0.001	<0.05	<0.001	0.028	0.002	<0.01	0.009
WMLP278	HRA	ES2229658006	18/08/2022	<0.001	<0.0001	0.003	<0.001	<0.05	<0.001	0.008	0.004	<0.01	0.011
WMLP279	HRA	ES2229440024	17/08/2022	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.045	0.003	<0.01	0.010
WMLP 279 DUPLICATE	HRA	ES2229440025	17/08/2022	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.046	0.003	<0.01	0.011
WMLP280	HRA	ES2229658009	18/08/2022	<0.001	<0.0001	<0.001	0.001	<0.05	<0.001	0.010	0.002	<0.01	0.012
WMLP301	Coal	ES2230100004	22/08/2022	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.030	<0.001	<0.01	0.008
WMLP302	Coal	ES2230100008	23/08/2022	<0.001	<0.0001	<0.001	<0.001	1.35	<0.001	0.029	0.002	<0.01	0.025
WMLP308	BCA	ES2229440004	15/08/2022	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.012	<0.001	<0.01	0.016
WMLP311	BCA	ES2229440008	15/08/2022	<0.001	<0.0001	0.002	0.001	<0.05	<0.001	0.006	0.004	<0.01	0.014
WMLP320	BCA	ES2229440018	16/08/2022	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.010	<0.001	<0.01	0.013
WMLP323	BCA	ES2229440009	16/08/2022	<0.001	<0.0001	<0.001	0.002	<0.05	<0.001	0.009	0.007	<0.01	0.035
WMLP324	CMOB	ES2229440010	16/08/2022	<0.001	<0.0001	<0.001	0.001	<0.05	<0.001	0.086	0.003	<0.01	0.016
WMLP325	CMOB	ES2229440005	15/08/2022	<0.001	<0.0001	<0.001	<0.001	0.63	<0.001	0.322	<0.001	<0.01	0.010
WMLP326	BCA	ES2229658005	18/08/2022	----	----	----	----	----	----	----	----	----	----
WMLP327	CMOB	ES2229658004	18/08/2022	----	----	----	----	----	----	----	----	----	----

Bore ID	Geology	Laboratory ID	Date	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Nickel	Selenium	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
WMLP328	BCA	ES2229440016	16/08/2022	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.005	<0.001	<0.01	0.010
WMLP336	HRA	ES2229440020	17/08/2022	0.001	<0.0001	<0.001	0.001	0.11	<0.001	0.067	0.002	<0.01	0.017
WMLP337	HRA	ES2229440022	17/08/2022	<0.001	<0.0001	<0.001	<0.001	0.47	<0.001	0.502	0.006	<0.01	0.011
WMLP338	HRA	ES2229440021	17/08/2022	0.002	<0.0001	<0.001	<0.001	4.15	<0.001	0.914	0.006	<0.01	0.015
WMLP343	GCA	ES2230311006	24/08/2022	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.012	0.001	<0.01	0.028
WMLP346	GCA	ES2230311004	24/08/2022	<0.001	<0.0001	0.001	<0.001	0.11	<0.001	0.180	<0.001	<0.01	0.023
WMLP349	GCA	ES2230311002	24/08/2022	<0.001	<0.0001	<0.001	<0.001	0.11	<0.001	0.080	0.001	<0.01	0.014
WMLP358	GCA	ES2230311001	24/08/2022	<0.001	<0.0001	<0.001	0.002	<0.05	<0.001	0.006	<0.001	<0.01	0.056
WMLP358 DUPLICATE	GCA	ES2230311008	24/08/2022	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.007	<0.001	<0.01	0.008
YAP016	BCA	ES2229440006	15/08/2022	<0.001	<0.0001	0.002	0.001	<0.05	<0.001	0.030	0.003	<0.01	0.014

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												
Ashton well	BCA	ES2229440003	15/08/2022	----	----	----	----	----	----	3.30	3.11	3.06
GM1	Coal	ES2229440007	15/08/2022	454	<0.004	<0.01	1.5	1.5	0.25	20.6	19.2	3.57
GM3A	GCA	ES2230311007	24/08/2022	----	----	----	----	----	----	56.0	53.8	1.96
PB1	BCA	ES2229440014	16/08/2022	----	----	----	----	----	----	9.80	10.0	1.04
RA18	BCA	ES2229440017	16/08/2022	----	----	----	----	----	----	10.1	10.0	0.47
RA27	HRA	ES2229658008	18/08/2022	52.7	<0.004	1.29	0.5	1.8	0.36	7.53	7.72	1.25
RM01	BCA	ES2229658010	18/08/2022	----	----	----	----	----	----	25.2	21.9	6.85
RM03	BCA	ES2229658001	18/08/2022	----	----	----	----	----	----	18.3	16.8	4.28
RM10	CMOB	ES2229440015	16/08/2022	----	----	----	----	----	----	5.07	5.30	2.17
RSGM1	Coal	ES2235297001	30/09/2022	126	<0.004	1.42	0.4	1.8	0.47	49.5	46.7	2.85
T2A	BCA	ES2229440012	16/08/2022	6.5	<0.004	0.77	0.2	1.0	0.03	7.68	7.61	0.40
T2P	CMOB	ES2229440013	16/08/2022	7.6	<0.004	<0.01	0.2	0.2	0.05	7.52	7.48	0.29
T3A	BCA	ES2229658003	18/08/2022	14.2	<0.004	1.80	0.4	2.2	0.08	33.9	32.2	2.58
T3P	CMOB	ES2229658002	18/08/2022	6.9	<0.004	0.04	1.1	1.1	0.03	34.8	32.7	3.07
T5	BCA	ES2229440001	15/08/2022	65.2	<0.004	1.20	0.5	1.7	0.07	10.4	10.2	0.92

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												
WML113C	BCA	ES2229440019	16/08/2022	38.2	<0.004	0.41	0.2	0.6	0.05	7.54	7.35	1.30
WML115B	CMOB	ES2229440002	15/08/2022	----	----	----	----	----	----	50.8	43.0	8.28
WML115C	BCA	ES2229440011	16/08/2022	----	----	----	----	----	----	3.74	4.12	4.91
WML119	Coal	ES2230100002	22/08/2022	290	<0.004	0.07	3.7	3.8	0.54	7.66	7.27	2.62
WML120A	Coal	ES2230100007	23/08/2022	7.0	<0.004	<0.01	0.2	0.2	0.04	8.05	7.93	0.74
WML120B	GCA	ES2230100006	23/08/2022	225	<0.004	1.13	0.6	1.7	0.17	8.82	8.56	1.47
WML129	GCA	ES2229440023	17/08/2022	1.7	<0.004	0.24	0.3	0.5	0.04	3.77	3.79	0.26
WML181	Coal	ES2230100001	22/08/2022	152	<0.004	<0.01	1.8	1.8	0.31	31.8	29.1	4.48
WML183	Coal	ES2230100005	22/08/2022	33.2	<0.004	0.02	1.2	1.2	0.05	30.8	29.2	2.69
WML239	GCA	ES2230311003	24/08/2022	300	<0.004	0.22	0.7	0.9	0.61	6.20	6.05	1.20
WML261	Coal	ES2230100009	23/08/2022	30.8	<0.004	0.05	0.6	0.6	0.26	0.86	0.96	----
WML262	Coal	ES2230100003	22/08/2022	31.6	<0.004	0.02	2.3	2.3	0.78	31.6	28.6	5.03
WMLP277	HRA	ES2229658007	18/08/2022	6.7	<0.004	1.19	0.5	1.7	0.19	10.5	10.3	0.83
WMLP278	HRA	ES2229658006	18/08/2022	4.6	<0.004	0.87	0.4	1.3	0.14	12.7	12.3	1.77
WMLP279	HRA	ES2229440024	17/08/2022	13.4	<0.004	0.91	0.2	1.1	0.12	7.71	7.57	0.90

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												
WMLP 279 DUPLICATE	HRA	ES2229440025	17/08/2022	48.6	<0.004	0.92	0.3	1.2	0.13	7.72	7.62	0.63
WMLP280	HRA	ES2229658009	18/08/2022	5.9	<0.004	0.02	0.3	0.3	0.28	5.17	5.13	0.36
WMLP301	Coal	ES2230100004	22/08/2022	43.3	<0.004	0.01	13.2	13.2	0.73	35.0	31.6	5.10
WMLP302	Coal	ES2230100008	23/08/2022	36.9	<0.004	0.02	2.2	2.2	0.30	7.59	7.59	0.04
WMLP308	BCA	ES2229440004	15/08/2022	8.5	<0.004	<0.01	0.2	0.2	0.03	7.88	7.73	0.98
WMLP311	BCA	ES2229440008	15/08/2022	36.4	<0.004	0.09	0.1	0.2	0.03	9.13	8.86	1.52
WMLP320	BCA	ES2229440018	16/08/2022	2.0	<0.004	0.28	0.1	0.4	0.06	7.66	7.43	1.53
WMLP323	BCA	ES2229440009	16/08/2022	23.8	<0.004	0.03	0.2	0.2	0.03	6.76	6.78	0.14
WMLP324	CMOB	ES2229440010	16/08/2022	5.4	<0.004	<0.01	0.3	0.3	0.02	7.31	7.22	0.65
WMLP325	CMOB	ES2229440005	15/08/2022	23.7	<0.004	<0.01	0.2	0.2	0.05	12.9	12.3	2.14
WMLP326	BCA	ES2229658005	18/08/2022	----	----	----	----	----	----	14.1	13.2	3.35
WMLP327	CMOB	ES2229658004	18/08/2022	----	----	----	----	----	----	21.4	19.6	4.36
WMLP328	BCA	ES2229440016	16/08/2022	4.4	<0.004	0.10	0.2	0.3	0.02	8.98	8.78	1.13
WMLP336	HRA	ES2229440020	17/08/2022	17.1	<0.004	2.67	1.4	4.1	1.02	6.69	6.92	1.66
WMLP337	HRA	ES2229440022	17/08/2022	80.6	<0.004	0.10	0.4	0.5	0.12	34.0	32.3	2.49

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												
WMLP338	HRA	ES2229440021	17/08/2022	550	<0.004	<0.01	0.9	0.9	0.40	21.6	19.6	4.88
WMLP343	GCA	ES2230311006	24/08/2022	166	<0.004	1.12	0.7	1.8	0.23	6.70	6.65	0.42
WMLP346	GCA	ES2230311004	24/08/2022	46.7	<0.004	0.02	0.3	0.3	0.08	6.78	6.49	2.23
WMLP349	GCA	ES2230311002	24/08/2022	50.0	<0.004	1.40	0.3	1.7	0.08	5.20	5.22	0.18
WMLP358	GCA	ES2230311001	24/08/2022	156	<0.004	1.54	1.1	2.6	0.19	4.12	4.19	0.82
WMLP358 DUPLICATE	GCA	ES2230311008	24/08/2022	52.3	<0.004	1.40	0.4	1.8	0.08	4.36	4.45	1.07
YAP016	BCA	ES2229440006	15/08/2022	8.6	<0.004	1.29	0.4	1.7	0.04	19.6	17.6	5.38

Appendix E

Groundwater chemistry – aquifer speciation

Table E1 Ashton August 2022 key monitoring bore water types

Bore ID	Geology	Individual Water Type	General Water Type
T5	BCA	Na-Ca-Cl-HCO3	Na-Ca
WMLP325	CMOB	Na-Ca-Cl-HCO3	
PB1	BCA	Na-Ca-Cl-HCO3-SO4	
T2-A		Na-Ca-Cl-HCO3-SO4	
WML113C		Na-Ca-Cl-HCO3-SO4	
WML115B	CMOB	Na-Ca-Cl-SO4-HCO3	
WML261	Coal	Na-Ca-HCO3-Cl	
WMLP349	GCA	Na-Ca-HCO3-Cl	
WMLP324	CMOB	Na-Ca-Mg-Cl-HCO3	
WML239	GCA	Na-Ca-Mg-Cl-HCO3	
WMLP346		Na-Ca-Mg-Cl-HCO3	
WMLP279	HRA	Na-Ca-Mg-Cl-HCO3	
WMLP328	BCA	Na-Ca-Mg-Cl-HCO3-SO4	
Ashton Well		Na-Ca-Mg-HCO3-Cl	
WMLP320		Na-Ca-Mg-HCO3-Cl	
WMLP323		Na-Ca-Mg-HCO3-Cl	
WML129	GCA	Na-Ca-Mg-HCO3-Cl	
WMLP343		Na-Ca-Mg-HCO3-Cl	
T2-P	CMOB	Na-Ca-Mg-HCO3-Cl-SO4	
RM01	BCA	Na-Cl	Na-Cl
T3-A		Na-Cl	
RA18		Na-Cl-HCO3	
WMLP326		Na-Cl-HCO3	
RM10	CMOB	Na-Cl-HCO3	
WMLP327		Na-Cl-HCO3	
RSGM1	Coal	Na-Cl	
WML181		Na-Cl-HCO3	
GM3A	GCA	Na-Cl-HCO3	
WMLP277	HRA	Na-Cl-HCO3	
WMLP278		Na-Cl-HCO3	
YAP016	BCA	Na-Cl-SO4-HCO3	

Bore ID	Geology	Individual Water Type	General Water Type
WML115C		Na-HCO3-Cl	Na-HCO3
WML119	Coal	Na-HCO3-Cl	
WML262		Na-HCO3-Cl	
WMLP301		Na-HCO3-Cl	
WMLP280	HRA	Na-HCO3-Cl	
WML120A	Coal	Na-Mg-Ca-Cl-HCO3	Na-Mg
WML120B	GCA	Na-Mg-Ca-Cl-HCO3	
WMLP338	HRA	Na-Mg-Ca-Cl-HCO3	
WMLP308	BCA	Na-Mg-Ca-Cl-HCO3-SO4	
T3-P	CMOB	Na-Mg-Cl	
RM03	BCA	Na-Mg-Cl-HCO3	
WML183	Coal	Na-Mg-Cl-HCO3	
WMLP302		Na-Mg-Cl-HCO3	
WMLP337	HRA	Na-Mg-Cl-HCO3	
WMLP311	BCA	Na-Mg-Cl-HCO3-SO4	
GM01	Coal	Na-Mg-Cl-HCO3-SO4	
RA27	HRA	Na-Mg-HCO3-Cl	
WMLP358	GCA	Ca-Na-Mg-HCO3-Cl	Ca-Na
WMLP336	HRA	Ca-Na-Mg-HCO3-Cl	

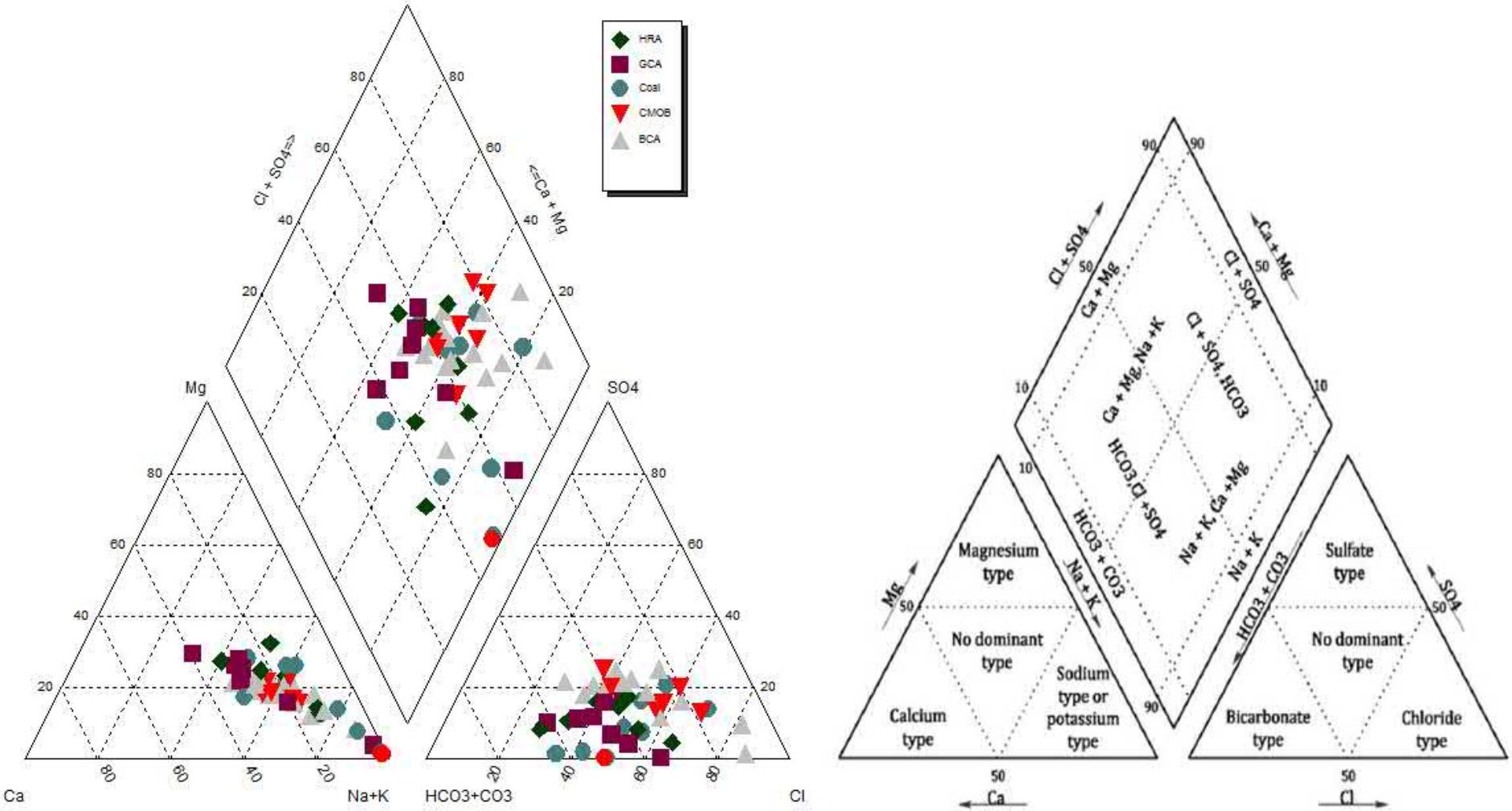

Figure E1 Ashton August 2022 key monitoring bore Piper Diagram

Appendix F

Laboratory certificate of analysis and chain of custody documents (August 2022)

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2229440**	Page	: 1 of 12
Client	: **AUSTRALASIAN GROUNDWATER AND ENVIRONMENTAL CONSULTANTS PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: BRYCE McKAY	Contact	: Customer Services ES
Address	: 4 HUDSON STREET HAMILTON NSW 2303	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 4926 2091	Telephone	: +61-2-8784 8555
Project	: Ashton Coal Mine GW Sampling	Date Samples Received	: 18-Aug-2022 08:10
Order number	: AUS5004	Date Analysis Commenced	: 18-Aug-2022
C-O-C number	: ----	Issue Date	: 25-Aug-2022 17:24
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
Neil Martin	Team Leader - Chemistry	Chemistry, Newcastle West, 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.

- EG020: It is recognised that total concentration is less than dissolved for some metal analytes. However, the difference is within experimental variation of the methods.
- 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.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	T5	WML115B	Ashton Well	WMLP308	WMLP325
			Sampling date / time	15-Aug-2022 08:45	15-Aug-2022 10:45	15-Aug-2022 11:30	15-Aug-2022 12:20	15-Aug-2022 13:35
Compound	CAS Number	LOR	Unit	ES2229440-001	ES2229440-002	ES2229440-003	ES2229440-004	ES2229440-005
				Result	Result	Result	Result	Result
EA005: pH								
pH Value	----	0.01	pH Unit	6.94	7.00	7.18	7.04	7.35
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	1070	4410	332	769	1160
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	626	----	----	420	685
EA045: Turbidity								
Turbidity	----	0.1	NTU	65.2	----	----	8.5	23.7
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	205	598	86	157	220
Total Alkalinity as CaCO3	----	1	mg/L	205	598	86	157	220
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	94	472	26	75	82
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	153	1030	37	113	240
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	49	220	20	33	57
Magnesium	7439-95-4	1	mg/L	22	96	8	21	28
Sodium	7440-23-5	1	mg/L	135	554	31	99	164
Potassium	7440-09-7	1	mg/L	2	3	4	2	2
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.002	----	----	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	0.001	----	----	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	0.018	----	----	0.016	0.010
Manganese	7439-96-5	0.001	mg/L	0.009	----	----	0.012	0.322
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	<0.01	<0.01
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	<0.05	0.63
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	<0.001	<0.001

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	T5	WML115B	Ashton Well	WMLP308	WMLP325
				Sampling date / time	15-Aug-2022 08:45	15-Aug-2022 10:45	15-Aug-2022 11:30	15-Aug-2022 12:20	15-Aug-2022 13:35
Compound	CAS Number	LOR	Unit		ES2229440-001	ES2229440-002	ES2229440-003	ES2229440-004	ES2229440-005
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	----	----	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		**0.004**	----	----	**0.003**	**0.001**
Copper	7440-50-8	0.001	mg/L		**0.004**	----	----	**0.004**	**0.001**
Nickel	7440-02-0	0.001	mg/L		**0.003**	----	----	**0.003**	**0.002**
Lead	7439-92-1	0.001	mg/L		**0.001**	----	----	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L		**0.024**	----	----	**0.021**	**0.015**
Manganese	7439-96-5	0.001	mg/L		**0.060**	----	----	**0.020**	**0.352**
Selenium	7782-49-2	0.01	mg/L		<0.01	----	----	<0.01	<0.01
Iron	7439-89-6	0.05	mg/L		**1.72**	----	----	**0.59**	**0.85**
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	----	----	<0.004	<0.004
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	----	----	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**1.20**	----	----	<0.01	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**1.20**	----	----	<0.01	<0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**0.5**	----	----	**0.2**	**0.2**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**1.7**	----	----	**0.2**	**0.2**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.07**	----	----	**0.03**	**0.05**
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**10.4**	**50.8**	**3.30**	**7.88**	**12.9**
ø Total Cations	----	0.01	meq/L		**10.2**	**43.0**	**3.11**	**7.73**	**12.3**
ø Ionic Balance	----	0.01	%		**0.92**	**8.28**	**3.06**	**0.98**	**2.14**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	YAP016	GM01	WMLP311	WMLP323	WMLP324
			Sampling date / time	15-Aug-2022 14:45	15-Aug-2022 15:20	15-Aug-2022 13:15	16-Aug-2022 07:30	16-Aug-2022 08:15
Compound	CAS Number	LOR	Unit	ES2229440-006	ES2229440-007	ES2229440-008	ES2229440-009	ES2229440-010
				Result	Result	Result	Result	Result
EA005: pH								
pH Value	----	0.01	pH Unit	6.92	7.28	6.90	7.09	7.15
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	1720	1770	865	672	709
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	1050	1090	490	371	400
EA045: Turbidity								
Turbidity	----	0.1	NTU	8.6	454	36.4	23.8	5.4
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	266	280	191	154	160
Total Alkalinity as CaCO3	----	1	mg/L	266	280	191	154	160
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	225	195	86	59	65
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	340	388	125	87	98
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	39	67	33	32	33
Magnesium	7439-95-4	1	mg/L	29	49	22	19	19
Sodium	7440-23-5	1	mg/L	303	269	123	82	91
Potassium	7440-09-7	1	mg/L	3	4	2	2	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	0.002	<0.001	0.002	<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	0.003	<0.001	0.004	0.007	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	0.014	0.054	0.014	0.035	0.016
Manganese	7439-96-5	0.001	mg/L	0.030	0.465	0.006	0.009	0.086
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	0.90	<0.05	<0.05	<0.05
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	0.005	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	YAP016	GM01	WMLP311	WMLP323	WMLP324
				Sampling date / time	15-Aug-2022 14:45	15-Aug-2022 15:20	15-Aug-2022 13:15	16-Aug-2022 07:30	16-Aug-2022 08:15
Compound	CAS Number	LOR	Unit		ES2229440-006	ES2229440-007	ES2229440-008	ES2229440-009	ES2229440-010
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
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		**0.009**	**0.008**	**0.018**	**0.002**	**0.003**
Copper	7440-50-8	0.001	mg/L		**0.004**	**0.012**	**0.003**	**0.002**	**0.001**
Nickel	7440-02-0	0.001	mg/L		**0.009**	**0.008**	**0.010**	**0.002**	**0.003**
Lead	7439-92-1	0.001	mg/L		<0.001	**0.012**	<0.001	**0.001**	<0.001
Zinc	7440-66-6	0.005	mg/L		**0.014**	**0.106**	**0.020**	**0.017**	**0.014**
Manganese	7439-96-5	0.001	mg/L		**0.040**	**1.34**	**0.016**	**0.025**	**0.094**
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		**0.30**	**13.5**	**1.14**	**0.82**	**0.16**
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
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**1.29**	<0.01	**0.09**	**0.03**	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**1.29**	<0.01	**0.09**	**0.03**	<0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**0.4**	**1.5**	**0.1**	**0.2**	**0.3**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**1.7**	**1.5**	**0.2**	**0.2**	**0.3**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.04**	**0.25**	**0.03**	**0.03**	**0.02**
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**19.6**	**20.6**	**9.13**	**6.76**	**7.31**
ø Total Cations	----	0.01	meq/L		**17.6**	**19.2**	**8.86**	**6.78**	**7.22**
ø Ionic Balance	----	0.01	%		**5.38**	**3.57**	**1.52**	**0.14**	**0.65**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	WML115C	T2-A	T2-P	PB1	RM10
			Sampling date / time	16-Aug-2022 09:10	16-Aug-2022 10:00	16-Aug-2022 10:35	16-Aug-2022 11:05	16-Aug-2022 11:30
Compound	CAS Number	LOR	Unit	ES2229440-011	ES2229440-012	ES2229440-013	ES2229440-014	ES2229440-015
				Result	Result	Result	Result	Result
EA005: pH								
pH Value	----	0.01	pH Unit	7.01	7.17	7.00	7.03	7.17
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	383	760	747	939	522
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	----	428	410	----	----
EA045: Turbidity								
Turbidity	----	0.1	NTU	----	6.5	7.6	----	----
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	104	169	162	196	114
Total Alkalinity as CaCO3	----	1	mg/L	104	169	162	196	114
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	35	71	84	108	42
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	33	100	90	129	68
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	13	32	39	39	18
Magnesium	7439-95-4	1	mg/L	6	17	18	22	10
Sodium	7440-23-5	1	mg/L	65	105	92	142	81
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	----	<0.001	0.003	----	----
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	----	0.003	0.002	----	----
Lead	7439-92-1	0.001	mg/L	----	<0.001	<0.001	----	----
Zinc	7440-66-6	0.005	mg/L	----	0.011	0.012	----	----
Manganese	7439-96-5	0.001	mg/L	----	0.011	0.157	----	----
Selenium	7782-49-2	0.01	mg/L	----	<0.01	<0.01	----	----
Iron	7439-89-6	0.05	mg/L	----	<0.05	1.33	----	----
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	----	<0.001	0.004	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	WML115C	T2-A	T2-P	PB1	RM10
			Sampling date / time	16-Aug-2022 09:10	16-Aug-2022 10:00	16-Aug-2022 10:35	16-Aug-2022 11:05	16-Aug-2022 11:30
Compound	CAS Number	LOR	Unit	ES2229440-011	ES2229440-012	ES2229440-013	ES2229440-014	ES2229440-015
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Cadmium	7440-43-9	0.0001	mg/L	----	<0.0001	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L	----	**0.004**	<0.001	----	----
Copper	7440-50-8	0.001	mg/L	----	**0.004**	<0.001	----	----
Nickel	7440-02-0	0.001	mg/L	----	**0.004**	**0.002**	----	----
Lead	7439-92-1	0.001	mg/L	----	<0.001	<0.001	----	----
Zinc	7440-66-6	0.005	mg/L	----	**0.015**	**0.016**	----	----
Manganese	7439-96-5	0.001	mg/L	----	**0.017**	**0.172**	----	----
Selenium	7782-49-2	0.01	mg/L	----	<0.01	<0.01	----	----
Iron	7439-89-6	0.05	mg/L	----	**0.20**	**1.57**	----	----
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	0.004	mg/L	----	<0.004	<0.004	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	----	<0.01	<0.01	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	----	**0.77**	<0.01	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	----	**0.77**	<0.01	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	----	**0.2**	**0.2**	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	----	**1.0**	**0.2**	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	----	**0.03**	**0.05**	----	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**3.74**	**7.68**	**7.52**	**9.80**	**5.07**
ø Total Cations	----	0.01	meq/L	**4.12**	**7.61**	**7.48**	**10.0**	**5.30**
ø Ionic Balance	----	0.01	%	**4.91**	**0.40**	**0.29**	**1.04**	**2.17**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	WMLP328	RA18	WMLP320	WML113C	WMLP336
			Sampling date / time	16-Aug-2022 12:20	16-Aug-2022 12:50	16-Aug-2022 13:40	16-Aug-2022 14:55	17-Aug-2022 08:00
Compound	CAS Number	LOR	Unit	ES2229440-016	ES2229440-017	ES2229440-018	ES2229440-019	ES2229440-020
				Result	Result	Result	Result	Result
EA005: pH								
pH Value	----	0.01	pH Unit	7.07	7.43	6.98	7.12	6.79
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	855	953	743	736	685
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	476	----	440	436	412
EA045: Turbidity								
Turbidity	----	0.1	NTU	4.4	----	2.0	38.2	17.1
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	165	172	186	150	166
Total Alkalinity as CaCO3	----	1	mg/L	165	172	186	150	166
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	90	53	69	76	47
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	135	198	89	105	85
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	43	26	39	42	45
Magnesium	7439-95-4	1	mg/L	25	17	19	17	23
Sodium	7440-23-5	1	mg/L	104	168	89	88	51
Potassium	7440-09-7	1	mg/L	2	1	2	1	22
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	0.002
Lead	7439-92-1	0.001	mg/L	<0.001	----	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	0.010	----	0.013	0.009	0.017
Manganese	7439-96-5	0.001	mg/L	0.005	----	0.010	0.006	0.067
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	<0.05	0.11
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	<0.001	<0.001	0.002

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	WMLP328	RA18	WMLP320	WML113C	WMLP336
				Sampling date / time	16-Aug-2022 12:20	16-Aug-2022 12:50	16-Aug-2022 13:40	16-Aug-2022 14:55	17-Aug-2022 08:00
Compound	CAS Number	LOR	Unit		ES2229440-016	ES2229440-017	ES2229440-018	ES2229440-019	ES2229440-020
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
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**	**0.017**	**0.002**
Copper	7440-50-8	0.001	mg/L		<0.001	----	<0.001	**0.002**	**0.004**
Nickel	7440-02-0	0.001	mg/L		<0.001	----	**0.001**	**0.009**	**0.003**
Lead	7439-92-1	0.001	mg/L		<0.001	----	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L		**0.012**	----	**0.018**	**0.015**	**0.026**
Manganese	7439-96-5	0.001	mg/L		**0.008**	----	**0.019**	**0.029**	**0.080**
Selenium	7782-49-2	0.01	mg/L		<0.01	----	<0.01	<0.01	<0.01
Iron	7439-89-6	0.05	mg/L		**0.08**	----	**0.13**	**1.62**	**0.63**
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	----	<0.004	<0.004	<0.004
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	----	<0.01	<0.01	**0.01**
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**0.10**	----	**0.28**	**0.41**	**2.66**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**0.10**	----	**0.28**	**0.41**	**2.67**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**0.2**	----	**0.1**	**0.2**	**1.4**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**0.3**	----	**0.4**	**0.6**	**4.1**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.02**	----	**0.06**	**0.05**	**1.02**
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**8.98**	**10.1**	**7.66**	**7.54**	**6.69**
ø Total Cations	----	0.01	meq/L		**8.78**	**10.0**	**7.43**	**7.35**	**6.92**
ø Ionic Balance	----	0.01	%		**1.13**	**0.47**	**1.53**	**1.30**	**1.66**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	WMLP338	WMLP337	WML129	WMLP279	Duplicate
			Sampling date / time	17-Aug-2022 09:25	17-Aug-2022 10:10	17-Aug-2022 11:35	17-Aug-2022 13:00	17-Aug-2022 13:00
Compound	CAS Number	LOR	Unit	ES2229440-021	ES2229440-022	ES2229440-023	ES2229440-024	ES2229440-025
				Result	Result	Result	Result	Result
EA005: pH								
pH Value	----	0.01	pH Unit	**6.99**	**7.20**	**7.14**	**7.08**	**7.10**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**1920**	**2880**	**364**	**746**	**754**
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**1130**	**1650**	**217**	**434**	**448**
EA045: Turbidity								
Turbidity	----	0.1	NTU	**550**	**80.6**	**1.7**	**13.4**	**48.6**
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	**372**	**722**	**124**	**171**	**170**
Total Alkalinity as CaCO3	----	1	mg/L	**372**	**722**	**124**	**171**	**170**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**44**	**124**	**16**	**68**	**68**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**470**	**601**	**34**	**102**	**103**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**90**	**106**	**22**	**43**	**44**
Magnesium	7439-95-4	1	mg/L	**59**	**127**	**12**	**21**	**21**
Sodium	7440-23-5	1	mg/L	**235**	**378**	**38**	**85**	**85**
Potassium	7440-09-7	1	mg/L	**1**	**5**	**2**	<1	<1
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	**0.002**	<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	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	**0.006**	**0.006**	**0.001**	**0.003**	**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	**0.015**	**0.011**	**0.010**	**0.010**	**0.011**
Manganese	7439-96-5	0.001	mg/L	**0.914**	**0.502**	**0.097**	**0.045**	**0.046**
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	**4.15**	**0.47**	<0.05	<0.05	<0.05
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	**0.004**	**0.001**	<0.001	<0.001	**0.002**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	WMLP338	WMLP337	WML129	WMLP279	Duplicate
				Sampling date / time	17-Aug-2022 09:25	17-Aug-2022 10:10	17-Aug-2022 11:35	17-Aug-2022 13:00	17-Aug-2022 13:00
Compound	CAS Number	LOR	Unit		ES2229440-021	ES2229440-022	ES2229440-023	ES2229440-024	ES2229440-025
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
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		**0.190**	**0.085**	<0.001	**0.020**	**0.020**
Copper	7440-50-8	0.001	mg/L		**0.018**	**0.010**	<0.001	**0.002**	**0.004**
Nickel	7440-02-0	0.001	mg/L		**0.090**	**0.050**	**0.001**	**0.019**	**0.012**
Lead	7439-92-1	0.001	mg/L		**0.005**	**0.003**	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L		**0.064**	**0.055**	**0.012**	**0.025**	**0.050**
Manganese	7439-96-5	0.001	mg/L		**1.06**	**0.617**	**0.104**	**0.054**	**0.113**
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		**10.9**	**5.81**	**0.07**	**0.90**	**4.32**
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
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		<0.01	**0.10**	**0.24**	**0.91**	**0.92**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	**0.10**	**0.24**	**0.91**	**0.92**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**0.9**	**0.4**	**0.3**	**0.2**	**0.3**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**0.9**	**0.5**	**0.5**	**1.1**	**1.2**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.40**	**0.12**	**0.04**	**0.12**	**0.13**
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**21.6**	**34.0**	**3.77**	**7.71**	**7.72**
ø Total Cations	----	0.01	meq/L		**19.6**	**32.3**	**3.79**	**7.57**	**7.62**
ø Ionic Balance	----	0.01	%		**4.88**	**2.49**	**0.26**	**0.90**	**0.63**

Inter-Laboratory Testing

Analysis conducted by ALS Newcastle - Water, NATA accreditation no. 825, site no. 1656 (Chemistry) 9854 (Biology).

(WATER) EA005: pH

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2229658**	Page	: 1 of 6
Client	: **AUSTRALASIAN GROUNDWATER AND ENVIRONMENTAL CONSULTANTS PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: BRYCE McKAY	Contact	: Customer Services ES
Address	: 4 HUDSON STREET HAMILTON NSW 2303	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 4926 2091	Telephone	: +61-2-8784 8555
Project	: Ashton Coal Mine GW Sampling	Date Samples Received	: 19-Aug-2022 10:24
Order number	: AUS5004	Date Analysis Commenced	: 19-Aug-2022
C-O-C number	: ----	Issue Date	: 26-Aug-2022 11:31
Sampler	: EDWARD HUNT		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 10		
No. of samples analysed	: 10		

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
Neil Martin	Team Leader - Chemistry	Chemistry, Newcastle West, 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.

- 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.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	RM03	T3-P	T3-A	WMLP327	WMLP326
			Sampling date / time	18-Aug-2022 07:55	18-Aug-2022 09:00	18-Aug-2022 09:40	18-Aug-2022 10:35	18-Aug-2022 10:55
Compound	CAS Number	LOR	Unit	ES2229658-001	ES2229658-002	ES2229658-003	ES2229658-004	ES2229658-005
				Result	Result	Result	Result	Result
EA005: pH								
pH Value	----	0.01	pH Unit	7.39	7.20	7.02	7.04	7.41
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	736	2420	3340	1740	1140
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	----	1880	1940	----	----
EA045: Turbidity								
Turbidity	----	0.1	NTU	----	6.9	14.2	----	----
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	232	364	172	332	241
Total Alkalinity as CaCO3	----	1	mg/L	232	364	172	332	241
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	135	208	152	151	119
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	386	821	967	412	240
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	54	102	76	71	48
Magnesium	7439-95-4	1	mg/L	43	91	70	40	25
Sodium	7440-23-5	1	mg/L	243	460	520	292	200
Potassium	7440-09-7	1	mg/L	1	4	<1	3	<1
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	0.002	----	----
Lead	7439-92-1	0.001	mg/L	----	<0.001	<0.001	----	----
Zinc	7440-66-6	0.005	mg/L	----	0.013	0.012	----	----
Manganese	7439-96-5	0.001	mg/L	----	0.092	0.008	----	----
Selenium	7782-49-2	0.01	mg/L	----	<0.01	<0.01	----	----
Iron	7439-89-6	0.05	mg/L	----	0.71	<0.05	----	----
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	----	<0.001	<0.001	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	RM03	T3-P	T3-A	WMLP327	WMLP326
				Sampling date / time	18-Aug-2022 07:55	18-Aug-2022 09:00	18-Aug-2022 09:40	18-Aug-2022 10:35	18-Aug-2022 10:55
Compound	CAS Number	LOR	Unit		ES2229658-001	ES2229658-002	ES2229658-003	ES2229658-004	ES2229658-005
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Cadmium	7440-43-9	0.0001	mg/L		----	<0.0001	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L		----	**0.006**	**0.021**	----	----
Copper	7440-50-8	0.001	mg/L		----	**0.002**	**0.002**	----	----
Nickel	7440-02-0	0.001	mg/L		----	**0.004**	**0.012**	----	----
Lead	7439-92-1	0.001	mg/L		----	**0.002**	<0.001	----	----
Zinc	7440-66-6	0.005	mg/L		----	**0.016**	**0.015**	----	----
Molybdenum	7439-98-7	0.001	mg/L		----	<0.001	<0.001	----	----
Selenium	7782-49-2	0.01	mg/L		----	<0.01	<0.01	----	----
Iron	7439-89-6	0.05	mg/L		----	**0.78**	**0.72**	----	----
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		----	<0.004	<0.004	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		----	<0.01	<0.01	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		----	**0.04**	**1.80**	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		----	**0.04**	**1.80**	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		----	**1.1**	**0.4**	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		----	**1.1**	**2.2**	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		----	**0.03**	**0.08**	----	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**18.3**	**34.8**	**33.9**	**21.4**	**14.1**
ø Total Cations	----	0.01	meq/L		**16.8**	**32.7**	**32.2**	**19.6**	**13.2**
ø Ionic Balance	----	0.01	%		**4.28**	**3.07**	**2.58**	**4.36**	**3.35**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	WMLP278	WMLP277	RA27	WMLP280	RM01
			Sampling date / time	18-Aug-2022 11:20	18-Aug-2022 11:55	18-Aug-2022 12:45	18-Aug-2022 13:30	18-Aug-2022 14:10
Compound	CAS Number	LOR	Unit	ES2229658-006	ES2229658-007	ES2229658-008	ES2229658-009	ES2229658-010
				Result	Result	Result	Result	Result
EA005: pH								
pH Value	----	0.01	pH Unit	7.26	7.33	7.18	7.14	6.84
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	1220	820	639	504	1100
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	692	594	438	306	----
EA045: Turbidity								
Turbidity	----	0.1	NTU	4.6	6.7	52.7	5.9	----
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	258	234	227	178	172
Total Alkalinity as CaCO3	----	1	mg/L	258	234	227	178	172
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	98	68	34	18	17
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	196	157	81	44	758
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	48	26	26	13	23
Magnesium	7439-95-4	1	mg/L	25	18	22	8	22
Sodium	7440-23-5	1	mg/L	180	174	106	88	430
Potassium	7440-09-7	1	mg/L	<1	<1	<1	<1	11
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	0.003	0.001	0.002	<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	0.004	0.002	0.002	0.002	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Zinc	7440-66-6	0.005	mg/L	0.011	0.009	0.069	0.012	----
Manganese	7439-96-5	0.001	mg/L	0.008	0.028	0.010	0.010	----
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	<0.05	<0.05	----
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	WMLP278	WMLP277	RA27	WMLP280	RM01
			Sampling date / time	18-Aug-2022 11:20	18-Aug-2022 11:55	18-Aug-2022 12:45	18-Aug-2022 13:30	18-Aug-2022 14:10
Compound	CAS Number	LOR	Unit	ES2229658-006	ES2229658-007	ES2229658-008	ES2229658-009	ES2229658-010
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L	**0.009**	**0.006**	**0.010**	**0.003**	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	**0.003**	**0.002**	----
Nickel	7440-02-0	0.001	mg/L	**0.006**	**0.005**	**0.009**	**0.004**	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Zinc	7440-66-6	0.005	mg/L	**0.012**	**0.013**	**0.016**	**0.014**	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	**0.002**	<0.001	<0.001	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Iron	7439-89-6	0.05	mg/L	**0.16**	**0.29**	**1.42**	**0.14**	----
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	<0.004	<0.004	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.87**	**1.19**	**1.29**	**0.02**	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.87**	**1.19**	**1.29**	**0.02**	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.4**	**0.5**	**0.5**	**0.3**	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**1.3**	**1.7**	**1.8**	**0.3**	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.14**	**0.19**	**0.36**	**0.28**	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**12.7**	**10.5**	**7.53**	**5.17**	**25.2**
ø Total Cations	----	0.01	meq/L	**12.3**	**10.3**	**7.72**	**5.13**	**21.9**
ø Ionic Balance	----	0.01	%	**1.77**	**0.83**	**1.25**	**0.36**	**6.85**

Inter-Laboratory Testing

Analysis conducted by ALS Newcastle - Water, NATA accreditation no. 825, site no. 1656 (Chemistry) 9854 (Biology).

(WATER) EA005: pH

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2230100**	Page	: 1 of 6
Client	: **AUSTRALASIAN GROUNDWATER AND ENVIRONMENTAL CONSULTANTS PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: BRYCE McKAY	Contact	: Customer Services ES
Address	: 4 HUDSON STREET HAMILTON NSW 2303	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 4926 2091	Telephone	: +61-2-8784 8555
Project	: Ashton Coal Mine GW Sampling	Date Samples Received	: 23-Aug-2022 17:36
Order number	: AUS5004	Date Analysis Commenced	: 23-Aug-2022
C-O-C number	: ----	Issue Date	: 31-Aug-2022 17:10
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*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Neil Martin	Team Leader - Chemistry	Chemistry, Newcastle West, 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.

- TDS by method EA-015 may bias high for sample 9 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.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	WML181	WML119	WML262	WMLP301	WML183
			Sampling date / time	22-Aug-2022 10:05	22-Aug-2022 12:00	22-Aug-2022 12:30	22-Aug-2022 13:25	22-Aug-2022 14:20
Compound	CAS Number	LOR	Unit	ES2230100-001	ES2230100-002	ES2230100-003	ES2230100-004	ES2230100-005
				Result	Result	Result	Result	Result
EA005: pH								
pH Value	----	0.01	pH Unit	**7.77**	**7.14**	**7.95**	**7.90**	**7.05**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**2910**	**782**	**2900**	**3300**	**2840**
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**1760**	**437**	**1710**	**1930**	**1610**
EA045: Turbidity								
Turbidity	----	0.1	NTU	**152**	**290**	**31.6**	**43.3**	**33.2**
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	**733**	**232**	**871**	**980**	**573**
Total Alkalinity as CaCO3	----	1	mg/L	**733**	**232**	**871**	**980**	**573**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**122**	**6**	<1	<1	**223**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**520**	**103**	**504**	**548**	**522**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**28**	**18**	**7**	**8**	**73**
Magnesium	7439-95-4	1	mg/L	**27**	**11**	**5**	**5**	**92**
Sodium	7440-23-5	1	mg/L	**584**	**124**	**638**	**707**	**410**
Potassium	7440-09-7	1	mg/L	**4**	**3**	**3**	**3**	**6**
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	**0.026**	**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	**0.005**	**0.004**	<0.001	<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	**0.009**	**0.022**	**0.012**	**0.008**	**0.011**
Manganese	7439-96-5	0.001	mg/L	**0.042**	**0.207**	**0.051**	**0.030**	**0.131**
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	**0.37**	**0.12**	<0.05	**0.22**
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	**0.003**	<0.001	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	WML181	WML119	WML262	WMLP301	WML183
				Sampling date / time	22-Aug-2022 10:05	22-Aug-2022 12:00	22-Aug-2022 12:30	22-Aug-2022 13:25	22-Aug-2022 14:20
Compound	CAS Number	LOR	Unit		ES2230100-001	ES2230100-002	ES2230100-003	ES2230100-004	ES2230100-005
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	**0.0002**	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		**0.085**	**0.006**	**0.003**	**0.003**	**0.002**
Copper	7440-50-8	0.001	mg/L		**0.015**	**0.049**	**0.007**	**0.013**	**0.003**
Nickel	7440-02-0	0.001	mg/L		**0.046**	**0.011**	**0.002**	**0.003**	**0.003**
Lead	7439-92-1	0.001	mg/L		**0.003**	**0.034**	**0.007**	**0.003**	**0.002**
Zinc	7440-66-6	0.005	mg/L		**0.041**	**0.566**	**0.178**	**0.052**	**0.048**
Manganese	7439-96-5	0.001	mg/L		**0.059**	**0.399**	**0.089**	**0.049**	**0.150**
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		**2.10**	**2.77**	**1.33**	**0.78**	**0.73**
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
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	**0.04**	**0.02**	<0.01	**0.01**
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		<0.01	**0.03**	<0.01	**0.01**	**0.01**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	**0.07**	**0.02**	**0.01**	**0.02**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**1.8**	**3.7**	**2.3**	**13.2**	**1.2**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**1.8**	**3.8**	**2.3**	**13.2**	**1.2**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.31**	**0.54**	**0.78**	**0.73**	**0.05**
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**31.8**	**7.66**	**31.6**	**35.0**	**30.8**
ø Total Cations	----	0.01	meq/L		**29.1**	**7.27**	**28.6**	**31.6**	**29.2**
ø Ionic Balance	----	0.01	%		**4.48**	**2.62**	**5.03**	**5.10**	**2.69**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	WML120B	WML120A	WMLP302	WML261	----
			Sampling date / time	22-Aug-2022 07:55	22-Aug-2022 08:45	22-Aug-2022 12:45	22-Aug-2022 14:00	----
Compound	CAS Number	LOR	Unit	ES2230100-006	ES2230100-007	ES2230100-008	ES2230100-009	--------
				Result	Result	Result	Result	----
EA005: pH								
pH Value	----	0.01	pH Unit	**6.86**	**6.97**	**6.58**	**6.58**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**902**	**812**	**766**	**109**	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**525**	**410**	**386**	**103**	----
EA045: Turbidity								
Turbidity	----	0.1	NTU	**225**	**7.0**	**36.9**	**30.8**	----
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	**191**	**182**	**156**	**29**	----
Total Alkalinity as CaCO3	----	1	mg/L	**191**	**182**	**156**	**29**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**64**	**59**	**25**	<1	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**130**	**113**	**140**	**10**	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**47**	**39**	**23**	**6**	----
Magnesium	7439-95-4	1	mg/L	**29**	**27**	**24**	**2**	----
Sodium	7440-23-5	1	mg/L	**88**	**86**	**101**	**8**	----
Potassium	7440-09-7	1	mg/L	<1	**1**	**3**	**6**	----
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	**0.003**	**0.012**	<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	**0.020**	**0.018**	**0.002**	**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	**0.026**	**0.020**	**0.025**	**0.189**	----
Manganese	7439-96-5	0.001	mg/L	**0.049**	**0.211**	**0.029**	**0.012**	----
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	**1.60**	**1.35**	**0.23**	----
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	**0.002**	<0.001	**0.001**	**0.001**	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	WML120B	WML120A	WMLP302	WML261	----
				Sampling date / time	22-Aug-2022 07:55	22-Aug-2022 08:45	22-Aug-2022 12:45	22-Aug-2022 14:00	----
Compound	CAS Number	LOR	Unit		ES2230100-006	ES2230100-007	ES2230100-008	ES2230100-009	--------
					Result	Result	Result	Result	----
EG020T: Total Metals by ICP-MS - Continued									
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L		**0.055**	**0.027**	**0.006**	**0.002**	----
Copper	7440-50-8	0.001	mg/L		**0.041**	**0.017**	**0.112**	**0.005**	----
Nickel	7440-02-0	0.001	mg/L		**0.033**	**0.022**	**0.005**	**0.002**	----
Lead	7439-92-1	0.001	mg/L		**0.005**	<0.001	**0.006**	**0.002**	----
Zinc	7440-66-6	0.005	mg/L		**0.060**	**0.023**	**0.065**	**0.278**	----
Manganese	7439-96-5	0.001	mg/L		**0.169**	**0.228**	**0.052**	**0.020**	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Iron	7439-89-6	0.05	mg/L		**8.20**	**1.95**	**2.54**	**1.74**	----
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	<0.004	<0.004	<0.004	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	**0.01**	<0.01	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**1.13**	<0.01	**0.01**	**0.05**	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**1.13**	<0.01	**0.02**	**0.05**	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**0.6**	**0.2**	**2.2**	**0.6**	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**1.7**	**0.2**	**2.2**	**0.6**	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.17**	**0.04**	**0.30**	**0.26**	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**8.82**	**8.05**	**7.59**	**0.86**	----
ø Total Cations	----	0.01	meq/L		**8.56**	**7.93**	**7.59**	**0.96**	----
ø Ionic Balance	----	0.01	%		**1.47**	**0.74**	**0.04**	----	----

Inter-Laboratory Testing

Analysis conducted by ALS Newcastle - Water, NATA accreditation no. 825, site no. 1656 (Chemistry) 9854 (Biology).

(WATER) EA005: pH

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2230311**	Page	: 1 of 6
Client	: **AUSTRALASIAN GROUNDWATER AND ENVIRONMENTAL CONSULTANTS PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: BRYCE McKAY	Contact	: Customer Services ES
Address	: 4 HUDSON STREET HAMILTON NSW 2303	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 4926 2091	Telephone	: +61-2-8784 8555
Project	: AUS5004 Ashton Coal Mine GW Sampling	Date Samples Received	: 25-Aug-2022 08:02
Order number	: ----	Date Analysis Commenced	: 26-Aug-2022
C-O-C number	: ----	Issue Date	: 01-Sep-2022 18:04
Sampler	: EDWARD HUNT		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 8		
No. of samples analysed	: 8		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

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Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

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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.

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^ = 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.

- 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.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	WMLP358	WMLP349	WML239	WMLP346	RSGM1
			Sampling date / time	24-Aug-2022 07:35	24-Aug-2022 08:45	24-Aug-2022 10:00	24-Aug-2022 11:15	24-Aug-2022 12:40
Compound	CAS Number	LOR	Unit	ES2230311-001	ES2230311-002	ES2230311-003	ES2230311-004	ES2230311-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.74**	**6.79**	**7.05**	**6.98**	**6.92**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**395**	**504**	**569**	**617**	**1410**
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**364**	**374**	**457**	**432**	**1130**
EA045: Turbidity								
Turbidity	----	0.1	NTU	**156**	**50.0**	**300**	**46.7**	**4290**
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	**108**	**124**	**156**	**159**	**256**
Total Alkalinity as CaCO3	----	1	mg/L	**108**	**124**	**156**	**159**	**256**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**21**	**36**	**18**	**12**	**102**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**54**	**70**	**96**	**119**	**330**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**33**	**21**	**36**	**36**	**57**
Magnesium	7439-95-4	1	mg/L	**15**	**10**	**16**	**20**	**35**
Sodium	7440-23-5	1	mg/L	**30**	**77**	**67**	**70**	**210**
Potassium	7440-09-7	1	mg/L	<1	<1	**1**	<1	**3**
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	**0.004**
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	**0.002**	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	**0.001**	<0.001	<0.001	**0.002**
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	**0.056**	**0.014**	**0.010**	**0.023**	**0.040**
Manganese	7439-96-5	0.001	mg/L	**0.006**	**0.080**	**0.023**	**0.180**	**0.990**
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	**0.11**	<0.05	**0.11**	**0.66**
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	**0.005**	<0.001	**0.009**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	WMLP358	WMLP349	WML239	WMLP346	RSGM1
				Sampling date / time	24-Aug-2022 07:35	24-Aug-2022 08:45	24-Aug-2022 10:00	24-Aug-2022 11:15	24-Aug-2022 12:40
Compound	CAS Number	LOR	Unit		ES2230311-001	ES2230311-002	ES2230311-003	ES2230311-004	ES2230311-005
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Cadmium	7440-43-9	0.0001	mg/L		**0.0001**	<0.0001	<0.0001	<0.0001	**0.0002**
Chromium	7440-47-3	0.001	mg/L		**0.010**	**0.004**	**0.007**	**0.002**	**0.008**
Copper	7440-50-8	0.001	mg/L		**0.032**	**0.002**	**0.009**	**0.002**	**0.014**
Nickel	7440-02-0	0.001	mg/L		**0.016**	**0.002**	**0.004**	**0.002**	**0.010**
Lead	7439-92-1	0.001	mg/L		**0.010**	**0.002**	**0.005**	**0.002**	**0.022**
Zinc	7440-66-6	0.005	mg/L		**0.127**	**0.023**	**0.029**	**0.043**	**0.407**
Manganese	7439-96-5	0.001	mg/L		**1.31**	**0.110**	**0.056**	**0.190**	**1.52**
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		**3.45**	**1.10**	**11.6**	**0.80**	**15.1**
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	<0.004	<0.004	<0.004	<0.004
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	**0.01**	<0.01	<0.01	**0.01**
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**1.54**	**1.39**	**0.22**	**0.02**	**0.93**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**1.54**	**1.40**	**0.22**	**0.02**	**0.94**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**1.1**	**0.3**	**0.7**	**0.3**	**8.2**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**2.6**	**1.7**	**0.9**	**0.3**	**9.1**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.19**	**0.08**	**0.61**	**0.08**	**1.99**
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**4.12**	**5.20**	**6.20**	**6.78**	**16.5**
ø Total Cations	----	0.01	meq/L		**4.19**	**5.22**	**6.05**	**6.49**	**14.9**
ø Ionic Balance	----	0.01	%		**0.82**	**0.18**	**1.20**	**2.23**	**5.12**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	WMLP343	GM3A	DUPLICATE	----	----
			Sampling date / time	24-Aug-2022 13:45	24-Aug-2022 14:45	24-Aug-2022 00:00	----	----
Compound	CAS Number	LOR	Unit	ES2230311-006	ES2230311-007	ES2230311-008	--------	--------
				Result	Result	Result	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.17**	**7.37**	**6.68**	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**614**	**5050**	**419**	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**486**	----	**357**	----	----
EA045: Turbidity								
Turbidity	----	0.1	NTU	**166**	----	**52.3**	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**192**	**1120**	**113**	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**192**	**1120**	**113**	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**32**	**3**	**21**	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**78**	**1190**	**59**	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**39**	**26**	**34**	----	----
Magnesium	7439-95-4	1	mg/L	**18**	**24**	**15**	----	----
Sodium	7440-23-5	1	mg/L	**74**	**1160**	**35**	----	----
Potassium	7440-09-7	1	mg/L	<1	**5**	<1	----	----
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	**0.028**	----	**0.008**	----	----
Manganese	7439-96-5	0.001	mg/L	**0.012**	----	**0.007**	----	----
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								
Arsenic	7440-38-2	0.001	mg/L	**0.002**	----	<0.001	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	WMLP343	GM3A	DUPLICATE	----	----
			Sampling date / time	24-Aug-2022 13:45	24-Aug-2022 14:45	24-Aug-2022 00:00	----	----
Compound	CAS Number	LOR	Unit	ES2230311-006	ES2230311-007	ES2230311-008	--------	--------
				Result	Result	Result	----	----
EG020T: Total Metals by ICP-MS - Continued								
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L	**0.009**	----	**0.002**	----	----
Copper	7440-50-8	0.001	mg/L	**0.006**	----	**0.002**	----	----
Nickel	7440-02-0	0.001	mg/L	**0.006**	----	**0.001**	----	----
Lead	7439-92-1	0.001	mg/L	**0.004**	----	**0.001**	----	----
Zinc	7440-66-6	0.005	mg/L	**0.071**	----	**0.019**	----	----
Manganese	7439-96-5	0.001	mg/L	**0.186**	----	**0.037**	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	<0.01	----	----
Iron	7439-89-6	0.05	mg/L	**6.67**	----	**1.06**	----	----
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	0.004	mg/L	<0.004	----	<0.004	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	----	<0.01	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**1.12**	----	**1.40**	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**1.12**	----	**1.40**	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.7**	----	**0.4**	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**1.8**	----	**1.8**	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.23**	----	**0.08**	----	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**6.70**	**56.0**	**4.36**	----	----
ø Total Cations	----	0.01	meq/L	**6.65**	**53.8**	**4.45**	----	----
ø Ionic Balance	----	0.01	%	**0.42**	**1.96**	**1.07**	----	----

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph 02 4423 2063 E: nowra@alsglobal.com
PERTH 10 Hod Way Malaga WA 6090 Ph 08 9209 7655 E: samples.perth@alsglobal.com
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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: AUS5004		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, Bryce.McKay@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:	4.6		

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE/TIME:	DATE/TIME: 17/8/22 17:04	DATE/TIME: 18/8/22 17.00	DATE/TIME: 18/8/22 7:40

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	T5	15/08/2022 0845	W	P	6	X	X	X	X	X	X	X	X	X	X	
2	WML115B	15/08/2022 1045	W	P	2	X	X									
3	Ashton Well	15/08/2022 1130	W	P	2	X	X									
4	WMLP308	15/08/2022 1220	W	P	6	X	X	X	X	X	X	X	X	X	X	
5	WMLP325	15/08/2022 1335	W	P	6	X	X	X	X	X	X	X	X	X	X	
6	YAP016	15/08/2022 1445	W	P	6	X	X	X	X	X	X	X	X	X	X	
7	GM01	15/08/2022 1520	W	P	6	X	X	X	X	X	X	X	X	X	X	
8	WMLP311	15/08/2022 1315	W	P	6	X	X	X	X	X	X	X	X	X	X	
9	WMLP323	16/08/2022 0730	W	P	6	X	X	X	X	X	X	X	X	X	X	
10	WMLP324	16/08/2022 0815	W	P	6	X	X	X	X	X	X	X	X	X	X	
11	WML115C	16/08/2022 0910	W	P	2	X	X									
12	T2-A	16/08/2022 1000	W	P	6	X	X	X	X	X	X	X	X	X	X	
				TOTAL	60											

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 = Form
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

pH @ WN

Environmental Division Sydney
Work Order Reference
ES2229440

Telephone : + 61-2-8784 8555

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph 02 4423 2063 E: nowra@alsglobal.com
PERTH 10 Hod Way Malaga WA 6090 Ph 08 9209 7655 E: samples.perth@alsglobal.com
SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph 02 8784 8555 E: samples.sydney@alsglobal.com
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: AUS5004		COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: 4.6 °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:
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, Bryce.McKay@ageconsultants.com.au		DATE/TIME:	DATE/TIME: 17/8/22 17:04
Email Invoice to: As above + accounts@ageconsultants.com.au			

RELINQUISHED BY:	RECEIVED BY:
DATE/TIME: 18/8/22 17.00	DATE/TIME: 18/8/22 7:40

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.
13	T2-P	16/08/2022 1035	W	P	6	X	X	X	X	X	X	X	X	X	X	
14	PB1	16/08/2022 1105	W	P	2	X	X									
15	RM10	16/08/2022 1130	W	P	2	X	X									
16	WMLP328	16/08/2022 1220	W	P	6	X	X	X	X	X	X	X	X	X	X	
17	RA18	16/08/2022 1250	W	P	2	X	X									
18	WMLP320	16/08/2022 1340	W	P	6	X	X	X	X	X	X	X	X	X	X	
19	WML113C	16/08/2022 1455	W	P	6	X	X	X	X	X	X	X	X	X	X	
20	WMLP336	17/08/2022 0800	W	P	6	X	X	X	X	X	X	X	X	X	X	
21	WMLP338	17/08/2022 0925	W	P	6	X	X	X	X	X	X	X	X	X	X	
22	WMLP337	17/08/2022 1010	W	P	6	X	X	X	X	X	X	X	X	X	X	
23	WML129	17/08/2022 1135	W	P	6	X	X	X	X	X	X	X	X	X	X	
24	WMLP279	17/08/2022 1300	W	P	6	X	X	X	X	X	X	X	X	X	X	
				TOTAL	60											

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.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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☐BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
☐GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com
☐MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com
☐MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
☐MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
☐NEWCASTLE 5 Rose Gum Road Warabrook NSW 2304 Ph: 02 4968 9433 E: samples.newcastle@alsglobal.com
☐NOWRA 4/15 Geary Place North Nowra NSW 2541 Ph: 024423 2063 E: nowra@alsglobal.com
☐PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
☐SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townesville.environmental@alsglobal.com
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CLIENT: AGE Consultants	TURNAROUND REQUIREMENTS : ☐ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE: Newcastle	(Standard TAT may be longer for some tests e.g. Ultra Trace Organics) ☐ 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	Free ice / frozen ice bricks present upon receipt? Yes No N/A
PROJECT ID: AUS5004	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: 4.6 °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:	RELINQUISHED BY:
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, Bryce.McKay@ageconsultants.com.au		DATE/TIME:	DATE/TIME: 17/8/22 17-04	DATE/TIME: 18/8/22 17.00
Email Invoice to: As above + accounts@ageconsultants.com.au				

RECEIVED BY:	
	DATE/TIME: 18/8/22 7140

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.
25	Duplicate	17/08/2022 1300	W	P	6	X	X	X	X	X	X	X	X	X	X	
26			W	P												
27			W	P												
28			W	P												
29			W	P												
30			W	P												
31			W	P												
32			W	P												
33			W	P												
34			W	P												
35			W	P												
36			W	P												
				TOTAL	6											

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.

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
GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph 07 7471 5600 E gladstone@alsglobal.com
MACKAY 78 Harbour Road Mackay QLD 4740 Ph 07 4944 0177 E mackay@alsglobal.com
MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph 03 8549 9600 E samples.melbourne@alsglobal.com
MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph 02 6372 6735 E mudgee.mail@alsglobal.com
NEWCASTLE 5 Rose Gum Road Warabrook NSW 2304 Ph 02 4968 9433 E samples.newcastle@alsglobal.com
ORANGE 4/15 Gearry Place North Orange NSW 2641 Ph 02 4423 2063 E orange@alsglobal.com
PERTH 10 Hod Way Malaga WA 6090 Ph 08 9209 7655 E samples.perth@alsglobal.com
SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph 02 8784 8555 E samples.sydney@alsglobal.com
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: AUS5004		COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: 17.9 °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: COC REC: 18/8/22 5:01pm
COC Emailed to ALS? YES	EDD FORMAT (or default): XTAB, ENMRG, ESDAT, PDF, MonPro		DATE/TIME: 18/8/22 4:12pm
Email Reports to: Edward@ageconsultants.com.au, Jordan@ageconsultants.com.au, Bryce.McKay@ageconsultants.com.au		DATE/TIME:	RELINQUISHED BY: DATE/TIME: 19/8/22 17:00
Email Invoice to: As above + accounts@ageconsultants.com.au			RECEIVED BY: DATE/TIME: 19/8/22 0730

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	RM03	18/08/2022 0755	W	P	2	X	X									
2	T3-P	18/08/2022 0900	W	P	6	X	X	X	X	X	X	X	X	X	X	
3	T3-A	18/08/2022 0940	W	P	6	X	X	X	X	X	X	X	X	X	X	
4	WMLP327	18/08/2022 1035	W	P	2	X	X									
5	WMLP326	18/08/2022 1055	W	P	2	X	X									
6	WMLP278	18/08/2022 1120	W	P	6	X	X	X	X	X	X	X	X	X	X	
7	WMLP277	18/08/2022 1155	W	P	6	X	X	X	X	X	X	X	X	X	X	
8	RA27	18/08/2022 1245	W	P	6	X	X	X	X	X	X	X	X	X	X	
9	WMLP280	18/08/2022 1330	W	P	6	X	X	X	X	X	X	X	X	X	X	
10	RM01	18/08/2022 1410	W	P	2	X	X									
11			W	P												
12			W	P												
				TOTAL	44											

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 Plast 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 = Sulfu 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
ES2229658

Telephone : + 61-2-8784 8555

pH @ WN

E-MAILED

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
GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5000 E: gladstone@alsglobal.com
MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com
MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
NEWCASTLE 5 Rose Gum Road Warabrook NSW 2304 Ph: 02 4968 9433 E: samples.newcastle@alsglobal.com
NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 024423 2063 E: nowra@alsglobal.com
PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
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 (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE: Newcastle	(Standard TAT may be longer for some tests e.g. Ultra Trace Organics) ☐ 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	Free ice / frozen ice bricks present upon receipt? Yes No N/A
PROJECT ID: AUS5004	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: 5.9 °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:
COC Emailed to ALS? YES EDD FORMAT (or default): XTAB, ENMRG, ESDAT, PDF, MonPro		TO B
Email Reports to: Edward@ageconsultants.com.au, Jordan@ageconsultants.com.au, Bryce.McKay@ageconsultants.com.au	DATE/TIME:	DATE/TIME: 23/8/22 4:03pm.
Email Invoice to: As above + accounts@ageconsultants.com.au		

RELINQUISHED BY:	RECEIVED BY:
	PP
DATE/TIME: 24-8-22 5pm	DATE/TIME: 24/8/22 1140

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	ED037 - HCO3	EK02SF	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	WML181	22/08/2022 1005	W	P	6	X	X	X	X	X	X	X	X	X	X	
2	WML119	22/08/2022 1200	W	P	6	X	X	X	X	X	X	X	X	X	X	
3	WML262	22/08/2022 1230	W	P	6	X	X	X	X	X	X	X	X	X	X	
4	WMLP301	22/08/2022 1325	W	P	6	X	X	X	X	X	X	X	X	X	X	
5	WML183	22/08/2022 1420	W	P	6	X	X	X	X	X	X	X	X	X	X	
6	WML120B	22/08/2022 0755	W	P	6	X	X	X	X	X	X	X	X	X	X	
7	WML120A	22/08/2022 0845	W	P	6	X	X	X	X	X	X	X	X	X	X	
8	WMLP302	22/08/2022 1245	W	P	6	X	X	X	X	X	X	X	X	X	X	
9	WML261	22/08/2022 1400	W	P	6	X	X	X	X	X	X	X	X	X	X	
10			W	P												
11			W	P												
12			W	P												
				TOTAL	54											

pH @ WN

Environmental Division Sydney
Work Order Reference
ES2230100

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.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0350 E: adelaide@alsglobal.com
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☐NEWCASTLE 5 Rose Gum Road Warabrook NSW 2304 Ph: 02 4968 9433 E: samples.newcastle@alsglobal.com
☐NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com
☐PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
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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):	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		Free ice / frozen ice bricks present upon receipt? Yes / No / N/A
PROJECT ID: AUS5004		COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7 OF: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: 1-8 °C
PROJECT MANAGER: Bryce McKay	CONTACT PH: 0414 324 504		Other comment:
SAMPLER: Edward Hunt	SAMPLER MOBILE: 0428 283 457		
COC Emailed to ALS? YES	EDD FORMAT (or default): XTAB, ENMRG, ESDAT, PDF, MonPro		

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE/TIME: 25/8/22	DATE/TIME: 25-8-22 8:02	DATE/TIME: 25-8-22 5pm	DATE/TIME: 25/8/22 7140 PP

Email Reports to: Edward@ageconsultants.com.au, Jordan@ageconsultants.com.au, Bryce.McKay@ageconsultants.com.au

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	ED037 - HCO3	EK02SF	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	WMLP358	24/08/2022 0735	W	P	6	X	X	X	X	X	X	X	X	X	X	
2	WMLP349	24/08/2022 0845	W	P	6	X	X	X	X	X	X	X	X	X	X	
3	WML239	24/08/2022 1000	W	P	6	X	X	X	X	X	X	X	X	X	X	
4	WMLP346	24/08/2022 1115	W	P	6	X	X	X	X	X	X	X	X	X	X	
5	RSGM1	24/08/2022 1240	W	P	6	X	X	X	X	X	X	X	X	X	X	
6	WMLP343	24/08/2022 1345	W	P	6	X	X	X	X	X	X	X	X	X	X	
7	GM3A	24/08/2022 1445	W	P	2	X	X									
8	DUPLICATE	24/08/2022	W	P	6	X	X	X	X	X	X	X	X	X	X	
9			W	P												
10			W	P												
11			W	P												
12			W	P												
				Total	44											

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 Preserve 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
ES2230311

Telephone : + 61-2-8784 8555

Department of Planning and Environment

NSW Planning ref: DA309-11-2001-I-PA-28

Phillip Brown
Environment & Community Relations Superintendent
ASHTON COAL OPERATIONS PTY LIMITED
Eora Country
Darling Park - Tower 2 Level 18, 201 Sussex Street
Sydney NSW 2000

20/09/2023

Sent via the Major Projects Portal only

Subject: Ashton Coal – 2022 Annual Review

Dear Mr Brown

I refer to your post approval matter, DA309-11-2001-I-PA-28, the Annual Review for Ashton Coal for the period 1 January 2022 to 31 December 2022, submitted as required by Schedule 5, Condition 10 of DA309-11-2001-I as modified (the consent) to the NSW Department of Planning and Environment (NSW Planning) on 31 March 2023.

NSW Planning has reviewed the Annual Review and considers it to generally satisfy the reporting requirements of the consent and the NSW Planning Annual Review Guideline (October 2015). Please make publicly available a copy of the 2022 Annual Review on the company's website within 30 days.

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.

Please note that the NSW Planning's acceptance of this Annual Review is not an endorsement of the compliance status of the project.

Should you wish to discuss the matter, please contact Joel Fleming, (Senior Compliance Officer) on (02) 6575 3416 or email compliance@planning.nsw.gov.au

Yours sincerely

Jennifer Sage
A/Team Leader Northern
Compliance

As nominee of the Planning Secretary