



DONALDSON COAL

Part of the Yancoal Australia Group
ABN: 87 073 088 945



Annual Review

Abel Underground Coal Mine

1 January 2023 – 31 December 2023

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DONALDSON COAL

PTY LTD

ABN: 87 073 088 945

Annual Review

for the

Abel Underground Coal Mine

1 January 2023 – 31 December 2023

Prepared for:

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ABN 87 073 088 945

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Ref No. 737/29b

March 2024

TITLE BLOCK

Name of Operation	Abel Underground Coal Mine
Name of Operator	Donaldson Coal Pty Ltd
Development consent / project approval #	05_0136
Name of holder of development consent / project approval	Donaldson Coal Pty Ltd
Mining Lease #	ML1618 and ML 1653
Name of holder of mining lease	Donaldson Coal Pty Ltd
Water licence #	20WA218986 and WAL41525
Name of holder of water licence	Donaldson Coal Pty Ltd
RMP start date	1 August 2022
RMP end date	Not Applicable
Annual Review start date	01/01/2023
Annual Review end date	31/12/2023
<p>I, Phillip Brown, certify that to the best of my knowledge this report is a true and accurate record of the compliance status of the Abel Underground Coal Mine for the period 1 January 2023 to 31 December 2023 and that I am authorised to make this statement of behalf of Donaldson Coal Pty Ltd.</p> <p><i>Note.</i></p> <p>a) <i>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.</i></p> <p>b) <i>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).</i></p>	
Name of authorised reporting officer	Phillip Brown
Title of authorised reporting officer	Environment and Community Relations Superintendent
Signature of authorised reporting officer	
Date	21 March 2024

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1. STATEMENT OF COMPLIANCE

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

Table 1.1
Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	Yes / No
Project Approval 05_0136	Yes
Mining Lease 1618	Yes
Mining Lease 1653	Yes
Water Supply Works Approval 20WA218986 and Water Access Licence 41525	Yes

2. INTRODUCTION

2.1 OVERVIEW OF OPERATIONS

The Abel Underground Coal Mine (“Abel Mine”) is located approximately 23km northwest of Newcastle, New South Wales (see **Figure 2.1**). Following the grant of Project Approval 05_0136 in June 2007, the company undertook construction and mining activities until the mine was placed on ‘care and maintenance’ from 2 May 2016. Activities undertaken to date include the following.

- i) Construction of surface infrastructure and facilities, including the administration offices, amenities, service and storage facilities and car parking area, within the surface infrastructure area.
- ii) Initial mine construction involving the formation of three mining portals and underground roadways and construction of the ventilation, conveying and coal stockpiling systems.
- iii) Coal recovery using bord and pillar methods including first and second workings.
- iv) Processing of recovered coal at the Bloomfield Colliery CHPP and transportation via the Bloomfield Rail Loop and Spur and subsequently via the Main Northern Railway.

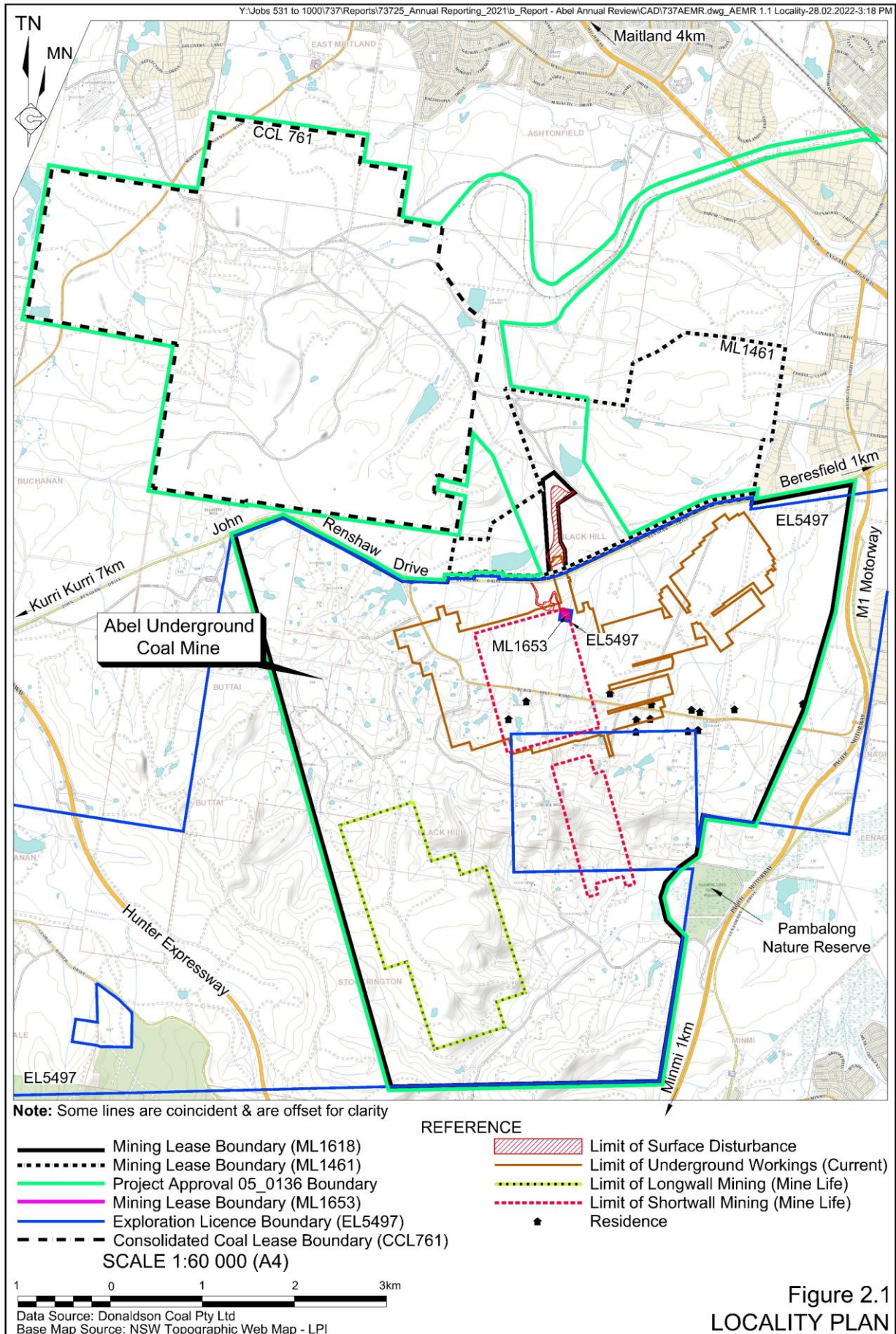
Several of the earlier activities relating to the mine, involving the formation of the box cut within which the surface facilities and ROM stockpiles are located, were undertaken as part of the approved Donaldson Open Cut Coal Mine.

2.2 SCOPE AND FORMAT

This Annual Review for the Abel Underground Coal Mine has been compiled by R.W. Corkery & Co. Pty Limited (RWC) on behalf of Donaldson Coal Pty Ltd (the “Company”). Donaldson Coal Pty Ltd became part of Yancoal Australia Limited in July 2012.

This is the eighth Annual Review submitted for the mine, following nine Annual Environmental Management Reports, and is applicable for the period 1 January to 31 December 2023 (“the reporting period”). The information presented within this Annual Review has been compiled based on information and advice provided by the Company.

This Annual Review generally follows the format and content requirements identified in the (then) Department of Planning and Environment’s (DPE) *Annual Review Guideline* dated October 2015 and meets the requirements of Condition 4, Schedule 6 of PA 05_0136.



2.3 KEY PERSONNEL CONTACT DETAILS

The Manager, Mining Engineering, Mr. William Farnworth is the primary mine contact (Tel: 02 4993 7356). Mr. Farnworth is currently the Manager Mining Engineering for legislative purposes and as such, is accountable for the environmental management of the mine and ensuring compliance with all relevant legislative obligations. Mr. Phillip Brown (Tel: 02 6570 9219) is the nominated Environment & Community Relations Superintendent and is responsible for the environmental management of the mine. The contact details for the mine office are as follows.

Postal Address:	Donaldson Coal Pty Ltd Box 5, L5, 28 Honeysuckle Dr NEWCASTLE NSW 2300	Tel: 02 4015 1100 Fax: 02 4015 1159
Email:	donaldson@doncoal.com.au	
Physical Address:	Abel Underground Coal Mine 1132 John Renshaw Drive BLACKHILL NSW 2322	

A 24-hour Environmental Hotline (Tel: 1800 111 271) is maintained by the Company. Details of calls taken on this number are forwarded to the Environment and Community Relations Superintendent for further actioning, if required.

3. APPROVALS

The Company has operated the approved activities at the mine under the approvals listed in **Table 3.1**.

Table 3.1
Abel Underground Coal Mine – Consents, Leases and Licences

Consent/Lease/Licence	Issue Date	Expiry Date	Details / Comments
Project Approval 05_0136	7 June 2007	31 December 2030	Granted by the (then) Minister for Planning and last modified on 04 December 2013.
Mining Lease ML 1618*	15 May 2008	15 May 2029	Granted by the Minister for Primary Industries. Incorporates 2 755ha of surface area.
Mining Lease ML 1653*	21 January 2011	21 January 2032	Granted by the Minister for Primary Industries. Incorporates 0.25ha of surface area. Issued construction of ventilation shaft.
Environment Protection Licence No. 12856	9 July 2008 (licence version date (20 April 2023))	Not applicable	Issued by the (then) Department of Environment and Climate Change (EPA). EPL 12856 has previously been consolidated with updated conditions applicable to both the Donaldson Coal Mine and Abel Underground Coal Mine.
Water Supply Works Approval 20WA218986	01/07/2016	30/06/2029	Bore Licence 20BL171935 was issued for the interception and inflow of groundwater due to the underground mining operations. Following commencement of the <i>Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016</i> in July 2016 20BL171935 was converted to a water supply works approval and water access licence with an allocation of 500ML/year.
Water Access Licence (WAL) 41525	01/07/2016	Continuing	

* See **Figure 2.1**

It is noted that this Annual Review has been prepared to fulfil the annual reporting requirements of Project Approval 05_0136 and WAL 41525. A separate Annual Return has continued to be submitted to the NSW EPA in accordance with the requirements of Environment Protection Licence (EPL) 12856. A separate Annual Rehabilitation Report and Forward Program are also lodged directly with the Department of Regional NSW (DRNSW) in accordance with the amendments to the *Mining Regulation 2016* and annual reporting requirements that now apply to the Mining Leases.

The Company also holds Exploration Licence 5497 (see **Figure 2.1**) incorporating a 4,687ha surface area. Exploration Licence 5497 was originally granted on 22 July 1998, was renewed on 7 October 2022 and has a current expiry date of 22 July 2025.

4. OPERATIONS SUMMARY

4.1 MINING OPERATIONS

Coal mining activities were suspended on 2 May 2016 when the site was placed on ‘care and maintenance’. No coal mining was undertaken during the reporting period or is planned during the next reporting period. **Table 4.1** presents a summary of the production statistics.

Table 4.1
Production Summary

Material	Approved limit (specify source)	Previous reporting period (actual)	This reporting period (actual)	Next reporting period (forecast)
Waste Rock / Overburden (m ³)	None specified	0	0	0
ROM Coal / Ore (t)	6 100 000 (PA 05_0136 Cond 2/6)	0	0	0
Coarse Reject (t)	None specified	0	0	0
Fine Reject (Tailings) (t)	None specified	0	0	0
Saleable Product (t)	None specified	0	0	0

4.2 OTHER OPERATIONS DURING THE REPORTING PERIOD

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

Environmental monitoring activities continued throughout the reporting period in accordance with the approved management plans. Results of this monitoring is summarised in Sections 6 and 7.

4.3 NEXT REPORTING PERIOD

The activities proposed for 2024 will principally involve continued monitoring and, if required, maintenance activities. The following provides a summary of the planned activities.

Exploration

No exploration is currently planned to be undertaken during the 2024 reporting period.

Mining

No mining is currently planned to be undertaken during the 2024 reporting period.

Rehabilitation

No specific rehabilitation activities are currently planned for the 2024 reporting period as all existing disturbance areas are associated with active surface infrastructure. However, work will continue to be undertaken in development of the closure strategy, including commencement of a rehabilitation materials balance report, and reflected in updates to the Rehabilitation Management Plan, as appropriate. Any rehabilitation works undertaken will relate to rehabilitation of any subsidence impacts or to ongoing maintenance, principally erosion and sediment control.

Monitoring

The following monitoring will be undertaken during the next reporting period.

- Air Quality – ongoing PM₁₀ monitoring will continue to be undertaken.
- Surface water – ongoing surface water quality at a range of routine monitoring sites located within Blue Gum Creek, Viney Creek, Buttai Creek, Four Mile Creek and a number of local water storages. This monitoring will be undertaken as part of the integrated monitoring with the Bloomfield, Donaldson and Tasman Extended Mines.
- Groundwater – ongoing groundwater quality and level monitoring will be undertaken as part of the integrated network of monitoring bores for the Bloomfield, Donaldson and Tasman Mines. Measurement of the quality and volume of inflow water to the underground workings will also continue to be undertaken.
- Noise – Bi-annual noise monitoring will continue whilst the mine remains on care and maintenance.
- Meteorological – the on-site meteorological station at the Abel Mine will be maintained and data collated.
- Subsidence monitoring will continue to be undertaken in accordance with the approved subsidence monitoring programs.

It is noted that flora and fauna surveys and reporting have not been undertaken in accordance with the Flora and Fauna Management Plan. Flora and fauna surveys and reporting will be recommenced following the recommencement of mining.

Community Consultation and Liaison

The Community Consultative Committee (CCC) will continue to be convened during the next reporting period. In accordance with CCC feedback, it is expected that meetings will now be held annually unless otherwise agreed with the Committee. The 24hr environmental hotline will be maintained and a register retained of any complaints received.

5. ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

The 2022 Annual Review was submitted to the Resources Regulator and the Department of Planning and Environment (DPE) on 29 March 2023. Feedback was received from the Resources Regulator compliance coordination unit dated 4 April 2023 and DPE dated 17 October 2023. No further action was required to be undertaken.

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. It is noted that a range of monitoring activities are integrated with the Donaldson Open Cut Coal Mine and Bloomfield Colliery. The following subsections present results specific to the Abel Mine with data relevant to other operations presented in their respective Annual Reviews.

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 complaints.	Implies management measures are currently adequate.	No additional management action required.
Blasting	No exceedance of applicable blast criteria.	No blasts undertaken. No complaints.	Implies management measures are currently adequate.	No additional management action required.
Air Quality	No exceedances of applicable air quality criteria.	No exceedances and no complaints.	Implies management measures are currently adequate.	No additional management action required.
Biodiversity	No significant impacts upon flora, fauna species, populations, communities or habitat.	No impacts upon flora, fauna species, populations, communities or habitat were recorded. No effect upon Pambalong Nature Reserve or Sub-tropical rainforest.	Implies current mining design and safeguards are currently adequate.	No additional management action required.
Heritage	Management in accordance with approved Aboriginal Heritage Management Plan.	No heritage items undermined during the reporting period. No subsidence impacts.	Implies no specific management actions were necessary.	No additional management action required.
Subsidence	Subsidence management in accordance with approved Subsidence Management Plan / Extraction Plan.	No notifiable events occurred.	Implies management measures are currently adequate and predictions sufficiently accurate.	No additional management action required.

6.2 METEOROLOGICAL MONITORING

An automated weather station, installed for the Donaldson Mine, has been approved by the (then) Department of Planning as also meeting the requirements for the Abel Mine. The weather station records wind speed and direction, temperature, rainfall and solar radiation. This station was subsequently relocated in March 2015 to adjacent the Helipad near the Abel surface facilities (see **Figure 6.1**). A summary of the rainfall data since commencement of the Abel Mine in 2007 is presented in **Table 6.2**.

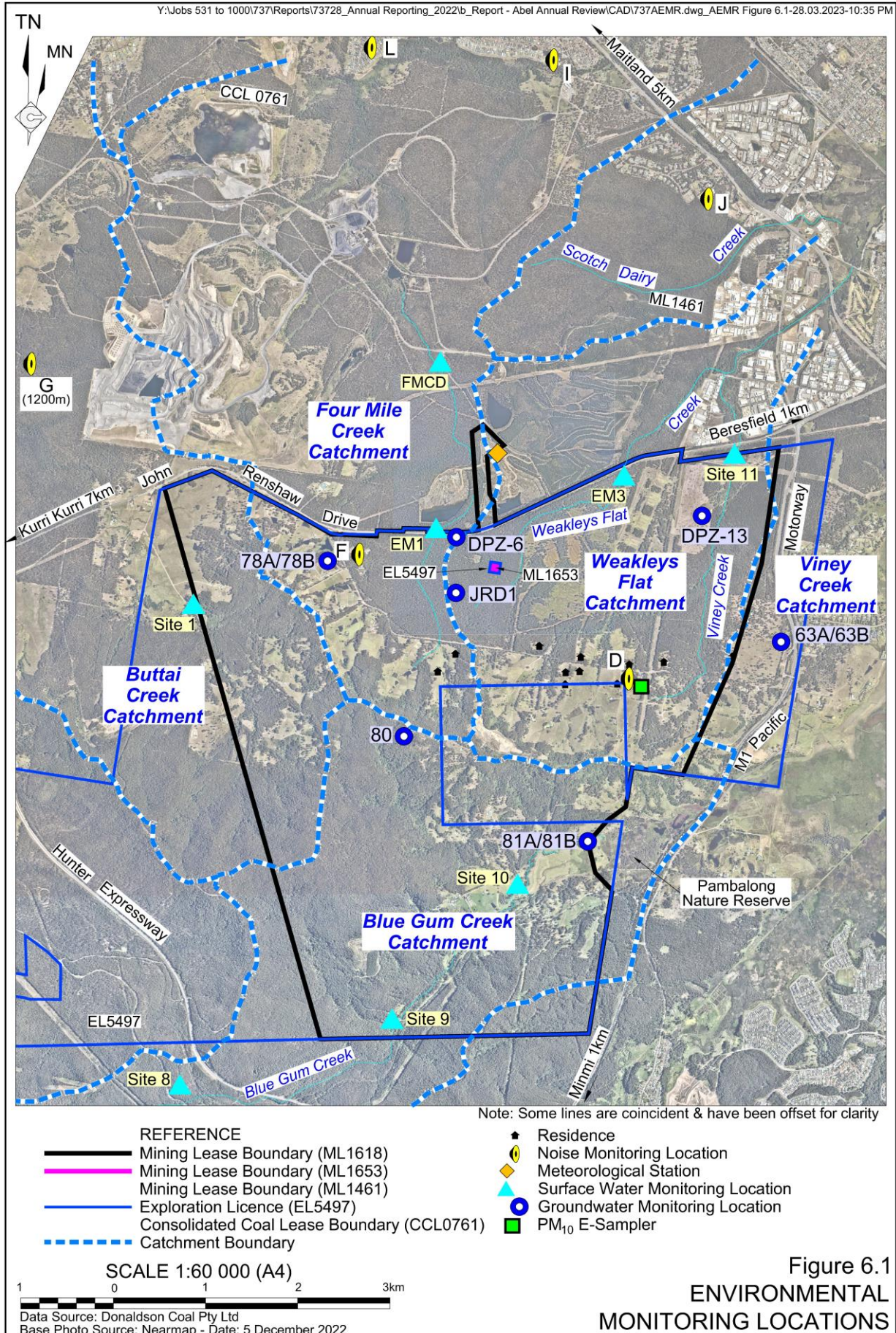


Figure 6.1
ENVIRONMENTAL
MONITORING LOCATIONS

Table 6.2
Monthly Rainfall Records – 2007 to 2023

Period	Average Monthly Rainfall (mm)												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	
2007	13.4	87.6	102.4	85.6	60	253	16.5	79.6	28.3	35	163.8	49.5	974.7
2008	153.4	191.8	46	237.6	2.2	122.9	30	28.5	195.3	62.2	73.3	62.6	1205.8
2009	11.3	340.7	136.5	189	143.8	75.7	32.1	1.8	29.2	59.8	51.4	62	1133.3
2010	89	52.1	83.9	37.1	89.4	112.8	65.3	38.5	26	80.6	171.1	55.9	901.7
2011	25.6	34.5	65.6	138	98.8	152.2	128.7	48.9	103.2	100	171.9	75.9	1143.2
2012	96.1	207	137.6	114.7	11.8	172.3	53.8	26.6	18.7	5.7	47.9	47.9	944.1
2013	166.7	226.6	97.9	89.4	60.9	96.5	11.2	9.7	21.2	49.5	261.8	2.6	1094
2014	15.6	108.3	112.8	99.3	44.3	31.4	24.6	104	42.4	55	38.4	133.4	809.5
2015	167	48	73.3	412	89.4	44.6	17.9	30.6	56.8	59	69.8	103.8	1172.2
2016	430.8	26	78	31.8	13.4	113	44.2	74.2	60	43.8	33.2	58.6	1007
2017	66.9	71.7	150.4	94.5	12.7	128.5	3.2	6	12.6	77.7	66.8	41.6	732.6
2018	6.6	120	191.4	52.8	7	107.4	4.2	21.4	55.4	109	92.6	91.8	859.6
2019	17.2	32.8	158	27	19.4	97.4	26	66.6	69.4	22	28.2	0	564
2020	55.2	214.8	106.4	52	45.4	80.2	166.6	41	35.6	146.6	53	118.4	1115.2
2021	89.4	101.8	234.8	48.6	31.4	72.0	20.6	20.6	31.0	67.4	198.6	55.4	971.6
2022	78.8	102.2	271.4	107.4	86.2	12.6	304.8	43.0	111.2	97.2	47.0	18.4	1280.2
2023	71.0	98.0	110.6	76.0	21.6	8.2	18.2	35.4	15.0	49.4	84.0	76.6	664.0
<i>Average</i>	91.4	121.4	126.9	111.3	49.3	98.9	56.9	39.8	53.6	65.9	97.2	62.0	974.9

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

Total rainfall during the 2023 calendar year was 664.0mm, representing an annual rainfall below the average annual rainfall of 974.9mm.

6.3 NOISE

Environmental Management

The principal noise control prior to the site entering care and maintenance was the continued use of low modulated frequency reversing alarms on mobile equipment used on the surface. As mobile equipment usage during care and maintenance was minimal, this remains the principal noise management measure.

Environmental Performance

Quarterly noise monitoring applicable to the Abel Mine commenced in December 2008 as an extension of the monitoring survey previously undertaken for the Donaldson Open Cut Coal Mine. Following the results of previous monitoring, the frequency of noise monitoring for the mine was reduced from quarterly to bi-annually for the current and future Annual Reports.

Bi-annual attended and unattended noise monitoring was undertaken during the reporting period at six monitoring locations relevant to the Abel Mine (see **Figure 6.1**) for half-yearly periods ending June/July (H1) and December (H2) 2023. Monitoring results are presented in **Table 6.3** and copies of the monitoring reports are presented within **Appendix 1**.

Table 6.3
Summary of Attended Noise Monitoring Results – 2023

Location	Time	Noise Criteria	Attended Monitoring ¹		Noise generated by Abel Mine
			H1	H2	
D Black Hill School, Black Hill	Day (L _A eq (15 min))	35	NA	NA	Operations inaudible at all times
	Evening (L _A eq (15 min))	35	NA	NA	Operations inaudible at all times
	Night (L _A eq (15 min))	35	NA	NA	Operations inaudible at all times
	Night (L _{A1} (1min))	45	NA	NA	Operations inaudible at all times
F Black Hill Rd, Black Hill	Day (L _A eq (15 min))	35	NA	NA	Operations inaudible at all times
	Evening (L _A eq (15 min))	35	NA	NA	Operations inaudible at all times
	Night (L _A eq (15 min))	35	NA	NA	Operations inaudible at all times
	Night (L _{A1} (1min))	45	NA	NA	Operations inaudible at all times
G Buchanan Rd, Buchanan	Day (L _A eq (15 min))	35	NA	NA	Operations inaudible at all times
	Evening (L _A eq (15 min))	35	NA	NA	Operations inaudible at all times
	Night (L _A eq (15 min))	35	NA	NA	Operations inaudible at all times
	Night (L _{A1} (1min))	45	NA	NA	Operations inaudible at all times
I Magnetic Drive, Ashtonfield	Day (L _A eq (15 min))	36	NA	NA	Operations inaudible at all times
	Evening (L _A eq (15 min))	36	NA	33	Abel (Bloomfield CHPP) operations audible in December monitoring
	Night (L _A eq (15 min))	36	NA	30	Abel (Bloomfield CHPP) operations audible in December monitoring
	Night (L _{A1} (1min))	45	NA	30	Operations inaudible at all times
J Parish Drive, Thornton	Day (L _A eq (15 min))	35	NA	NA	Operations inaudible at all times
	Evening (L _A eq (15 min))	35	NA	NA	Operations inaudible at all times
	Night (L _A eq (15 min))	35	NA	NA	Operations inaudible at all times
	Night (L _{A1} (1min))	45	NA	NA	Operations inaudible at all times
L 65 Tipperary Dr, Ashtonfield	Day (L _A eq (15 min))	40	NA	30	Abel (Bloomfield CHPP) occasionally audible and audible in December monitoring
	Evening (L _A eq (15 min))	40	NA	37	Abel (Bloomfield CHPP) operations audible in December monitoring
	Night (L _A eq (15 min))	40	NA	36	Abel (Bloomfield CHPP) operations audible in December monitoring
	Night (L _{A1} (1min))	47	NA	42	Abel (Bloomfield CHPP) operations audible in December monitoring
NA – Not able to be calculated as operations inaudible at all times.			CHPP – Coal Handling Processing Plant.		
Note 1: Estimated Abel Contribution (L _A eq _(15min) dBA).					
Source: SLR Consulting Australia Pty Ltd (2023).					

Noise monitoring concluded that operations were generally inaudible or below the relevant noise criteria at all monitoring locations during both noise monitoring events. Notably, all monitoring events were undertaken whilst the Abel Mine was under care and maintenance and therefore not audibly contributing to received noise with audible noise occurring from the Bloomfield CHPP, which operates under the Abel Mine PA 05_0136. Further discussion regarding the Bloomfield CHPP is provided in their respective annual reporting.

Whilst PA 05_0136 provides for cumulative noise criteria, no cumulative effects are considered to have occurred given that the Abel operations were inaudible or below the relevant criteria at all times, the Donaldson Coal Mine is also on care and maintenance, and noise from the Bloomfield CHPP was either inaudible or well below the relevant criteria.

Reportable Incidents

No reportable incidents were recorded during the reporting period.

Further Improvements

Other than ongoing plant maintenance and noise monitoring, no additional management measures are planned or considered necessary during the next reporting period.

6.4 BLASTING

No blasts were undertaken during the reporting period.

6.5 AIR QUALITY

Environmental Management

As the Abel Mine is on care and maintenance the principal air quality management measure during the reporting period was maintenance of mobile equipment and on-site vehicles to reduce greenhouse and particulate emissions.

Environmental Performance

Particulates

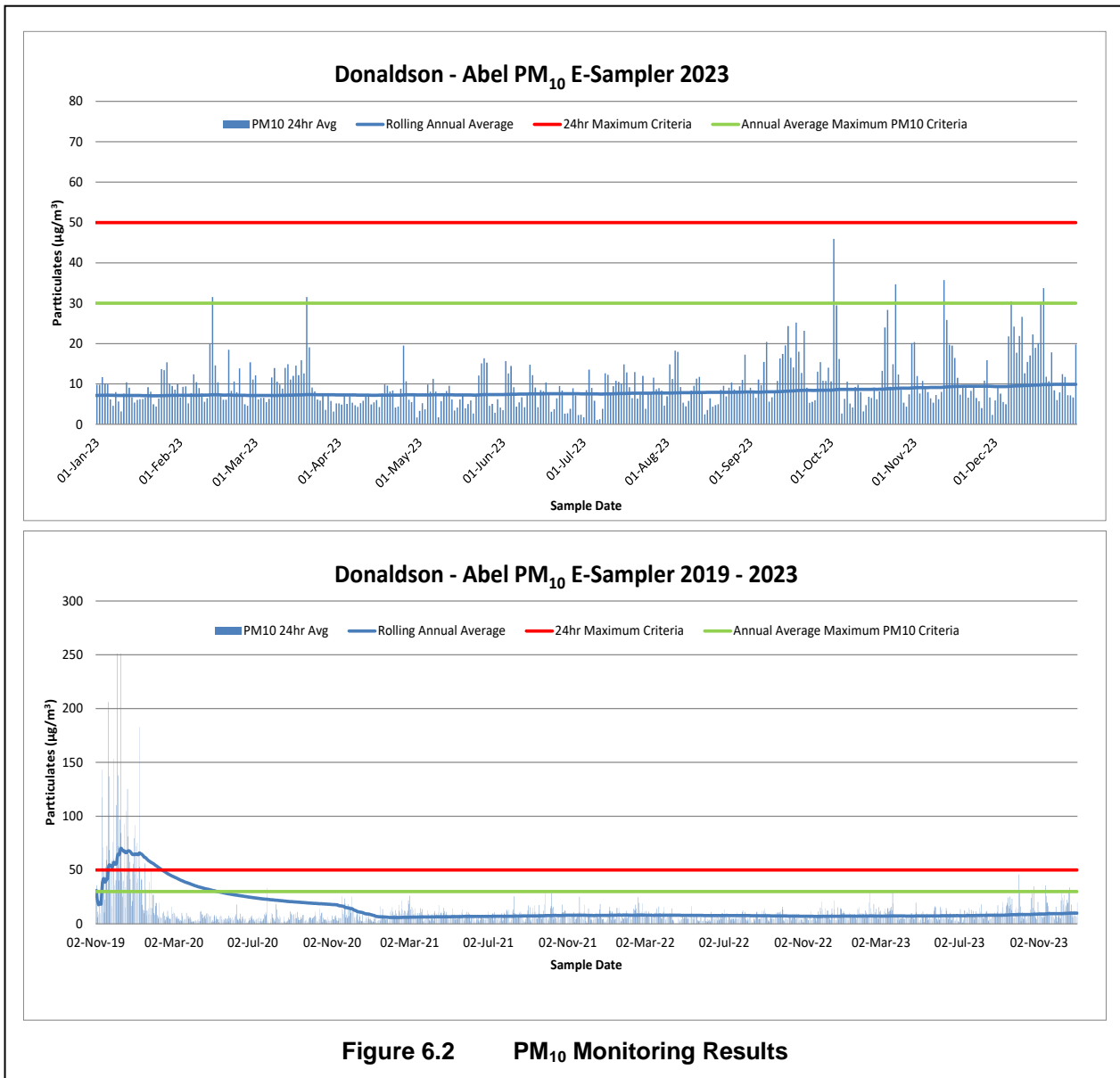
Monthly deposited dust monitoring for the Abel Mine ceased in December 2021 together with monitoring for PM₁₀ and TSP utilising the High Volume Air Sampler (HVAS). These monitors were decommissioned in accordance with the revised monitoring requirements in the approved 2019 Air Quality and Greenhouse Gas Management Plan and consolidated EPL 12856. Air quality monitoring during the reporting period consisted of continuous PM₁₀ monitoring by the E-Sampler.

Current monitoring locations are shown on **Figure 6.1** and results from the continuous E-Sampler are summarised in **Figure 6.2**. Previous deposited dust monitoring and PM₁₀ and TSP results from the HVAS can be viewed in the respective Annual Review reports available on the Donaldson Coal website.

The highest 24-hour average PM₁₀ concentration during the reporting period was 46.0¹µg/m³ on 2 October 2023. As such, there were no exceedances of the 50µg/m³ 24-hour criteria for PM₁₀ as specified in Schedule 3 Condition 9 of PA 05_0136. The annual average PM₁₀ concentration was 9.9µg/m³ for the 12 months to 31 December 2023, i.e. below the annual average criteria of 30µg/m³.

Other than an annual trend of lower 24-hour average PM₁₀ during the winter months and higher 24-hour averages during the summer months, no other long-term PM₁₀ trends are apparent. Similarly, rolling annual average PM₁₀ levels have remained relatively consistent with the exception of elevated levels associated with the widespread regional bushfire events during 2019/2020.

¹ Dust concentration from all sources.



Greenhouse Gas Emissions

The original Environmental Assessment for the mine was prepared in 2006 and estimated that annual emissions of CO₂-equivalent would range between 5,807 tonnes/year to 709,560 tonnes/year. Estimates were not provided as Scope 1, 2 or 3 emissions, as appropriate to the assessment requirements at that time. However, the range provided would be equivalent to total Scope 1 and 2 emissions.

As part of the 2013 modification, to include the use of longwall and shortwall mining in addition to existing bord and pillar mining methods and to increase the amount of ROM coal received from the Tasman Extension Project, a further assessment of greenhouse gases was completed. It is noted that the changes approved through the 2013 modification have not commenced given the mine remains on care and maintenance. A summary of the predicted greenhouse gas emissions from this assessment is provided in **Table 6.4**.

Table 6.4
Summary of Predicted CO₂ equivalent Emissions per Scope

Year	Scope 1	Scope 2	Scope 3	Scope 1+2
1	56,442	36,732	5,266,506	93,174
2	93,443	58,836	8,718,530	152,278
3	126,820	79,586	11,832,654	206,406
4	125,577	79,008	11,716,780	204,585
5	112,015	70,954	10,451,498	182,969
6	116,902	73,943	10,907,403	190,845
7	118,682	75,033	11,073,538	193,715
8	111,456	70,676	10,399,352	182,132
9	88,163	56,426	8,226,078	144,589
10	73,959	47,737	6,900,863	121,696
11	74,208	46,732	6,923,824	120,940
12	34,474	22,361	3,216,689	56,835
13	30,892	20,169	2,882,487	51,062
14	21,513	14,431	2,007,382	35,944
15	22,672	14,775	2,115,493	37,447
16	40,210	25,011	3,751,633	65,221
17	17,620	11,190	1,644,040	28,811
TOTAL	1,265,048	803,600	118,034,750	2,068,649

Source: Todoroski Air Sciences (2012) - Table 12-6

Abel Mine reports Scope 1 and Scope 2 greenhouse gas emissions in accordance with the National Greenhouse and Energy Report System (NGERS). In summary, Scope 1 emissions associated with the Abel Mine totalled 49,520t CO_{2-e} (tonnes CO₂ equivalent) for the 2022/2023 reporting period compared to 52,182t CO_{2-e} for the previous 2021/2022 reporting period. Scope 2 emissions associated with the Abel during the 2022/2023 reporting period totalled 2,971t CO_{2-e} compared to 2,751t CO_{2-e} during the previous 2021/2022 reporting period.

Beyond maintenance of vehicles, no specific management measures were implemented or feasible during the reporting period.

Reportable Incidents

No reportable incidents relating to air quality occurred during the reporting period.

Further Improvements

No other improvements relating to air quality management are planned or considered necessary.

6.6 BIODIVERSITY

Environmental Management

No underground mining occurred during the reporting period and no mining has previously been undertaken within areas that would lead to subsidence under or near the Pambalong Nature Reserve, or under sub-tropical rainforest. Hence, no specific flora or fauna management measures have been required to date above these areas.

Biodiversity Offsets

Schedule 4 Condition 18 of PA 05_0136 requires the establishment of a total of 20ha of biodiversity offsets prior to the commencement of construction of the coal conveyor or the associated vegetation clearing. As construction of the coal conveyor or any associated vegetation clearing has not been undertaken, there is currently no biodiversity offset requirement for the Abel Underground Coal Mine.

Environmental Performance

In accordance with the Flora and Fauna Management Plan (Version 4 – dated 3 June 2019), presented as Appendix 3 of the Rehabilitation Management Plan – Care and Maintenance (Version 2 – dated 3 June 2019), the monitoring of the Pambalong Nature Reserve, dam monitoring and management survey, and monitoring of the sub-tropical rainforest was not required during the reporting period. Additionally, aquatic monitoring of macroinvertebrate assemblages in Blue Gum Creek was not undertaken during the reporting period following a review of the need for this monitoring as recommended by Niche Environment and Heritage. Monitoring of flora and fauna present in these areas will recommence following the recommencement of mining operations.

A summary of previous monitoring results is provided within the respective Annual Reviews, which can be found on the Donaldson Coal website (<https://www.doncoal.com.au/page/abel/publications/annual-reviews-and-reports/>).

Reportable Incidents

No reportable incidents were recorded during the reporting period.

Further Improvements

In accordance with the Flora and Fauna Management Plan, further monitoring of dams, sub-tropical rainforest and the Pambalong Nature Reserve will not be undertaken until the recommencement of mining activities. Additionally, macroinvertebrate sampling will not be undertaken until the recommencement of mining activities.

Prior to the recommencement of mining operations, relevant dams will be reassessed for frog habitat to account for changes such as eutrophication from stock, fertiliser applications or other farming practices as opposed to changes resulting from mining.

6.7 HERITAGE

In accordance with the June 2019 *Abel Underground Mine: Aboriginal Heritage Management Plan* (Donaldson Coal, 2019), annual reporting will be undertaken through the Annual Reviews with a 5 yearly report documenting the results of monitoring undertaken in accordance with the plan to be prepared and provided to either the Mindaribba or Awabakal Local Aboriginal Land Councils (LALCs) (as applicable to the area monitored), DPE and Heritage NSW. Given that no mining was undertaken during the 2023 reporting period, no specific monitoring was completed. The first of the 5 yearly reports is planned following the recommencement of mining operations.

6.8 SUBSIDENCE

Environmental Management

Four Subsidence Management Plan (SMP) / Extraction Plans have been prepared for the mine to date. As part of each SMP/Extraction Plan, subsidence monitoring programs have been prepared together with required environmental and public safety management plans. Copies of all relevant SMP / Extraction Plan assessment reports and management plans are available on the Company's website.

Environmental Performance and Further Improvements

No mining occurred during the reporting period and no further quantitative monitoring of previous undermined panels occurred. However, photographic monitoring and visual inspections continued during the reporting period. A summary of the outcomes of this monitoring and any actions taken is outlined as follows.

- Minor remediation works were undertaken on a private property over Panel 24 due to water run-off from a high rainfall event washing out previously remediated surface cracking.
- No further impacts to Blackhill Road were observed and the infrastructure remained within a safe and serviceable condition.
- No further impacts on the Hunter Water Corporation Waterline, Ausgrid Powerlines and TransGrid Transmission Towers. Subsidence was within predicted levels with no subsidence impacts or management actions required during the reporting period.
- There have been no other observed and/or reported subsidence impacts, incidents, service difficulties or community complaints during the reporting period that would require notification under the SMP/Extraction Plan approvals or plans.

A comparison of previously surveyed subsidence levels against predicted levels for all panels within which extraction has been completed to date is provided within the annual Subsidence Management Report (see **Appendix 3**). A summary of subsidence impacts against the performance measures outlined in PA 05_0136 *Schedule 3 Condition 1* is also provided in **Table 6.6**.

During the next reporting period monitoring will be continued in accordance with the approved or any new SMP/Extraction Plans.

Table 6.5
Review of Subsidence Impact Performance Measures

Performance Measure		Status
<i>Table 2: Subsidence Impact Performance Measures</i>		
Water Resources		
<ul style="list-style-type: none"> Hexham Swamp; Blue Gum Creek and Alluvium; and Long Gully. 	<ul style="list-style-type: none"> Negligible environmental consequences, including: <ul style="list-style-type: none"> negligible reduction in the quantity of water entering the swamp or the creeks (ie baseflow or environmental flows); negligible reduction in the quality of water entering the swamp or the creeks; and negligible reduction in creek bed or bank stability. No connective cracking between the surface and the mine. 	Mining to date has occurred substantially north of these features. Groundwater level monitoring has also not recorded any drawdown of surficial aquifers (see Section 7.3). Subsidence monitoring has not recorded any impacts upon other watercourses.
<ul style="list-style-type: none"> All other watercourses in the mining area. 	<ul style="list-style-type: none"> No greater environmental consequences than predicted in the EA and EA (MOD 3). 	
Land		
<ul style="list-style-type: none"> Cliffs. 	<ul style="list-style-type: none"> Minor environmental consequences (that is, occasional rockfalls, displacement of or dislodgement of boulders or slabs, or fracturing, that in total do not impact more than 3% of the total face area of cliffs within the mining area). 	Mining has not yet occurred under any major cliff areas. Subsidence monitoring has not recorded any rock falls or other impacts. No mining related impacts upon Pambalong Nature Reserve have been recorded.
<ul style="list-style-type: none"> Minor cliffs Rock face features; and Steep slopes. 	<ul style="list-style-type: none"> Minor environmental consequences (that is, occasional rockfalls, displacement or dislodgement of boulders or slabs, or fracturing, that in total do not impact more than 5% of the total face area of each such type of feature within the mining area). 	
<ul style="list-style-type: none"> Pambalong Nature Reserve. 	<ul style="list-style-type: none"> Negligible environmental consequences. 	
Biodiversity		
<ul style="list-style-type: none"> Threatened species; and Endangered ecological communities (including unspecified Lowland Rainforest EEC). 	<ul style="list-style-type: none"> Negligible environmental consequences. 	No mining related impacts have been recorded to date (see Section 6.6).
Heritage Sites		
<ul style="list-style-type: none"> Aboriginal heritage sites. 	<ul style="list-style-type: none"> No greater subsidence impacts or environmental consequences than predicted in the EA and EA (MOD 3). 	No impacts upon Aboriginal or historical heritage have been recorded to date.
<ul style="list-style-type: none"> Historic heritage. 	<ul style="list-style-type: none"> No greater subsidence impacts or environmental consequences than predicted in the EA and EA (MOD 3). 	
Mine workings		
<ul style="list-style-type: none"> First workings under an approved Extraction Plan beneath any feature where performance measures in this table require negligible subsidence impacts, negligible environmental consequences. 	<ul style="list-style-type: none"> To remain long-term stable and non-subsiding. 	Subsidence control zones and second workings have been implemented in accordance with the approved Subsidence Management Plans.
<ul style="list-style-type: none"> Second workings. 	<ul style="list-style-type: none"> To be carried out only in accordance with an approved Extraction Plan. 	

6.9 WASTE MANAGEMENT

In accordance with *Schedule 3 Condition 25* of PA 05_0136, a summary of waste management during the reporting period is provided as follows.

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

- Non-Hazardous (Recycled) – paper and cardboard, effluent, scrap steel.
- Hazardous (Disposal) – medical and sanitary waste.
- Non-Hazardous (Disposal) – mixed solid waste.

Waste oil is stored within 205L drums, 1 000L IBCs or the waste oil tank within the oil store before being removed from site, along with used oil filters and oily rags, by J R Richards & Sons. A purpose built bunded storage container is also utilised to ensure adequate bunded storage is available. Used tyres are removed from site during servicing by Marathon Tyres Pty Ltd for repair or disposal.

Paper, cardboard, steel, aluminium and any other recyclable material was stored separately in 1.5m³ and 3.0m³ skip bins for recycling. Paper, cardboard and general waste material continued to be collected by J R Richards & Sons on a weekly basis whilst scrap metal was also collected by J R Richards & Sons on an as-needs basis. The scrap steel/drum crusher continued to be used.

All general wastes were stored in skip bins and removed by J R Richards & Sons.

The approximate volume of each waste stream generated during the reporting period is presented in **Table 6.7** together with the proportion of waste recycled. The proportion of waste recycled increased from 31.46% in 2022 to 84.65% in 2023, largely due to an increase in non-hazardous waste recycling and a reduction in total disposable waste from 68.54% in 2022 to 15.35% in 2023. As is expected, the total volume of wastes has continued to remain relatively low since the mine entered care and maintenance.

As part of the Company's Environmental Management Strategy, it is a requirement for contractors and employees to minimise waste generation wherever possible and to dispose of all waste in a satisfactory matter. Whilst waste volumes during care and maintenance will remain relatively low, waste volumes will continue to be monitored into the future and opportunities to minimise waste or increase recycling implemented, where appropriate.

Table 6.6
Approximate Waste Volumes 2016 to 2023

Waste Class	Waste Stream	Total Volume (kg)							
		2016	2017	2018	2019	2020	2021	2022	2023
Hazardous (Recycled)	Effluent	43 500	0	0	0	0	28 000	0	0
	Lead Acid Batteries	0	0	220	0	0	0	476	0
	Empty Drums	0	88	0	16	74	1 436	9	0
	Waste Oil & Oil Filters	6 046	2 900	800	1 100	1 400	0	2,200	0
	Oily Water (Off Site)	0	0	0	0	970	0	298	0
	% of Total Waste	20.55%	6.31%	1.11%	5.17%	4.13%	46.98%	15.30%	0%
Non-Hazardous (Recycled)	Paper and Cardboard	1 960	1 170	545	1 200	1 205	905	330	940
	Confidential Documents	0	0	420	466	228	260	245	0
	Scrap Steel	116 560	14 100	66 271	0	16 380	13 180	0	5,460
	Timber	4 560	0	0	0	0	0	3,200	0
	Effluent Offsite	-	-	-	-	-	-	-	95,000
	% of Total Waste	51.05%	32.24%	73.19%	7.72%	30.11%	22.89%	16.16%	84.65%
Hazardous (Disposal)	Medical and Sanitary Waste	359	138	161	238	112	144	303	54
	Oily Rags	408	258	54	72	0	0	146	0
	% of Total Waste	0.35%	0.84%	0.23%	1.44%	0	0.23%	3.20%	0.05%
Non-Hazardous (Disposal)	Mixed Solid Waste	67 595	28 715	23 390	18 499	38 795	18 735	15,000	18,320
	% of Total Waste	28.04%	60.62%	25.46%	85.68%	65.57%	29.90%	65.34%	15.30%
Total Waste		241,077	47,369	91,861	21,591	59,164	62,660	23,359	119,774
Recycled Waste		172,633	18,258	68,256	2,782	20,257	43,781	7,350	101,400
Recycled Waste (%)		71.61%	38.54%	74.30%	12.88%	34.24%	69.87%	31.47%	84.66%

7. WATER MANAGEMENT

7.1 WATER TAKE

Applicable water licencing held for the Abel Mine operations include Water Supply Works and Use Approval 20WA218986 and Water Access Licence (WAL) 41525, which provide for up to 500ML of water take annually. The Abel Mine is not actively dewatered in advance of mining, rather passive inflows into the mine workings are transferred to completed mine workings or to the surface.

The net groundwater inflow volume has been estimated to be 280ML for the current water year 01 July 2022 to 30 June 2023. No take of water from the overlying alluvial aquifers has occurred to date.

No compensatory water has been required to be supplied throughout the life of the mine.

7.2 SURFACE WATER

Environmental Management

As part of the Water Management Plan, Abel Mine transfers water off site to the Big Kahuna Dam and then to Bloomfield CHPP, as required. During the reporting period, a total of 260.6ML was transferred from the Abel Mine to the Big Kahuna Dam (consisting of groundwater inflows to the underground working and surface flows from the Square Pit, West Pit and Surface Infrastructure Area) and a total of 611.5ML was transferred from the Big Kahuna Dam to the Bloomfield CHPP dams.

Surface water monitoring sites specified for the Abel Mine are aimed at detecting indirect impacts such as from underground mining activities and activities in the surface infrastructure area. The mine's Water Management Plan (version dated June 2019) specifies surface water monitoring be undertaken at the following monitoring locations (see **Figure 6.1**).

- EM1 (previously referred to as Four Mile Creek Upstream or FMCU): monitoring commenced in July 2000 and mining in the Four Mile Creek Catchment commenced in July 2013.
- EM3: monitoring commenced in July 2000 and mining in the Weakleys Flat Creek Catchment commenced in July 2010.
- Site 1: monitoring commenced in June 2007 and mining has not been undertaken in the Buttai Creek Catchment.
- Site 9²: monitoring commenced in June 2007 and mining has not been undertaken in the Blue Gum Creek Catchment.
- Site 10: monitoring commenced in June 2007 and mining has not been undertaken in the Blue Gum Creek Catchment.
- Site 11: monitoring commenced in June 2007 and mining in the Viney Creek Catchment commenced in July 2010.

² Site 9 has been inaccessible since January 2011 due to a road closure. Surrogate monitoring is undertaken at Site 8, located upstream of Site 9 and within the Blue Gum Creek Catchment (see **Figure 6.1**).

Where more than two years' worth of monitoring data is available for individual monitoring locations, site specific trigger values based on the 20th and 80th percentile values have been developed as recommended in the ANZECC *Guidelines for Fresh and Marine Water Quality 2000*. These values represent anticipated value ranges rather than limits and are expected to prompt data reviews and further investigation into potential mine-related impacts where recorded values fall outside of the expected range.

Additional assessment would be undertaken in the event that significant changes in water quality are recorded, these changes are attributable to land use effects and they are recorded in a catchment where mining has occurred. Additionally, the Water Management Plan specifies that an exceedance of the upper trigger value for EC for three consecutive months represents a trigger for further assessment of metal concentrations (iron, aluminium and manganese).

Environmental Performance

Surface water monitoring data for the reporting period is summarised in **Table 7.1** and presented graphically in **Figure 7.1**. Surface water monitoring data recorded since 2008 is presented in **Figure 7.2** and the data set is provided in **Appendix 2**.

pH

Recorded pH values during the reporting period marginally exceeded the lower trigger value and/or the upper trigger value at all sites on a number of occasions during the reporting period. It is noted that, as the site-specific trigger values developed in the Water management Plan are based on the 20th and 80th percentile values for each site, it is expected that these values will occasionally be exceeded. It is also clear that, where site-specific trigger values have been developed, the acceptable pH value range is typically narrow (e.g. a range equivalent to 0.3 units for Site 11) and the upper value is low relative to the ANZECC trigger value for lowland rivers in NSW (8.5). Notably, the highest pH level recorded was 8.09 at Site EM3.

Average pH levels for all sites during the reporting period are generally consistent with the long-term average. Notwithstanding, a correlation in pH with rainfall is apparent (see **Figure 7.2**) with slightly lower pH recorded during the relatively drier 2018 and 2019 period and trending back up to the long-term average during the corresponding high rainfall throughout 2020 to 2022. Given that no operational activities occurred at either the Abel Mine or the Donaldson Open Cut Mine, it is considered that the mine did not contribute to any variation in pH values recorded during this time.

Electrical Conductivity

The electrical conductivity (EC) ranged between 125µS/cm and 1885µS/cm at all monitoring sites during the reporting period. Lower trigger values were exceeded at Site 10 (upstream) and Sites 11, EM1, and EM3 (downstream) during the reporting period. Upper trigger values for EC were exceeded at Site 1 and 10 (upstream) and Site 11 (downstream). However, the trigger for additional investigations (i.e., EC results of representative samples above the upper trigger value for three consecutive months) was not activated during the reporting period.

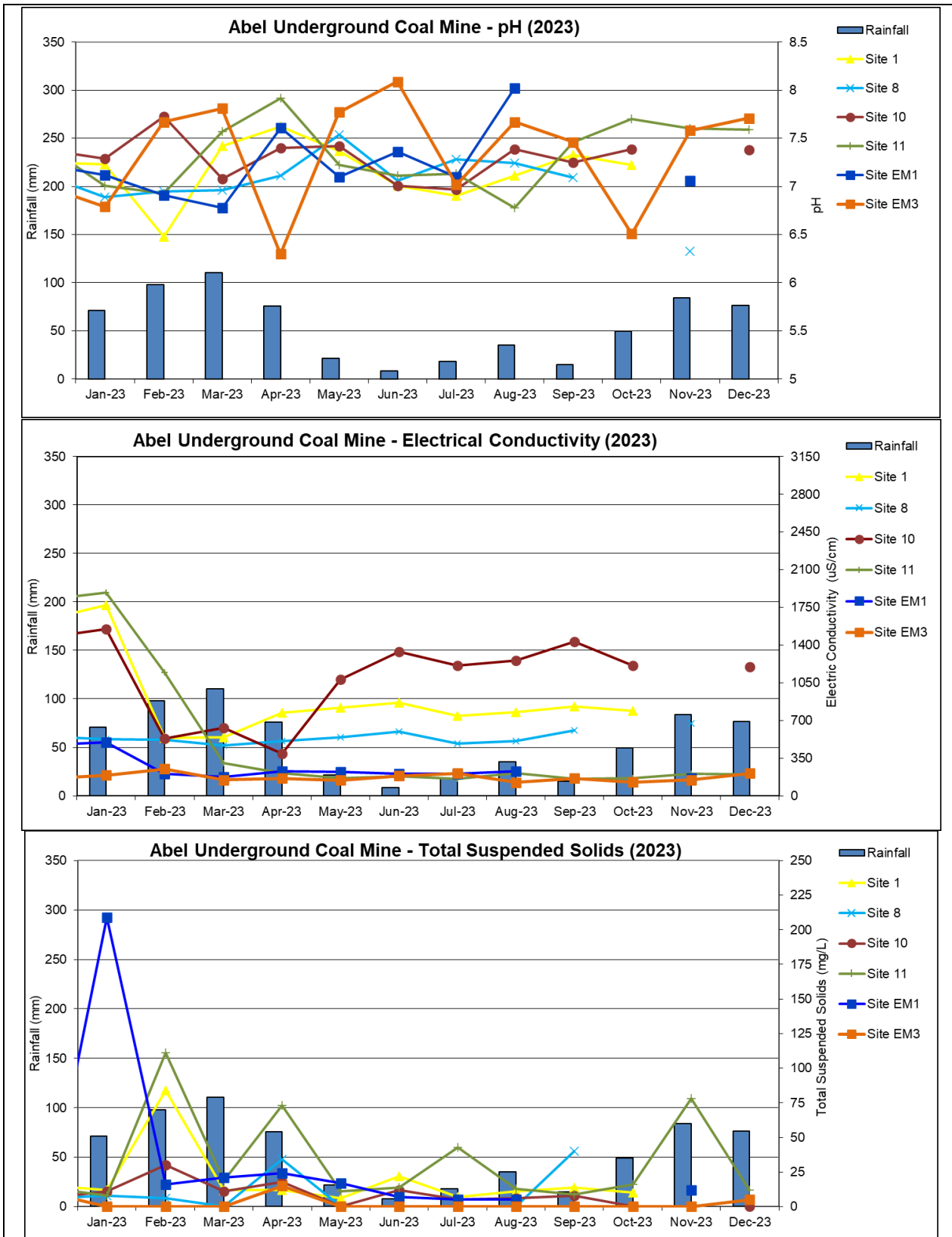


Figure 7.1 Surface Water Quality Monitoring Results – 2023

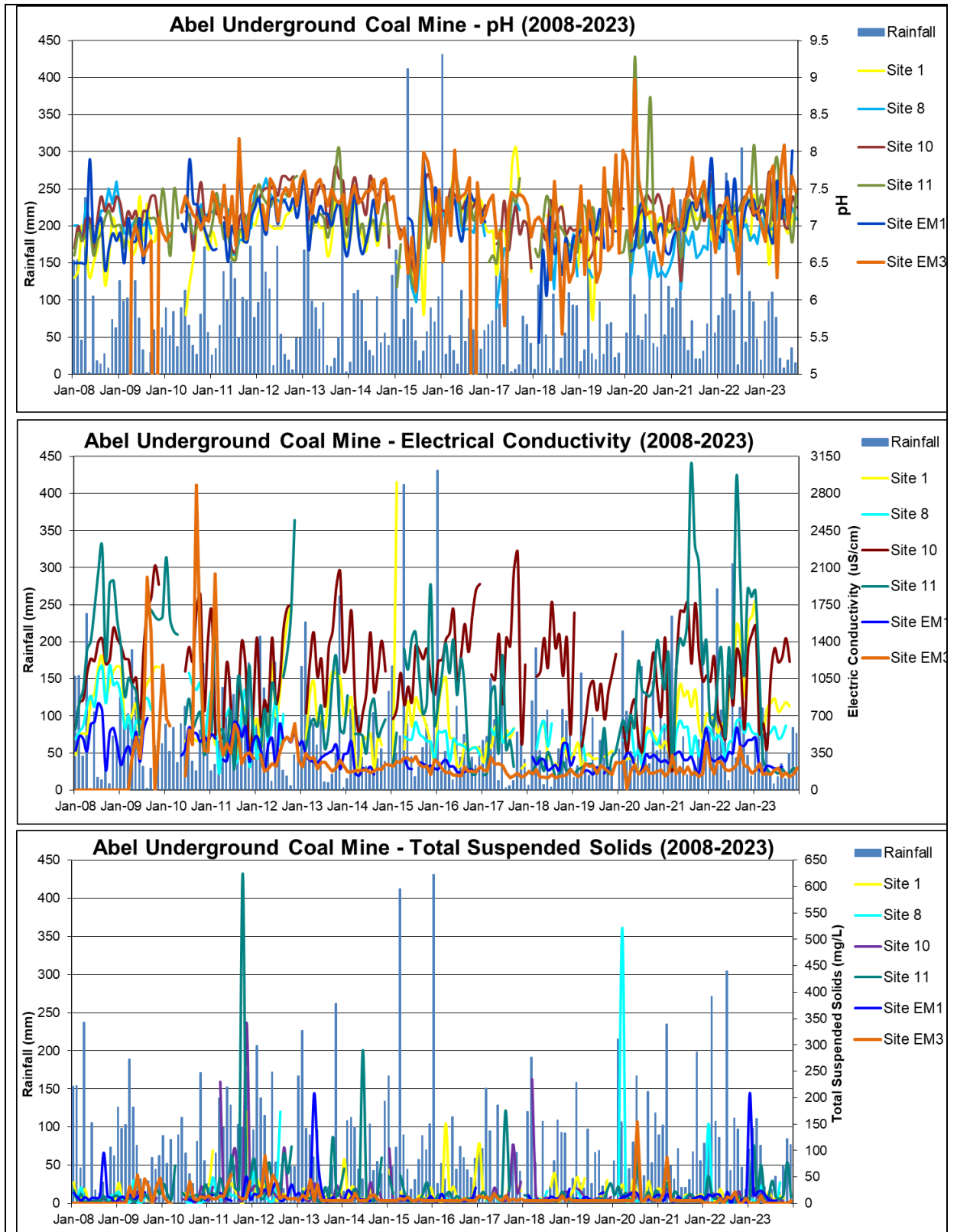


Figure 7.2 Surface Water Quality Monitoring Results – 2008 to 2023

Table 7.1
Summary of Surface Water Quality Monitoring Results – 2023

Sample Site	Triggers	2023												Total / Mean 2023	Long-term Mean
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Rainfall (mm)															
-	-	71	98	110.6	76	21.6	8.2	18.2	35.4	15	49.4	84	76.6	664.0	974.9
Flow[#]															
1 [^]	-	Trickle.	Slow	Still	Still	Still	Still	Still	Still.	Still.	Still	Dry	Dry	-	-
8 [^]	-	Still	Trickle	Still	Trickle	Still	Still	Still	Still.	Still.	Dry	Still	Dry	-	-
10 [^]	-	Trickle	Slow	Trickle	Trickle	Steady	Still	Trickle	Still	Still.	Still	Dry	Still	-	-
11 [*]	-	Trickle	Trickle	Steady	Trickle	Slow	Slow	Slow	Slow	Trickle.	Slow	Trickle	Still.	-	-
EM1 [*]	-	Still	Slow	Trickle	Slow	Still	Still	Still	Still	No Flow	No Flow	Still	No Flow	-	-
EM3 [*]	-	Trickle	Slow	Trickle	Trickle	Trickle	Trickle	Trickle	Trickle	Trickle	Trickle	Trickle	Still	-	-
pH															
1 [^]	6.6 - 7.7	7.23	6.48	7.42	7.62	7.37	7.01	6.9	7.11	7.33	7.22	NS	NS	7.17	6.95
8 [^]	6.6 - 7.3	6.89	6.95	6.96	7.11	7.54	7.06	7.28	7.24	7.09	NS	6.33	NS	7.05	6.92
10 [^]	7.0 - 7.5	7.29	7.73	7.08	7.4	7.42	7.01	6.97	7.39	7.25	7.39	NS	7.38	7.30	7.20
11 [*]	6.8 - 7.1	7.01	6.93	7.57	7.92	7.22	7.11	7.13	6.78	7.46	7.7	7.6	7.59	7.34	7.09
EM1 [*]	6.5 - 7.1	7.12	6.91	6.78	7.61	7.1	7.36	7.1	8.02	NS	NS	7.06	NS	7.23	7.02
EM3 [*]	6.6 - 7.2	6.79	7.67	7.81	6.3	7.77	8.09	7.02	7.67	7.46	6.51	7.58	7.71	7.37	7.19
Electrical Conductivity (mS/cm)															
1 [^]	498 - 1 060	1769	541	545	770	819	864	741	780	829	789	NS	NS	845	662
8 [^]	395 - 746	527	518	468	507	545	598	486	510	608	NS	669	NS	544	563
10 [^]	798 - 1 496	1549	533	629	392	1084	1340	1207	1254	1434	1211	NS	1197	1076	1147
11 [*]	920 - 1 704	1885	1145	304	211	162	183	160	208	161	163	206	200	416	876
EM1 [*]	235 - 580	496	206	173	229	225	207	207	225	NS	NS	161	NS	236	340
EM3 [*]	235 - 1 116	191	251	148	162	144	187	210	125	163	126	149	210	172	301
Total Suspended Solids (mg/L)															
1 [^]	28	12	84	12	12	6	22	7	11	14	10	NS	NS	19	20
8 [^]	16	8	6	<5	34	<5	<5	<5	<5	40	NS	<5	NS	22	17
10 [^]	24	11	30	11	18	<5	12	5	6	8	<5	NS	<5	13	19
11 [*]	18	8	111	19	73	11	14	43	13	9	16	78	12	34	26
EM1 [*]	34	209	16	21	24	17	7	5	5	NS	NS	12	NS	35	16
EM3 [*]	30	<5	<5	<5	15	<5	<5	<5	<5	<5	<5	<5	5	10	13
Red values exceed Trigger Levels [^] Upstream of Underground Workings *Downstream of Underground Workings #No Flow / Still – Result not representative															
Source: Donaldson Coal Pty Ltd															

The average EC levels during the reporting period are generally consistent with or slightly below the long-term average for all sites excluding Site 1 and Site 11. For Site 1 (upstream location), the average EC during the reporting period was 845µS/cm compared with the long-term average of 662µS/cm. For Site 11 (downstream location), the average EC during the reporting period was 416µS/cm compared with the long-term average of 876µS/cm.

Notably, EC levels at Sites 1 and 11 have been highly variable since commencement of monitoring and, whilst average EC for the reporting period is above / below the long-term average, the variability is generally consistent with previous variation (see **Figure 7.2**).

Overall, no significant difference is apparent between upstream and downstream monitoring locations.

Total Suspended Solids

The relevant upper total suspended solids (TSS) trigger values were exceeded at Sites 1, 8, 10 and EM1, on one occasion and at Site 11 on three occasions during the reporting period. Given that the exceedances at Sites 1, 8, 10 and EM1 did not persist across multiple sampling rounds, it is considered that short-term, localised conditions rather contributed to these levels. For Site 11, it is noted that significant development and earthmoving activities not related to the Abel Mine commenced in 2022 and continued throughout the reporting period immediately west and south of Site 11 and are considered likely to have influenced monitoring results during the reporting period and are likely to continue to influence results during the next reporting period.

No long-term trends are apparent in the TSS monitoring data and spikes in TSS are not always correlated with high monthly rainfall. Baseline monitoring for both upstream and downstream monitoring sites have previously recorded significantly elevated TSS results which are considered to form part of the natural variation within these creek systems.

The Environmental Assessment (Donaldson Coal, 2006) predicted no significant impacts on surface water as a result of the mine activities. The monitoring results to date support that assessment.

Reportable Incidents

No reportable incidents occurred during the reporting period.

Further Improvements

No other surface water control measures are planned or considered necessary.

7.3 GROUNDWATER

Environmental Management

Monthly monitoring of regional groundwater levels and groundwater quality was undertaken, where possible, throughout the reporting period in accordance with the Water Management Plan and Integrated Environmental Monitoring Program.

Environmental Performance

Groundwater Levels

A graphical summary of groundwater level monitoring results relevant to the Abel Underground Coal Mine is provided in **Figure 7.3** and an interpretation of these results is provided as follows.

Monitoring indicates that there is little evidence of any drawdown response in the alluvium or regolith groundwater. In particular Piezometers 81A and 81B are located adjacent to the Pambalong Nature Reserve (see **Figure 6.1**). Monitoring results from 81A (single vibrating wire transducer placed within the Lower Donaldson Seam) showed a drawdown response to mining the Donaldson Seam within the Abel Mine. This drawdown appears to have subsequently stabilised (see **Figure 7.3**), although further monitoring is required. Conversely, Piezometer 81B is screened within overlying shallow Permian strata with water levels remaining stable during the current and previous reporting periods. The lack of response in the shallow piezometer indicates minimal mining impact on the Pambalong Nature Reserve.

Piezometers 63A and 63B are located to the east of the Abel Mine adjacent to the M1 Pacific Motorway and near the Hexham Swamp (see **Figure 6.1**). It appears that the shallow Piezometer 63B has failed or the bore has collapsed and therefore this piezometer no longer provides useful data. However, Piezometer 63A is screened in the Lower Donaldson Seam and remains operational. Monitoring results from Piezometer 63A remained consistent throughout the current and previous reporting periods indicating minimal impact from previous mining activities.

Similarly, monitoring results from 78A (standpipe piezometer within the Donaldson Seam) indicated minimal impact until the start of secondary extraction in Panel 23 in June 2013. Drawdown rates stabilised during 2016 and have since remained steady. As for the other nested piezometers, 78B located within the overlying regolith indicates minimal drawdown response and remained consistent during the reporting period.

Piezometer 80 is screened in the Donaldson Seam and located to the south of the mining activities completed to date. An expected drawdown commenced during secondary extraction in Panel 23 June 2013. The decline has steadied since the cessation of mining activities with a steady but modest recovery since mid-2017 which continued during the reporting period.

The results indicate that groundwater pressure reduction within the Lower Donaldson Seam resulting from mining has occurred as anticipated and is insulated from shallow and surficial groundwater systems in this area. This is consistent with the predictions within the Environmental Assessment.

Groundwater Inflows

As reported for 2015, between August 2013 and October 2015 inflow volumes could not be accurately estimated as a significant portion of mine water was accumulating in isolated in-mine storages. From 1 October 2015 water began reporting from the overflow of the storage areas. Based on a total in-mine storage volume of 459ML, it is calculated that average groundwater inflow ranged from 120ML/year to 240ML/year during that time.

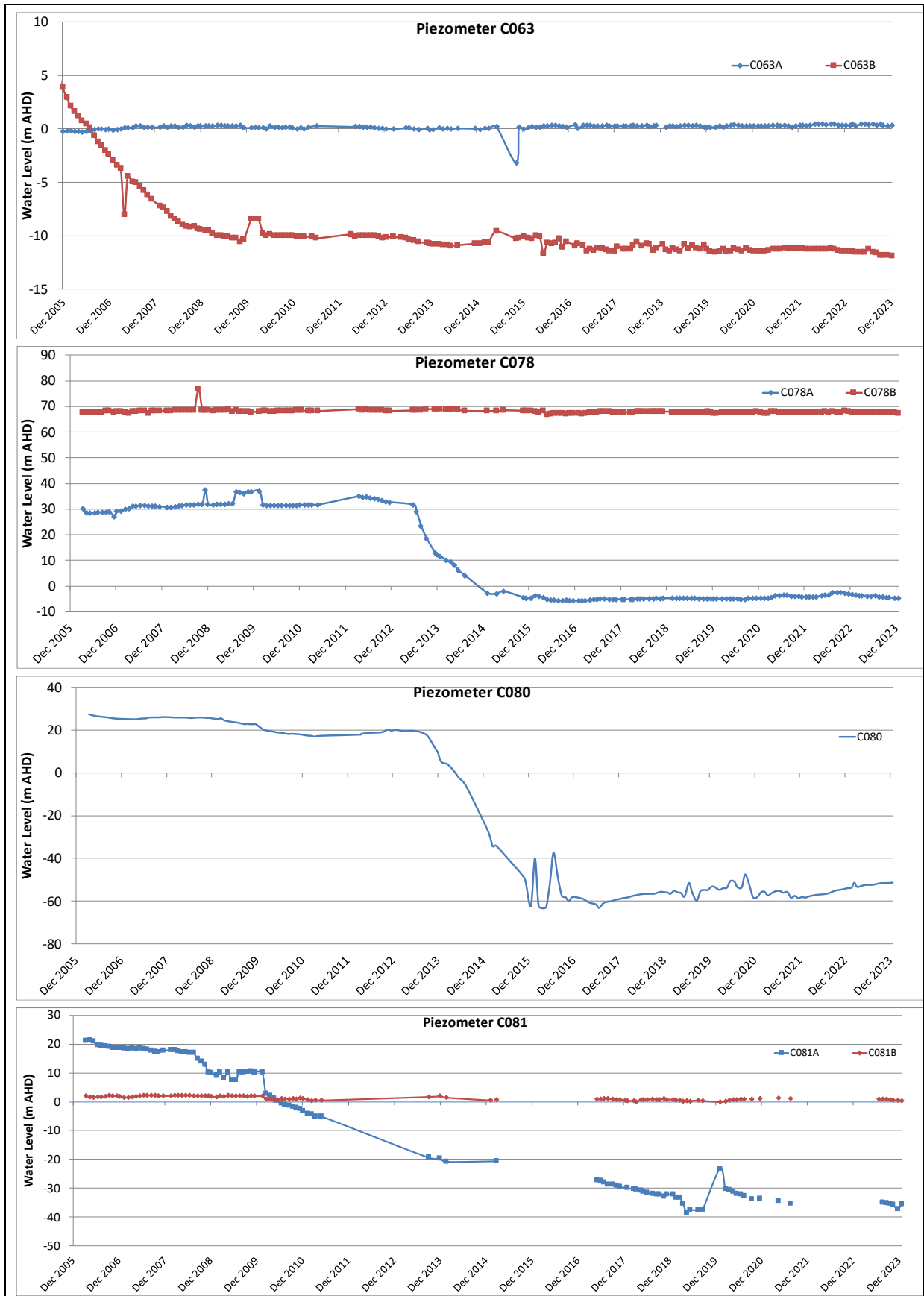


Figure 7.3 Groundwater Level Results – All Data

During the 2022/2023 water year, groundwater inflows are estimated at 280ML. Since the mine was placed on care and maintenance, water has continued to be pumped from the underground workings, however, there have been smaller volumes of inflow and declining outflows. Groundwater model predictions for this stage of mining were for between 800ML and 1 000ML/year. Therefore, the actual inflow rates remain well below the predicted maximum rate.

Groundwater Quality

Groundwater quality monitoring results are presented in **Appendix 2**. A summary of three representative bores located within the Abel underground mine area is presented in **Table 7.2** and **Figure 7.4** with the full graphical presentation since 2008 presented in **Figure 7.5**.

Table 7.2
Summary of Groundwater Quality Monitoring Results

Sampling Site#	All Results	2023
pH		
DPZ – 6	5.44 – 7.58 (6.6)	6.57 - 6.84 (6.73)
DPZ – 13*	No Access	No Access
JRD2	5.23 – 8.06 (6.9)	6.82 - 7.20 (7.00)
Electrical Conductivity		
DPZ – 6	120 – 4,960 (2620)	282 - 2320 (1994)
DPZ – 13*	No Access	No Access
JRD2	146 – 2,660 (1,530)	2080 - 2458 (2254)
() = Average	# see Figure 6.1	*DPZ – 13 inaccessible during 2023
Source: Donaldson Coal Pty Ltd		

During the reporting period pH values ranged from slightly acidic to near neutral (6.57-7.20) and remained within previously recorded ranges. The average pH at site DPZ – 6 and at JRD2 was slightly higher than the average of all results for both sites respectively. EC values ranged between 282µS/cm and 2,458µS/cm and remained within previously recorded ranges, however, average EC at DPZ-6 was below the average of all results, whilst the EC at JRD2 was above the average of all results.

A downward trend in EC has previously been observed at bore DPZ13 (**Figure 7.5**) starting in 2010 / 2011, which may be due to enhanced recharge following drawdowns in the coal measures as a result of mining. Landholder access was unable to be obtained to enable sampling from DPZ-13 during the reporting period to confirm whether this trend had continued or plateaued. Conversely, EC has been relatively consistent within DPZ-6 and JRD2, with monitoring indicating occasional ‘outliers’ of significantly lower EC. This is likely due to ingress of rainwater temporarily lowering the salinity.

For comparison, the Environmental Assessment baseline monitoring reported that the quality of groundwater sampled within the underground mining area of the Abel Mine was variable with total dissolved solids (TDS) ranging from less than 518mg/L to 13,000mg/L, which is approximately equivalent to EC readings of between 865µS/cm and 21,700µS/cm.

Reportable Incidents

No reportable incidents occurred during the reporting period.

Further Improvements

Monitoring will continue in accordance with the current Water Management Plan (WMP). During the next reporting period the Water Management Plan will be reviewed and revised in consideration of consolidated EPL 12856.

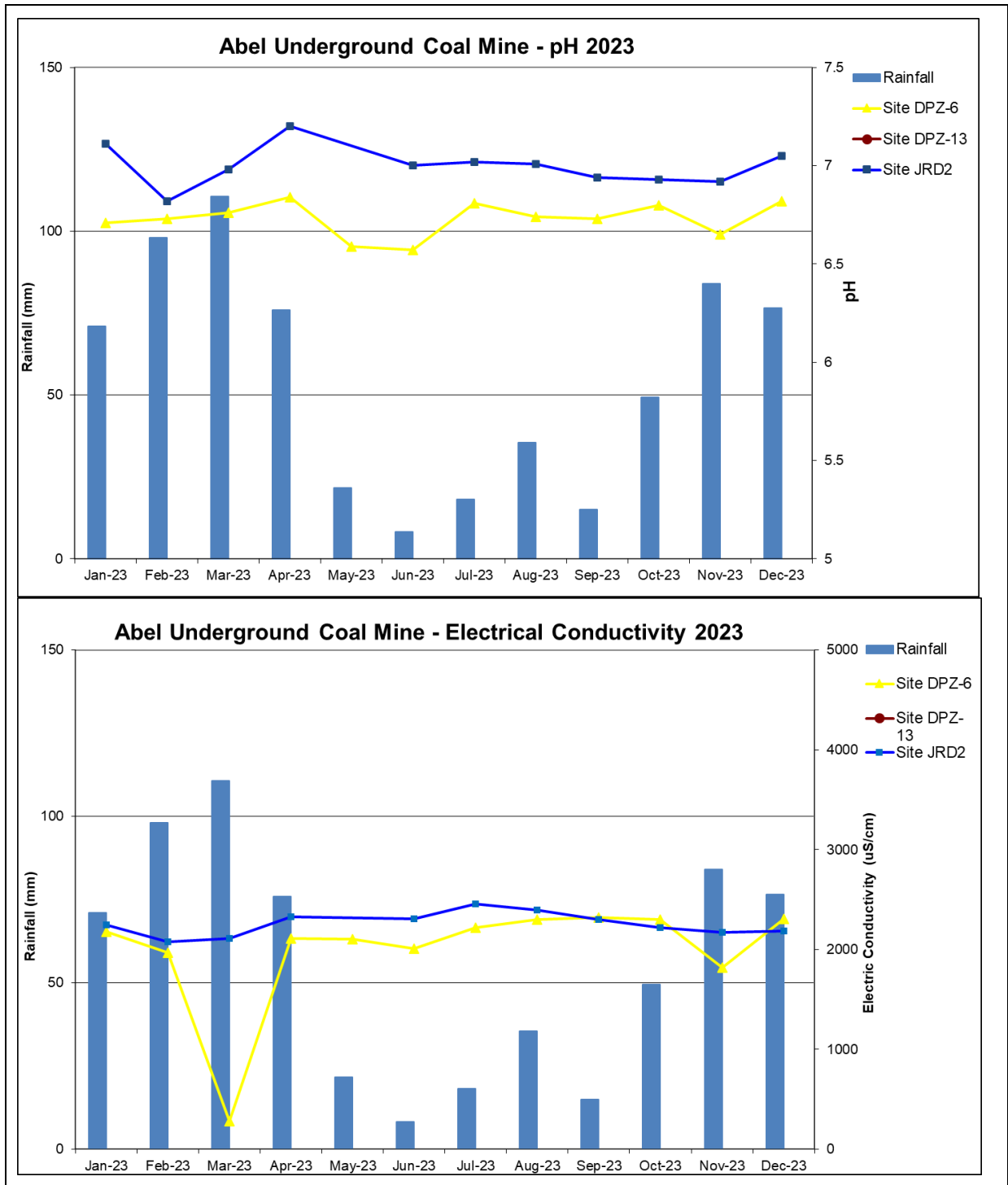


Figure 7.4 Groundwater Quality Monitoring Results – 2023

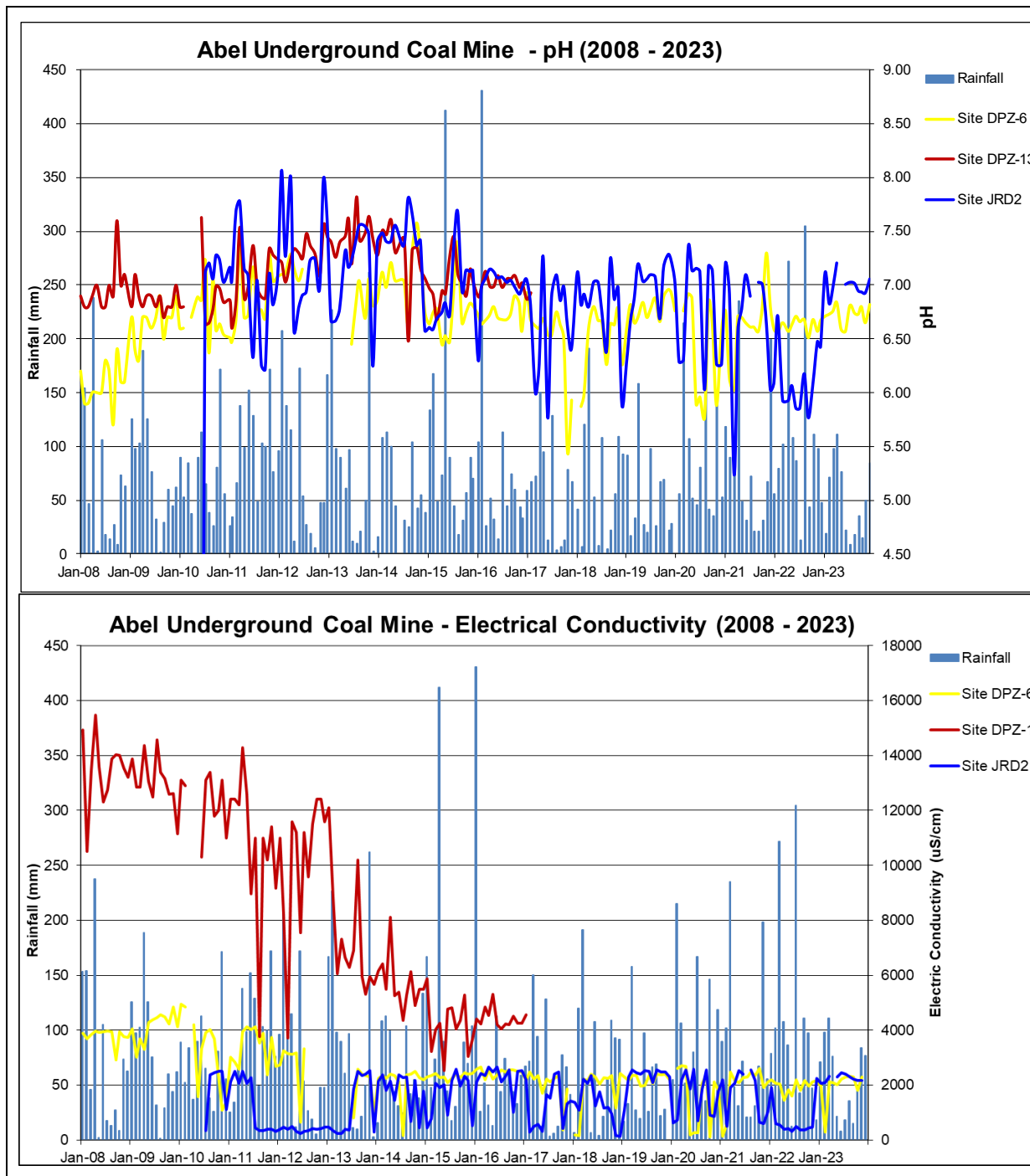


Figure 7.5 Groundwater Quality Monitoring Results – 2008 – 2023

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)	This Reporting Period (Actual)	Next Reporting Period (Forecast)
	Year 12 (ha)	Year 13 (ha)	Year 14 (ha)
Total mine footprint	13.81 ¹	13.81 ¹	13.81 ¹
Total active disturbance	13.81 ²	13.81 ²	13.81 ²
Land being prepared for rehabilitation	0	0	0
Land under active rehabilitation	0	0	
Completed rehabilitation	0	0	0

Notes:

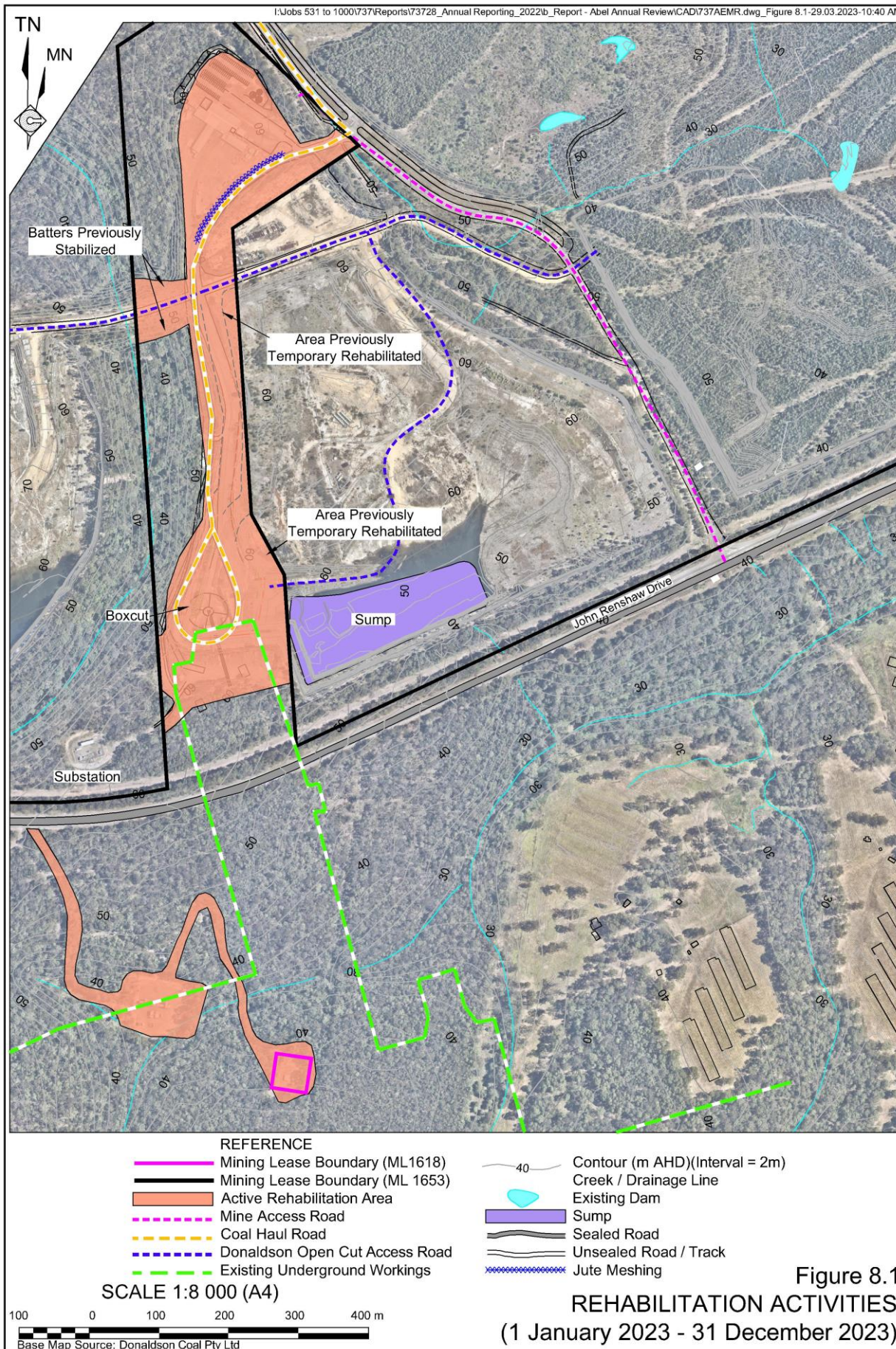
- 1: Includes 0.41ha associated with the extended light vehicle car park, 0.23ha for the downcast ventilation shaft and 0.58ha relating to the upcast ventilation shaft but excludes underground mining areas. Areas that have been temporarily rehabilitated also included.
- 2: Whilst some areas have been temporarily rehabilitated, all areas within ML1618 surface infrastructure area are considered to be 'active'.

A wild dog and fox baiting program was undertaken by Enright Land Management between October and November 2023 in consultation with surrounding landholders.

Within the surface infrastructure area, no permanent buildings were structurally altered, renovated or removed during the reporting period and, other than regular inspection and maintenance of previously temporarily rehabilitated areas (i.e. batter slopes) and retained vegetation, no specific rehabilitation activities were undertaken. Maintenance activities completed included scheduled equipment maintenance, regular security patrols of boundary fencing to prevent unauthorised access, and ongoing control of weeds (e.g. Pampas Grass) across the entire surface infrastructure area.

No rehabilitation trials or research was undertaken during the reporting period and there were no variations to the rehabilitation activities as outlined within the approved Rehabilitation Management Plan.

There are currently no specific issues affecting the ability to successfully rehabilitate the site and therefore no specific management measures.



No rehabilitation areas became available for sign off by the Resources Regulator and no final land use objectives were met during the reporting period. As the Abel Mine is an underground operation, the only significant rehabilitation will be during mine closure and decommissioning.

As outlined within the approved Rehabilitation Management Plan and Forward Program, during decommissioning the creation of the final landform will involve blasting of the western side of the Abel Box Cut (as part of final landform creation within the West Pit) followed by grading using a dozer to create a maximum slope of 18°. The northern side of the Abel Box Cut will also be blasted and graded to a maximum of 10°, with a permanent vehicle access and egress ramp constructed to allow access to the final void for ongoing monitoring and management.

Surface infrastructure areas located within existing forested areas, such as the substation and ventilation shafts, will be returned to native vegetation. In both closure scenarios presented in the *Abel Underground Mine and Donaldson Open Cut Mine – Closure Strategy for the West and Square Pits*, the current post-mining land use goal for the Abel Box Cut is for use as water storage suitable for use in surrounding mining operations.

The Rehabilitation Management Plan (RMP), including proposed Rehabilitation Objectives, Completion Criteria and Final Landform Plan was prepared during the 2022 reporting period in accordance with the Operational Rehabilitation Reforms and amendments to the *Mining Regulation 2016*. On 25 August 2023 the Rehabilitation Objectives and Final Landform Plan were approved by the Resources Regulator. The RMP was subsequently revised to reflect the approved objectives and landform plan and propose updated Completion Criteria.

8.2 ACTIONS FOR THE NEXT REPORTING PERIOD

No specific rehabilitation works are planned during the next reporting period and no major rehabilitation work will be able to be undertaken until closure and decommissioning of the site. However, work will continue to be undertaken in development of the closure strategy, including commencement of a rehabilitation materials balance report, and reflected in updates to the Rehabilitation Management Plan, as appropriate.

In the event that any surface cracks appear these will be backfilled, compacted, topsoiled and seeded and ongoing repairs to any subsidence damage to public roads will be completed in accordance with the approved subsidence monitoring and management plans. Notably, any further rehabilitation works to Blackhill Road will be completed by the Subsidence Advisory NSW.

Maintenance works, such as erosion and sediment control, and ongoing control of weeds and feral pests will also be undertaken as required.

9. COMMUNITY

9.1 COMMUNITY COMPLAINTS

No complaints were received during the 2023 reporting period. The last complaint was received on 9 October 2017. Given that no further complaints have been received and the Abel Mine is currently under care and maintenance, no specific actions are currently deemed necessary.

9.2 COMMUNITY LIAISON AND CONTRIBUTIONS

The principal formal community consultation undertaken is the Community Consultative Committee. In accordance with *Schedule 6 Condition 6* of PA 05_0136, the Company has established a Community Consultative Committee for the Abel Mine. During the reporting period, the committee consisted of:

- four representatives of the local community (Mr Alan Brown, Mr Allan Jennings, Mr Terry Lewin, Mr Brad Ure); and
- three representatives from the Company (Mr William (Bill) Farnworth, Mr James Benson and Mr Phillip Brown).

The committee was chaired by Mrs Margaret MacDonald-Hill, an independent chairperson appointed as the independent Chair by the Secretary, DPE. It is noted that Cessnock and Maitland City Councils have been invited to meetings but have elected not to attend.

The committee held one meeting during the reporting period (11 September 2023), consistent with the previous determination by the CCC that the frequency of meetings could be reduced to annually due to the Mine being in care and maintenance. The meetings continue to provide an opportunity for the Company to keep the community up to date with activities undertaken and programmed at the Abel Mine and for community members to table issues relating to the Abel Mine for the Company's consideration. It is noted that the Company provided a presentation during 2023 meeting to provide updates on the care and maintenance, environmental monitoring, subsidence management, planning, and other relevant matters.

Copies of minutes and presentations are available on the Donaldson Coal Website at www.doncoal.com.au.

During the reporting period no additional community contributions were made.

10. INDEPENDENT AUDIT

The last independent environmental audit of the mine was undertaken in February 2022, in accordance with *Schedule 5 Condition 5* of PA 05_0136 for the period 21 December 2018 to 31 December 2021. The independent audit report was finalised in April 2022 and confirmed that the Company was generally compliant in terms of environmental performance without any serious incidents.

The audit identified a total of four (4) non-compliances (deemed to be administrative) against PA 05_0136 for the audit period. Four non-compliances (two administrative and two low risk) were also identified associated with EPL 12856, and which were reported in the respective Annual Returns with no further corrective action required. No non-compliances were recorded against ML 1653 and ML 1618. Recorded no-compliances apply to the period prior to the current reporting period.

A range of recommendations were provided within the audit and a response plan prepared. A status review of these responses is provided in **Table 10.1** and will continue to be updated as part of the Annual Review for the next reporting period.

The next independent environmental audit is due to be commissioned during 2024.

Table 10.1
Independent Audit Action Response Plan Status

Page 1 of 3

Condition	Description	Donaldson Response	Timeline	Status Update
PA 05_0136 Corrective Actions				
Schedule 6 Condition 1	Ensure the Integrated Environmental Management Program, which has not been revised since 2007, is updated to reflect the current status of mining operations and associated monitoring on site.	The Abel Project Approval 05_0136 previously required a standalone Environmental Management Program. This condition has since been removed. Schedule 6 Condition 1 of Project Approval 05_0136 requires the implementation of an Environmental Management Strategy (EMS) that includes a plan depicting all monitoring required. Donaldson Coal will update the EMS to remove the existing Appendix D – 'Integrated Environmental Monitoring Plan and include all monitoring conducted under Project Approval 05_0136 in Chapter 12 of the EMS.	29 July 2022	The EMS has been reviewed and updated. However, final submission requires the update of the Bloomfield CHPP programs (required to be included as an appendix). The Bloomfield Group received an extension to July 2023 for update of the Bloomfield plans. Donaldson awaits the updated plans following which the EMS will be submitted for approval following finalisation of the Bloomfield plans.
Schedule 6 Condition 11	Whilst the mining lease has been uploaded following the audit, noise monitoring results for 2021 should be uploaded to the website as soon as practicable.	All noise monitoring reports for 2021 have been uploaded to the Donaldson Coal website.	Completed	Completed. Further data will also be uploaded to the website when available.
EPL12856 Compliance Recommendations				
P1.1, P1.3	As management plans prepared for the project were prepared prior to approval of the EPL variation on 1 October 2021, a review of the relevant management plans should be undertaken to ensure monitoring location names are updated to either be consistent with the EPL or ensure location names identified in the EPL are identified in relevant plans. As an example, reduction of noise monitoring from quarterly to biannually should be captured in the NMP.	Donaldson Coal will review and update all relevant Management Plans required under the Abel Development Consent to ensure consistency with the current version of the Abel Environment Protection Licence.	29 July 2022	Submission of the updated management plans to be undertaken during the 2024 reporting period. As noted above, final update of management plans is reliant upon completion of the respective Bloomfield CHPP management plans.
P1.3	Ensure the licensed discharge point is provided appropriate signage to identify it as an EPL discharge point.	Donaldson Coal will install signage at the discharge point by the 30 June 2022	30 June 2022	Completed. Signage was installed in June 2022.
P1.4	Provide an update to the NMP and AQGGMP to provide relevant location of meteorological Station relied upon for monitoring purposes.	Donaldson Coal will review and update the Noise Management Plan and Air Quality and Greenhouse Gas Management Plan to include the location of the Abel meteorological Station.	29 July 2022	Submission of the updated management plans to be undertaken during the 2024 reporting period. As noted above, final update of management plans is reliant upon completion of the respective Bloomfield CHPP management plans.

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

Condition	Description	Donaldson Response	Timeline	Status Update
PA 05_0136 Compliance Recommendations				
Schedule 3, Condition 1	If mining is to recommence, ensure monitoring frequency of surface water and groundwater is determined in consultation with NRAR and DPE.	The environmental monitoring schedule will be updated in consultation with relevant stakeholders prior to the recommencement of mining.	Prior to the recommencement of mining	Not yet applicable. Mining has not yet recommenced or planned to recommence during the next reporting period.
Schedule 4, Condition 5	Ensure the NMP is updated to identify times where relevant noise limits do not apply, as identified in Condition L4.4 of EPL 12856.	Donaldson Coal will review and update the Noise Management Plan to include times when relevant noise limits do not apply.	29 July 2022	Submission of the updated management plan to be undertaken during the 2024 reporting period. As noted above, final update of management plan is reliant upon completion of the respective Bloomfield CHPP management plans.
	Discuss additional measures of noise mitigation during times where noise limits do not apply due to meteorological conditions.	Donaldson Coal will review and update the Noise Management Plan to include additional measures of noise mitigation during times where noise limits do not apply due to meteorological conditions.	29 July 2022	
Schedule 4, Condition 6	A process should be documented in relevant plans (i.e. AQGGMP and NMP) for both Bloomfield Colliery and Abel Coal Mine to ensure that Abel personnel are formally notified as soon as possible by Bloomfield in relation to any potential exceedances due to operations at the CHPP, rail loadout facility, rail loop and rail spur.	Donaldson Coal will review and update all relevant Management Plans to include the agreed process for communicating potential exceedances and incidents at the Bloomfield CHPP, rail loadout facility, rail loop and rail spur.	29 July 2022	Submission of the updated management plans to be undertaken during the 2024 reporting period. As noted above, final update of management plans is reliant upon completion of the respective Bloomfield CHPP management plans.
Schedule 4, Condition 27	The previous audit recommended that at next review of MOP (now known as an RMP and Annual Rehabilitation Report and Forward Program) to remove any requirements that are not required for care and maintenance status. This should be considered during the updates currently being completed. In addition, this update should consider the need for a rehabilitation care and maintenance program in consultation with the NSW Resources Regulator.	The Abel Rehabilitation Management Plan is currently being compiled. This document will be a contemporary management plan that covers the site being in care and maintenance as well as account for the possibility of the recommencement of mining.	2 July 2022	Completed. The Abel Rehabilitation Management Plan was finalised during the 2022 reporting period and has been uploaded onto the website.
	Ensure the RMP required by DA 05_0136 is updated to consider the requirements of the RMP and Annual Rehabilitation Report and Forward Program currently being prepared (as now required by the NSW Resources Regulator instead of a MOP) and documents where topsoil will be stored and the estimated volumes required for rehabilitation.	The Abel Rehabilitation Management Plan (RMP) currently being developed will comply with the NSW Resources Regulator's RMP Guidelines as well as including topsoil storage locations.	2 July 2022	The Abel RMP was developed in accordance with the relevant guidelines. A rehabilitation materials balance report will also be commenced during subsequent reporting periods.

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

Page 3 of 3

Condition	Description	Donaldson Response	Timeline	Status Update
PA 05_0136 Compliance Recommendations (Cont'd)				
Schedule 4, Condition 29	Ensure consultation is undertaken with all prescribed parties during the next revision of the RMP.	Consultation for the RMP will occur and be in accordance with the NSW Resources Regulator's RMP Guidelines.	Noted	Completed. Consultation was undertaken in accordance with the relevant guideline during preparation of the RMP.
Schedule 6, Condition 1	The previous audit recommended adding links to EMS attached documents or including as appendix to EMS. This has not been addressed during this audit period, and this recommendation still remains open.	The Abel and Donaldson Environmental Management Strategy (EMS) has recently been updated to include links to Management Plans as required by relevant approvals.	29 July 2022	The EMS links will be further updated following the update of the various management plans.
Schedule 6, Condition 2	It is recommended that other plans prepared under this consent implement the tabular condition list as per the 2019 IEA Recommendation.	All management plans required by both the Abel and Donaldson Development Consents are currently being updated and will be resubmitted to the relevant authorities. The updated management plans all have a commitments table that outline the commitments made within the management plan	29 July 2022	Submission of the updated management plans to be undertaken during the 2024 reporting period. As noted above, final update of management plans is reliant upon completion of the respective Bloomfield CHPP management plans.

11. INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

During the reporting period there were no:

- no non-compliances;
- reportable incidents or exceedances relating to Abel Underground Coal Mine operations; or
- official cautions, warning letters, penalty notices or prosecution proceedings relating to the Abel Underground Coal Mine operations.

12. ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

As outlined in Section 4.3, a range of monitoring, including surface water, groundwater, noise, and subsidence monitoring, are planned during the next reporting period. This monitoring represents the monitoring approved through the updated management plans for care and maintenance. Notwithstanding, the need for and frequency of monitoring is to be continually reviewed together with corresponding management plans to ensure that an appropriate level of monitoring and management during care and maintenance is undertaken.

Other key activities to be undertaken during the next reporting period include:

- review and update of the Environmental Management Strategy and all environmental management plans; and
- finalisation of the rehabilitation materials balance report.

Appendices

- Appendix 1 Noise Monitoring Reports
- Appendix 2 Water Monitoring Results
- Appendix 3 Abel Mine Subsidence Management Plan End of
Year Report 2023

Appendix 1

Noise Monitoring Reports

(No. of pages including blank pages = 157)



Donaldson and Abel Coal Mines

Bi-Annual Noise Monitoring – Half-year Ending June 2023

Donaldson Coal Pty Ltd

Box 5, L5, 28 Honeysuckle Drive
Newcastle NSW 2300

Prepared by:

SLR Consulting Australia

10 Kings Road, New Lambton NSW 2305,
Australia

SLR Project No.: 630.01053.20000

6 November 2023

Revision: v1.0

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
v1.0	6 November 2023	Martin Davenport	Shannon Harvey	Martin Davenport

Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Donaldson Coal Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.



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Appendices

Appendix A	Acoustic Terminology
Appendix B	Noise Monitoring Locations
Appendix C	Calibration Certificates
Appendix D	Statistical Ambient Noise Levels



1.0 Introduction

1.1 Background

Donaldson Coal Pty Ltd has commissioned SLR Consulting Australia Pty Ltd (SLR) to conduct half-yearly noise monitoring surveys for the Donaldson Coal Mine and Abel Coal Mine during the June 2023 half in accordance with the *Donaldson Coal Mine and Abel Underground Coal Mine - Noise Management Plan Care and Maintenance* (the NMP) dated 3 June 2019.

1.2 Objectives of this Report

The objectives of the noise monitoring survey for this half-year were as follows:

- Measure the ambient noise levels at six focus receptor locations (potentially worst affected) surrounding Donaldson Coal Mine and Abel Coal Mine.
- Qualify all sources of noise within each of the attended surveys, including estimated contribution or maximum level of individual noise sources.
- Assess the noise emissions of Donaldson Coal Mine and Abel Coal Mine with respect to the limits contained in the Development Consent.

1.3 Acoustic Terminology

The following report uses specialist acoustic terminology. An explanation of common terms is provided in **Appendix A**.

2.0 Development Consent Project Approval

Development consent was obtained by Donaldson Coal Pty Ltd for the Donaldson Mine in October 1999 following a Commission of Inquiry. Development Consent number N97/00147 was issued by the Minister for Urban Affairs pursuant to Section 101 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

Project Approval (Application No. 05_0136) granted by the Minister of Planning was obtained by Donaldson Coal Pty Ltd for Abel Coal Mine in 2007.

2.1 Donaldson Coal Mine Development Consent Conditions

The Development Consent nominates hours of operation and mine noise emission goals in the Sections entitled “*Operation of Development, Condition No. 3(1) and 3(2)*”, and “*Noise and Vibrational Noise Limits: Condition No. 15*” as follows:

3.(1) Subject to (2) the approved hours of operation are as follows:

Works	Period	Hours
Construction, including construction of any bunds	Monday to Friday Saturday	7 am to 6 pm 8 am to 1 pm
Mining operations, including mining, haulage of waste to dumps and coal processing	Monday to Friday Saturday, Sunday	24 hours per day 7 am to 6 pm



Works	Period	Hours
Road Transportation and stockpiling of coal	7 days per week	24 hours per day
Rail loading of coal	7 days per week	7 am to 10 pm
Maintenance of mobile and fixed plant	7 days per week	24 hours per day
Blasting, not involving closure of John Renshaw Drive	Monday to Saturday	7 am to 5 pm
Blasting, involving closure of John Renshaw Drive	Monday to Saturday	10 am to 2 pm
Notes: Restrictions on Public Holidays are the same as Sundays		

2. *The Applicant shall submit a report to the Director-General's satisfaction demonstrating the noise limits in Condition 15 can be met while rail loading of coal is occurring during the period from 6 pm to 10 pm. If that report does not demonstrate that the noise limits can be met to the Director-General's satisfaction, then the hours of operation for rail loading of coal shall be restricted to 7 am to 6 pm."*
15. *Unless subject to a negotiated agreement in accordance with Condition 23, the Applicant shall ensure that the noise emission from construction or mining operations, when measured or computed at the boundary of any dwelling not owned by the applicant (or within 30 metres of the dwelling, if the boundary is more than 30 metres from the dwelling), shall not exceed the following noise limits:*

Location	LA10(15minute) Noise Limits (dBA)	
	Daytime	Night-time
Beresfield area (residential)	45	35
Steggles Poultry Farm	50	40
Ebenezer Park Area	46	41
Black Hill Area	40	38
Buchanan and Louth Park Area	38	36
Ashtonfield Area	41	35
Thornton Area	48	40
Notes: Daytime is 7 am to 10 pm Monday-Saturday, and 8 am to 10 pm Sundays and Public Holidays. Night-time is 10 pm to 7 am Monday-Saturday, and 10 pm to 8 am Sundays and Public Holidays.		

The noise limits apply for prevailing meteorological conditions (winds up to 3 m/s), except under conditions of temperature inversions."

Other Conditions of Consent relevant to noise are as follows:



18. *The applicant shall survey and investigate noise reduction measures from plant and equipment and set targets for noise reduction in each Annual Environmental Management Report (AEMR), taking into consideration valid noise complaints received in the previous year. The Report shall also include remedial measures.*
19. *The Applicant shall revise the Noise Management Plan as necessary and provide an updated Plan five years after commencement of mining to the Director-General, the independent noise expert (Condition 48), EPA, Councils and the Community Consultative Committee.*

2.2 Abel Coal Mine – Project Approval

Approved Operations

The following operations are approved under the Abel Coal Mine Project Approval:

- Extraction of up to 6.1 Mtpa of Run of Mine (ROM) coal from the Abel Underground Coal Mine.
- Transport coal to the existing Bloomfield Coal Handling and Preparation Plant (CHPP) by private haul roads, or by coal conveyor, or by a combination of both methods.
- Operate the CHPP to process coal extracted from the Abel Coal Mine and the Bloomfield and Donaldson Coal Mines.
- Transportation of product coal from the Bloomfield site by rail via the Bloomfield rail loading facility.

The Project Approval was modified in June 2010 (05_0136 MOD 1) allowing construction and operation of a downcast ventilation fan. In May 2011 the Project Approval was modified again (05_0136 MOD 2) to allow the construction and operation of an upcast ventilation fan (and associated facilities). In December 2013 the Project Approval was further modified (05_0136 MOD3) to account for the increase in coal extracted including the upgrade of the Bloomfield CHPP.

Consent Conditions

The relevant conditions relating to noise from the Abel Coal Mine approval are reproduced below.

Schedule 4

NOISE

Operational Noise Criteria

1. *The Proponent shall ensure that the noise generated by the Project does not exceed the criteria in Table 4 at any residence on privately-owned land.*

Table 4: Operational Noise Criteria dB(A)

Location	Receiver Area	Day	Evening	Night	
		LAeq(15minute)	LAeq(15minute)	LAeq(15minute)	LA1(1minute)
Location 1	Lord Howe Drive, Ashtonfield	36	36	36	45



Location	Receiver Area	Day	Evening	Night	
		LAeq(15minute)	LAeq(15minute)	LAeq(15minute)	LA1(1minute)
Location K	Catholic Diocese Land	37	37	37	45
Location L	Kilshanny Avenue, Ashtonfield	40	40	40	47
All other Locations	All other privately owned Residences	35	35	35	45

Notes: To interpret the locations referred to in Table 4, see plan in Appendix 3.

Noise generated by the project is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy. Appendix 4 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

These noise criteria do not apply if the Proponent has an Agreement with the relevant landowner to generate higher noise levels, and the proponent has advised the Department in writing of the terms of this agreement.

Construction Noise Criteria

- The proponent shall ensure that the noise generated during the construction of the downcast ventilation shaft as described in EA (MOD3) does not exceed the criteria in Table 5.

Table 5: Construction Noise Criteria dB(A)

Location	Receiver	Day
		LAeq(15minute)
Location R	281 Lings Road, Buttai	50
Location S	189 Lings Road, Buttai	43

Notes: The criteria in Table 5 apply only whilst the downcast ventilation shaft is being constructed, and for a maximum of 12 weeks from the commencement of construction.

To interpret the locations referred to in Table 5, see plan in Appendix 3 (attached to this report as Appendix A).

Noise generated by the project is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy.

However, these noise criteria do not apply if the Proponent has an Agreement with the relevant landowner to generate higher noise levels, and the proponent has advised the Department in writing of the terms of this agreement.

Rail Noise Criteria

- The proponent shall ensure that the noise from rail movements on the Bloomfield Rail Spur does not exceed the limits in Table 6 at any residence on privately owned land.

Table 6: Rail Spur noise criteria dB (A)

Table Heading	Day	Evening	Night
	LAeq(period)		
All privately owned land	55	45	40



Cumulative Noise Criteria

1. *The proponent shall implement all reasonable and feasible measures to ensure that the noise generated by the project combined with noise generated by other mines does not exceed the criteria in Table 7 at any residence on privately-owned land.*

Table 7: Cumulative noise criteria dB (A)

Table Heading	Day	Evening	Night
	LAeq(period)		
All privately owned land	55	45	40
Notes: Cumulative noise is to be measured in accordance with the relevant requirements, and exemptions (including meteorological conditions), of the NSW Industrial Noise Policy. Appendix 4 sets out the metrological conditions under which these criteria apply and the requirements for evaluating compliance with these criteria.			

Operating Conditions

1. *The proponent shall:*
 - a. *Implement best management practise to minimise the construction, operational, road and rail noise of the project;*
 - b. *Operate an on-site noise management system to ensure compliance with the relevant conditions of this approval;*
 - c. *Minimise the noise impacts of the project during meteorological conditions under which the noise limits in this consent do not apply (see Appendix 4);*
 - d. *Only receive and/or dispatch locomotives and rolling stock either on or from the site that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL (No. 3142);*
 - e. *Carry out regular monitoring to determine whether the project is complying with the noise criteria and other relevant conditions of approval, to the satisfaction of the Director-General.*

Noise Management Plan

2. *The proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Director-General. This plan must:*
 - a. *Be prepared in consultation with the EPA, and be submitted to the Director-General for approval within 6 months of the date of approval of MOD 3;*
 - b. *Describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this approval; Describe the proposed noise management system in detail; and*
 - c. *Include a monitoring program that:*
 - *Uses attended monitoring to evaluate the compliance of the project against the noise criteria in this approval;*
 - *Evaluates and reports on:*
 - *The effectiveness of the on-site noise management system; and*
 - *Compliance against the noise operating conditions; and*



- *Defines what constitutes a noise incident, and includes protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents. Appendix 4*

Noise Compliance Assessment

Applicable Meteorological Conditions

1. *The noise criteria in Tables 4 and 7 are to apply under all metrological conditions except the following:*
 - 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 measured at 10m above ground level; or*
 - d. *Temperature inversion conditions greater than 3°C/100m.*

Determination of Meteorological Conditions

2. *Except for wind speed at microphone height, the data to be used for determining metrological conditions shall be that recorded by the meteorological station located on the site.*

Compliance Monitoring

3. *Attended monitoring is to be used to evaluate compliance with the relevant conditions of this approval.*
4. *Unless otherwise agreed with the director-general, this monitoring is to be carried out in accordance with the relevant requirements 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. *Metrological conditions during which collection of noise data is not appropriate;*
 - c. *Equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and*
 - d. *Modification to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.*

Appendix 5

Statement of Commitments

3. Noise

3.1 Construction Activities

The following noise control measures will be implemented prior to commencement of construction of the Abel Underground Mine or the upgrade of the Bloomfield CHPP.

1. *Maintain all machinery and equipment in working order;*



- a. *No construction activities at the Abel pit top will take place on Sundays or Public Holidays;*
- b. *Where possible locate noisy site equipment behind structures that act as barriers or at the greatest distance from noise sensitive areas; and*
- c. *Orientate equipment so that noise emissions are directed away from noise sensitive areas.*

3.2 Noise Control Measures

- a. *The following noise control measures will be implemented prior to the mining of coal from the Abel underground Mine:*
 - i. *Orientation of the ventilation fans away from residential receivers and angle the output parallel to the ground.*
 - ii. *The sound power level of the front end loader to be used near the portal should not exceed 113 dBA and will be fitted with a noise sensitive reversing alarm.*
- b. *The following noise control measures will be implemented prior to the Bloomfield CHPP receiving any ROM coal from Able Underground Mine;*
 - i. *Noise mitigation works including partial enclosure and noise screening of drives and conveyors of the Bloomfield CHPP to screen residences to the north of the site.*

3.2 Monitoring

The Company will implement a Noise Monitoring Program for the Abel Underground Mine and the Bloomfield CHPP, to the satisfaction of the Director-General. The Noise Monitoring Program shall include a combination of real-time and supplementary attended monitoring measures, and a noise monitoring protocol for evaluating compliance with the noise environmental assessment. This plan will be integrated with the monitoring plans for the Tasman, Donaldson and Bloomfield Mines to provide a single integrated Noise Monitoring Program for all 4 mines.

3.4 Continuous Improvement

The Company shall:

- a. *Report on these investigations and implementation of any new noise mitigation measures on site in the AEMR, to the satisfaction of the Director General.*

The operator of the Bloomfield CHPP shall:

- b. *Investigate ways to reduce the noise generated by the Bloomfield CHPP, including maximum noise levels which may result in sleep disturbance;*
- c. *Implement all reasonable and feasible best practice noise mitigation measures on the site; and*



- d. Report on these investigations and the implementation of any new noise mitigation measures on site in the AEMR, to the satisfaction of the Director-General

3.0 Noise Monitoring Methodology

3.1 General Requirements

The operational noise monitoring program was conducted with reference to Development Consent N97/00147 (Donaldson Coal Mine), Project Approval 05_0136 (Abel Coal Mine), the NMP and AS 1055-2018 *Acoustics - Description and Measurement of Environmental Noise*.

All acoustic instrumentation employed throughout the monitoring program has been designed to comply with the requirements of AS IEC 61672.1 – 2019 *Electroacoustics—Sound level meters*, AS IEC 60942 2017 *Electroacoustics – Sound calibrators* and carried current NATA or manufacturer calibration certificates. Certificates for acoustic instrumentation used during the June 2023 half is provided in **Appendix B**.

Instrument calibration was conducted before and after each measurement, with the variation in calibrated levels not exceeding ± 0.5 dBA.

3.2 Monitoring Locations

Baseline and preceding operational half-yearly surveys have been conducted at 11 locations surrounding the Donaldson Mine and Abel Coal Mine sites. With the experience of these previous surveys, it was decided to concentrate noise monitoring at six focus locations that represent the potentially most noise affected areas from Donaldson Mine and Abel Coal Mine. The details of the monitoring locations are contained within **Table 1**.

It is relevant to note that Donaldson Open Cut Mine has ceased production and all major earthworks on the site have been finalised. Furthermore, Abel mine was placed in Care & Maintenance on 28th April 2016 and there were no operations onsite during the June 2023 noise monitoring period.

Table 1 Monitoring Locations

Noise Monitoring Location	Description
D	Black Hill School, Black Hill
F	Lot 684 Black Hill Road, Black Hill
G	156 Buchannan Road, Buchannan
I	Magnetic Drive, Ashtonfield
J	Parish Drive, Thornton
L	65 Tipperary Dr, Ashtonfield

A map giving the approximate location of the noise monitoring sites is contained within **Appendix C**.



3.3 Unattended Noise Monitoring

An environmental noise logger was deployed for a minimum of a seven day period between Wednesday 21 June 2023 to 11 July 2023 at each of the six (6) nominated locations given in **Table 1**.

All unattended monitoring equipment was programmed to continuously record statistical noise level indices in 15 minute intervals including the L_{Amax} , LA_1 , LA_{10} , LA_{90} , LA_{99} , L_{Amin} and LA_{eq} . The statistical noise exceedance levels (L_{AN}) are the levels exceeded for N% of the 15 minute interval. The LA_{90} represents the level exceeded for 90% of the interval period and is referred to as the average minimum or background noise level. The LA_{10} is the level exceeded for 10% of the time and is usually referred to as the average maximum noise level. The LA_{eq} is the equivalent continuous sound pressure level and represents the steady sound level which is equal in energy to the fluctuating level over the interval period. The L_{Amax} is the maximum noise level recorded over the interval.

3.4 Operator Attended Noise Monitoring

Operator attended surveys were conducted at each of the six monitoring locations during the daytime, evening and night-time periods, to verify the unattended logging results and to determine the character and contribution of ambient noise sources.

4.0 Operator Attended Noise Monitoring

4.1 Results of Operator Attended Noise Monitoring

Operator attended noise measurements were conducted commencing during the evening period on 29 June 2023 and finished during the daytime period on 30 June 2023. Operator attended noise surveys were conducted using a Brüel & Kjær Type 2270 and 2250L (serial numbers 2679354 and 3003389) sound level meters.

Ambient noise levels given in the tables include all noise sources such as traffic, insects, birds, and mine operations as well as any other industrial operations.

The tables provide the following information:

- Monitoring location.
- Date and start time.
- Wind velocity (m/s) and Temperature (°C) at the measurement location.
- Typical maximum (L_{Amax}) and contributed noise levels.

Mine contributions listed in the tables are from the Abel Coal Mine and are stated only when a contribution could be quantified.



Table 2 Location D, Black Hill Public School, Black Hill

Period	Date/ Start time/Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission, Typical Maximum Noise Levels (L _{Amax} – dBA)
		L _{Amax}	LA1	LA10	LA90	L _{Aeq}	
Day	30/6/2023 08:21 10°C 5.1 m/s WNW	73	67	56	48	55	Birdsong 52-62 Wind in trees 42-51 Road traffic -56-73 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					
Evening	29/6/2023 18:10 11°C 4.0 m/s NW	76	57	46	52	50	Birdsong/frogs 35-41 Road traffic 38-76 Dogs barking 39-43 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					
Night	30/6/2023 03:50 7°C 4.8 m/s W	66	54	51	46	49	Road traffic 39-45 wind in trees 45-66 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					

Table 3 Location F, Lot 684 Black Hill Road, Black Hill

Period	Date/ Start time/Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission, Typical Maximum Noise Levels (L _{Amax} – dBA)
		L _{Amax}	LA1	LA10	LA90	L _{Aeq}	
Day	30/6/2023 08:51 10°C 5.1 m/s WNW	78	70	61	53	59	Wind in trees 50-55 Road traffic 57-78 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					
Evening	29/6/2023 18:32 11°C 4.0 m/s NW	79	66	58	52	58	Birdsong/frogs 50-53 Road traffic 48-79 Dogs barking 39-43 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					
Night	30/6/2023 04:13 7°C 4.8 m/s WNW	76	64	57	50	55	Insects 35 Wind in trees 45-54 Road traffic 45-76 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					

Table 4 Location G, Buchanan Road, Buchanan

Period	Date/ Start time/Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission, Typical Maximum Noise Levels (L _{Amax} – dBA)
		L _{Amax}	LA1	LA10	LA90	L _{Aeq}	
Day	30/6/2023 10:34 13°C 5.2 m/s NW	59	57	54	47	51	Wind in trees 47-59 Road traffic 42-53 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					
Evening	29/6/2023 19:39	54	52	50	41	47	Road traffic 40-54 Frogs 30-34 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					



Period	Date/ Start time/Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission, Typical Maximum Noise Levels (L _{Amax} – dBA)
		L _{Amax}	LA1	LA10	LA90	L _{Aeq}	
	10°C 4.2 m/s WNW						
Night	30/6/2023 05:54 7°C 4.6 m/s WNW	53	51	49	41	46	Wind in trees 40-52 Road traffic 44-53 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					

Table 5 Location I, Magnetic Drive, Ashtonfield

Period	Date/ Start time/Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission, Typical Maximum Noise Levels (L _{Amax} – dBA)
		L _{Amax}	LA1	LA10	LA90	L _{Aeq}	
Day	30/6/2023 11:28 14°C 4.2 m/s W	72	64	56	45	53	Birdsong 52 Wind in trees 40-52 Road traffic 61-68 Aeroplane 62-72 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					
Evening	29/6/2023 20:34 9°C 4.2 m/s WNW	59	52	46	40	44	Road traffic 32-36 Wind 40-53 Frogs 38-40 Other industry <30 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					
Night	30/6/2023 06:18 7°C 4.3 m/s WNW	66	55	51	43	48	Birdsong 52 Pedestrian 66 Road traffic 63 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					

Table 6 Location J, Parish Drive, Thornton

Period	Date/ Start time/Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission, Typical Maximum Noise Levels (L _{Amax} – dBA)
		L _{Amax}	LA1	LA10	LA90	L _{Aeq}	
Day	30/6/2023 07:02 9°C 4.5 m/s WNW	69	57	53	48	51	Birdsong 50-64 Wind in trees 49-57 Road traffic 48-69 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					
Evening	29/6/2023 20:59 9°C 4.2 m/s WNW	54	52	48	43	46	Road traffic 41-53 Wind 40-54 Other industry <30 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					
Night		69	57	53	48	51	



Period	Date/ Start time/Weather	Primary Noise Descriptor (dBA re 20 μ Pa)					Description of Noise Emission, Typical Maximum Noise Levels (LAmax – dBA)
		LAmax	LA1	LA10	LA90	LAeq	
	30/9/2023 06:44 7°C 4.3 m/s WNW	Estimated Abel Mine Noise Contribution Inaudible					Birdsong 50-64 Wind in trees 49-57 Road traffic 48-69 Abel Mine Inaudible

Table 7 Location L, 65 Tipperary Drive, Ashtonfield

Period	Date/ Start time/Weather	Primary Noise Descriptor (dBA re 20 μ Pa)					Description of Noise Emission, Typical Maximum Noise Levels (LAmax – dBA)
		LAmax	LA1	LA10	LA90	LAeq	
Day	30/6/2023 11:05 14°C 4.2 m/s W	72	64	52	42	52	Birdsong 45-53 Wind in trees 41-51 Car idling 43 Road traffic 48-72 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					
Evening	29/6/2023 20:10 9°C 4.2 m/s WNW	69	60	42	35	46	Road traffic 32-69 Wind 38-47 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					
Night	30/6/2023 05:54 7°C 4.6 m/s WNW	73	59	42	37	49	Urban hum 34-38 Road traffic 65-73 Wind in trees 40-52 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					

4.2 Operator Attended Noise Monitoring Summary

4.2.1 Donaldson Mine

Donaldson Open Cut Mine has ceased production and all major earthworks on the site have been finalised. There were no operations onsite during the June 2023 noise monitoring period.

4.2.2 Abel Coal Mine

Abel mine was placed in Care & Maintenance on 28th April 2016 and there were no operations onsite, excluding that from the Bloomfield CHPP which operates under the Abel Coal Mine project consent conditions.

The Bloomfield CHPP and Abel noise emissions were inaudible during all operator attended noise surveys. Noise generated by local and distant traffic was a significant contributor to ambient noise levels at all monitored locations as well as neighbourhood noise and ‘natural’ noises such as birds, insects and wind related noise.



4.3 Compliance Assessment and Discussion of Results

4.3.1 Operations

Results of the operational compliance assessment are given in **Table 8**.

Table 8 Compliance Noise Assessment - Operations

Location	Estimated Abel LAeq(15minute)– Contribution dBA			Consent Conditions LAeq(15minute) dBA			Compliance		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
D – Black Hill School, Black Hill	Inaudible	Inaudible	Inaudible	35	35	35	Yes	Yes	Yes
F – Black Hill Road, Black Hill	Inaudible	Inaudible	Inaudible	35	35	35	Yes	Yes	Yes
G – Buchanan Road, Buchanan	Inaudible	Inaudible	Inaudible	35	35	35	Yes	Yes	Yes
I – Magnetic Drive, Ashtonfield	Inaudible	Inaudible	Inaudible	36	36	36	Yes	Yes	Yes
J – Parish Drive, Thornton	Inaudible	Inaudible	Inaudible	35	35	35	Yes	Yes	Yes
L – 65 Tipperary Dr, Ashtonfield	Inaudible	Inaudible	Inaudible	40	40	40	Yes	Yes	Yes

Results presented in **Table 8** indicate that compliance with the relevant consent conditions was achieved at all noise monitoring locations during all periods.

4.3.2 Sleep Disturbance

Results of the sleep disturbance compliance assessment are given in **Table 9**.

Table 9 Compliance Noise Assessment – Sleep Disturbance

Location	Estimated Abel LA1(1minute) Contribution dBA	Consent Conditions LA1(1minute) dBA	Compliance
D – Black Hill School, Black Hill	Inaudible	45	Yes
F – Black Hill Road, Black Hill	Inaudible	45	Yes
G – Buchanan Road, Buchanan	Inaudible	45	Yes
I – Magnetic Drive, Ashtonfield	Inaudible	45	Yes
J – Parish Drive, Thornton	Inaudible	45	Yes



Location	Estimated Abel LA1(1minute) Contribution dBA	Consent Conditions LA1(1minute) dBA	Compliance
L – 65 Tipperary Dr, Ashtonfield	Inaudible	47	Yes

Results presented in **Table 9** indicate that compliance with the sleep disturbance consent conditions was achieved at all noise monitoring locations during the night-time noise surveys.

5.0 Unattended Continuous Noise Monitoring

5.1 Results of Unattended Continuous Noise Monitoring

Unattended continuous noise monitoring was conducted between Wednesday 21 June 2023 to 11 July 2023 at each of the six monitoring locations given in **Table 10**.

Table 10 Noise Logger and Noise Monitoring Locations

Location	Noise Logger Serial Number	Date of Logging
D – Black Hill School, Black Hill	SVAN 977 98070	3/7/2023 to 11/7/2023
F – Black Hill Road, Black Hill	SVAN 977 98465	21/6/2023 to 30/6/2023
G – Buchanan Road, Buchanan	ARL EL-316 16-203-526	21/6/2023 to 30/6/2023
I – Magnetic Drive, Ashtonfield	SVAN 977 98465	3/7/2023 to 11/7/2023
J – Parish Drive, Thornton	SVAN 957 20644	30/6/2023 to 9/7/2023
L – 65 Tipperary Dr, Ashtonfield	SVAN 977 98466	3/7/2023 to 11/7/2023

The unattended ambient noise logger data from each monitoring location are presented graphically on a daily basis and are attached as **Appendix C**. A summary of the results of the unattended continuous noise monitoring is given in **Table 11**.

The ambient noise level data quantifies the overall noise level at a given location independent of its source or character.

The measured ambient noise levels were divided into three periods representing day, evening and night as designated in the NSW Noise Policy for Industry (NPfI).

Precautions were taken to minimise influences from extraneous noise sources (eg optimum placement of the loggers away from creeks, trees, houses, etc), however, not all these sources or their effects can be eliminated. This is particularly the case during the warmer times of year when noise from insects, frogs, birds and other animals can become quite prevalent.

Weather data for the subject area during the noise monitoring period was provided by Bloomfield Colliery. Noise data during periods of any rainfall and/or wind speeds in excess of 5 m/s were discarded in accordance with NPfI weather affected data exclusion methodology.



Table 11 Unattended Continuous Noise Monitoring Ambient Noise Levels (dBA)

Location	Period	LA1	LA10	LA90	LAeq
D – Black Hill School, Black Hill	Day	69	57	39	56
	Evening	60	45	37	49
	Night	50	46	38	48
F – Black Hill Road, Black Hill	Day	57	51	41	51
	Evening	53	49	39	47
	Night	50	45	33	45
G – Buchanan Road, Buchanan	Day	53	51	41	49
	Evening	51	48	36	45
	Night	50	45	28	43
I – Magnetic Drive, Ashtonfield	Day	65	55	40	55
	Evening	57	45	37	51
	Night	50	44	34	46
J – Parish Drive, Thornton	Day	54	50	44	52
	Evening	48	46	40	46
	Night	49	45	35	46
L – 65 Tipperary Dr, Ashtonfield	Day	61	50	34	58
	Evening	57	40	29	46
	Night	47	36	27	43

5.2 Long term Unattended Continuous Monitoring Summary for Donaldson Mine and Abel Coal Mine

5.2.1 Ambient LA90 Noise Levels

The long term ambient LA90 noise levels collected from each monitoring location are presented graphically in **Figure 1**, **Figure 2** and **Figure 3** for the daytime, evening and night-time periods respectively.



Figure 1 Long Term Daytime LA90 Noise Levels

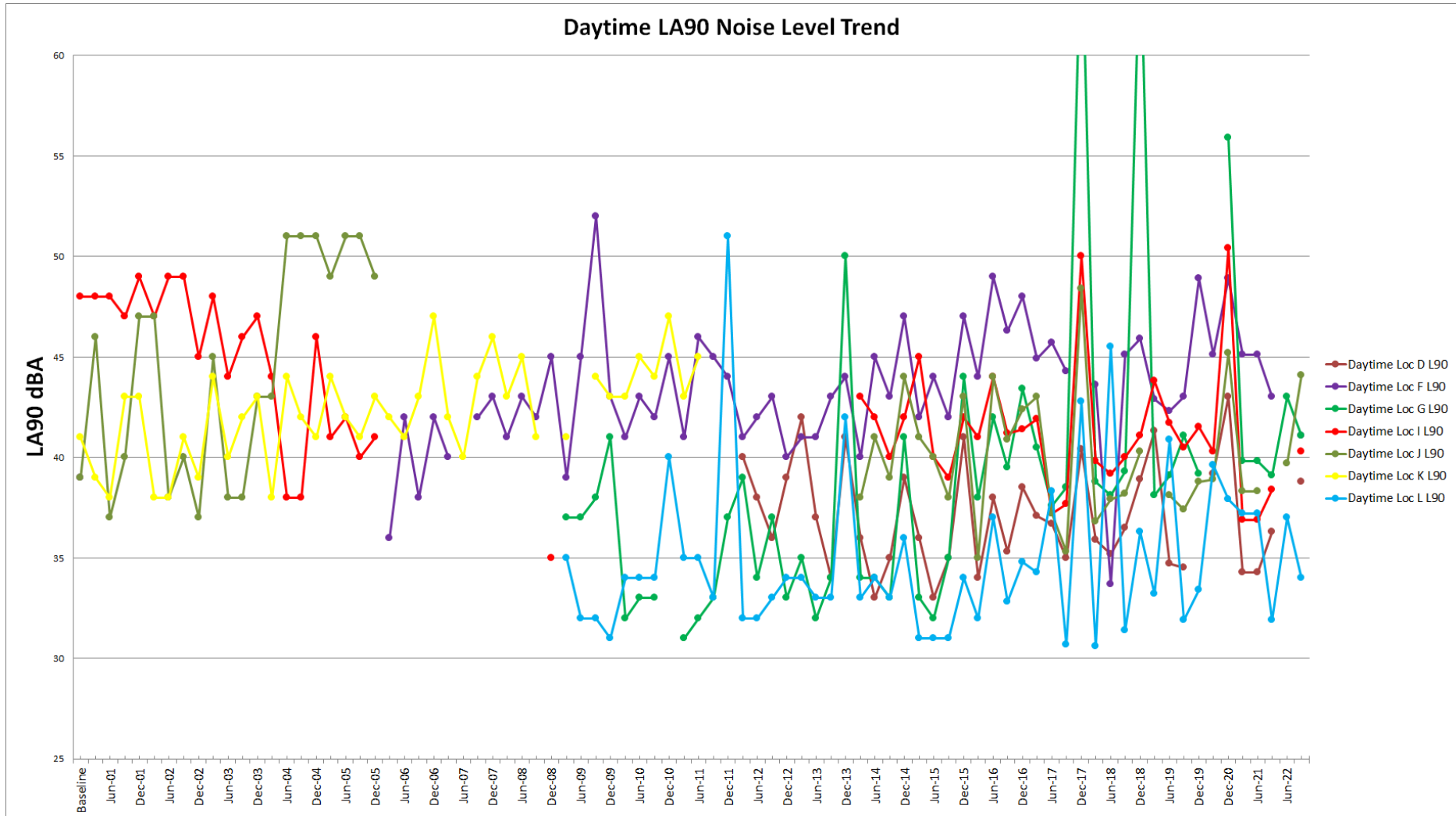


Figure 2 Long Term Evening LA90 Noise Levels

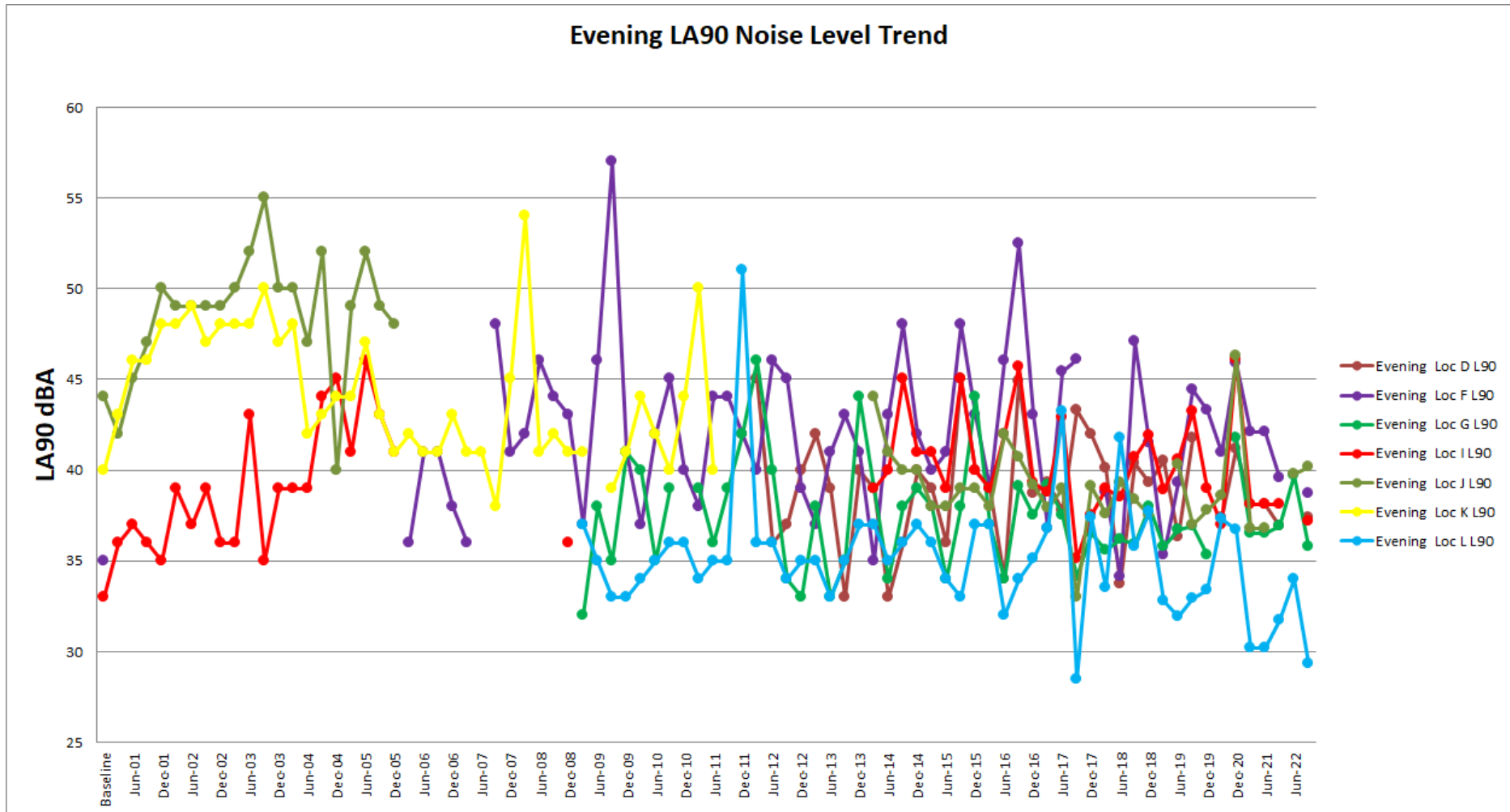
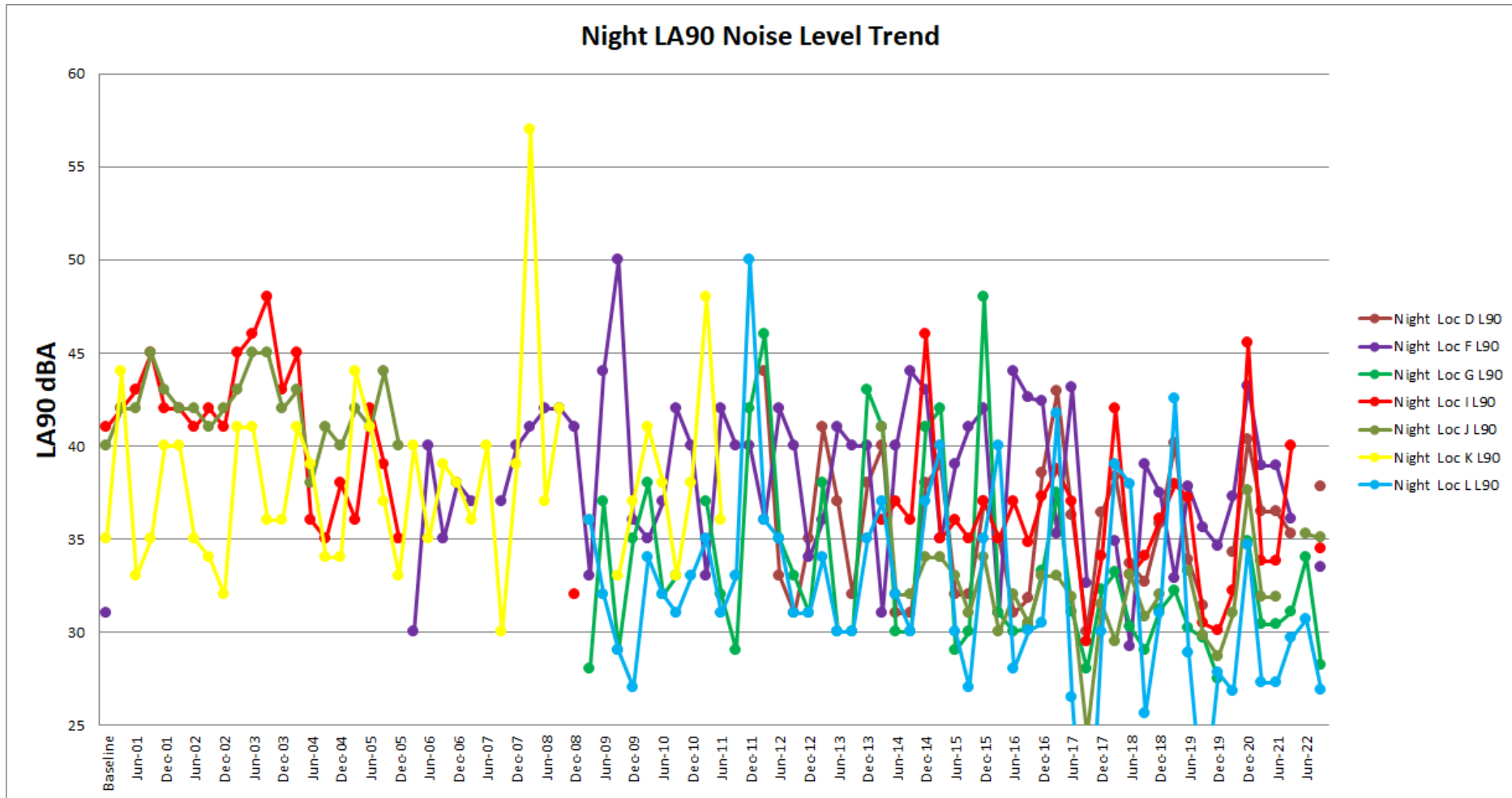


Figure 3 Long Term Night-time LA90 Noise Levels



5.2.1.1 Baseline

The summary of results in **Table 12** shows the ambient LA90 noise levels recorded for the current monitoring period compared to the levels recorded during the baseline monitoring process (ie. prior to commencement of mining operation at Donaldson).

Table 12 LA90 Results Comparison - Baseline

Monitoring Location	Period ¹	Long term Night-time LA90 Noise Levels		Difference dB ³
		Baseline	June/July 2023	
D – Black Hill School, Black Hill	Day	N/A ²	39	N/A ²
	Evening	N/A ²	37	N/A ²
	Night	N/A ²	38	N/A ²
F – Black Hill Road, Black Hill	Day	39	41	2
	Evening	35	39	4
	Night	31	34	3
G – Buchanan Road, Buchanan	Day	N/A ²	41	N/A ²
	Evening	N/A ²	36	N/A ²
	Night	N/A ²	28	N/A ²
I – Magnetic Drive, Ashtonfield	Day	48	40	-8
	Evening	33	37	4
	Night	41	35	-7
L – 65 Tipperary Dr, Ashtonfield	Day	N/A ²	34	N/A ²
	Evening	N/A ²	29	N/A ²
	Night	N/A ²	27	N/A ²
J – Parish Drive, Thornton	Day	39	44	5
	Evening	44	40	-4
	Night	40	35	-5
<p>Note 1: Periods are as detailed the NPfl and are Daytime - 7.00 am to 6.00 pm Monday to Saturday, 8.00 am to 6.00 pm Sunday; Evening - 6.00 pm 10.00 pm; Night - 10.00 pm to 7.00 am pm Monday to Saturday, 10.00 pm to 8.00 am Sunday.</p> <p>Note 2: No data was available during baseline measurements, no comparisons can be made.</p> <p>Note 3: Rounded to the nearest whole dB.</p>				

5.2.1.2 Previous Half-year

Table 13 presents the ambient LA90 noise levels recorded for the current monitoring period compared to those measured during the previous monitoring period.



Table 13 LA90 Results Comparison – Previous Half-year

Monitoring Location	Period ¹	Long term Night-time LA90 Noise Levels		Difference dB ²
		December 2022	June/July 2023	
D – Black Hill School, Black Hill	Day	40	39	-1
	Evening	40	37	-3
	Night	39	38	-1
F – Black Hill Road, Black Hill	Day	43	41	-2
	Evening	45	39	-5
	Night	32	34	-2
G – Buchanan Road, Buchanan	Day	59	41	-18
	Evening	43	36	-7
	Night	34	28	-6
I – Magnetic Drive, Ashtonfield	Day	45	40	-5
	Evening	41	37	-4
	Night	41	35	-6
L – 65 Tipperary Dr, Ashtonfield	Day	34	34	0
	Evening	34	29	-5
	Night	27	27	0
J – Parish Drive, Thornton	Day	45	44	-1
	Evening	43	40	-3
	Night	35	35	0
Note 1: Periods are as detailed the NPfl and are Daytime - 7.00 am to 6.00 pm Monday to Saturday, 8.00 am to 6.00 pm Sunday; Evening - 6.00 pm 10.00 pm; Night - 10.00 pm to 7.00 am pm Monday to Saturday, 10.00 pm to 8.00 am Sunday. Note 2: Rounded to the nearest whole dB.				

5.2.1.3 Coinciding Period last Year

Table 14 presents the ambient LA90 noise levels recorded for the current monitoring period compared to those measured during the coinciding monitoring period last year.

Table 14 LA90 Results Comparison – Coinciding Period Last Year

Monitoring Location	Period ¹	Long term Night-time LA90 Noise Levels		Difference dB ³
		June 2022	June/July 2023	
D – Black Hill School, Black Hill	Day	-2	39	-2
	Evening	-2	37	-2
	Night	-2	38	-2
	Day	-2	41	-2



Monitoring Location	Period ¹	Long term Night-time LA90 Noise Levels		Difference dB ³
		June 2022	June/July 2023	
F – Black Hill Road, Black Hill	Evening	-2	39	-2
	Night	-2	34	-2
G – Buchanan Road, Buchanan	Day	43	41	-3
	Evening	40	36	-4
	Night	34	28	-6
I – Magnetic Drive, Ashtonfield	Day	-2	40	-2
	Evening	-2	37	-2
	Night	-2	35	-2
L – 65 Tipperary Dr, Ashtonfield	Day	37	34	-3
	Evening	34	29	-5
	Night	31	27	-3
J – Parish Drive, Thornton	Day	40	44	4
	Evening	40	40	0
	Night	35	35	0
<p>Note 1: Periods are as detailed the NPfl and are Daytime - 7.00 am to 6.00 pm Monday to Saturday, 8.00 am to 6.00 pm Sunday; Evening - 6.00 pm 10.00 pm; Night - 10.00 pm to 7.00 am pm Monday to Saturday, 10.00 pm to 8.00 am Sunday.</p> <p>Note 2: No data was available during baseline measurements, no comparisons can be made.</p> <p>Note 3: Rounded to the nearest whole dB.</p>				

5.2.2 Ambient LA10 Noise Comparison

The long term ambient LA10 noise levels collected from each monitoring location are presented graphically in **Figure 4**, **Figure 5** and **Figure 6** for the daytime, evening and night-time respectively.



Figure 4 Long Term Daytime LA10 Noise Levels

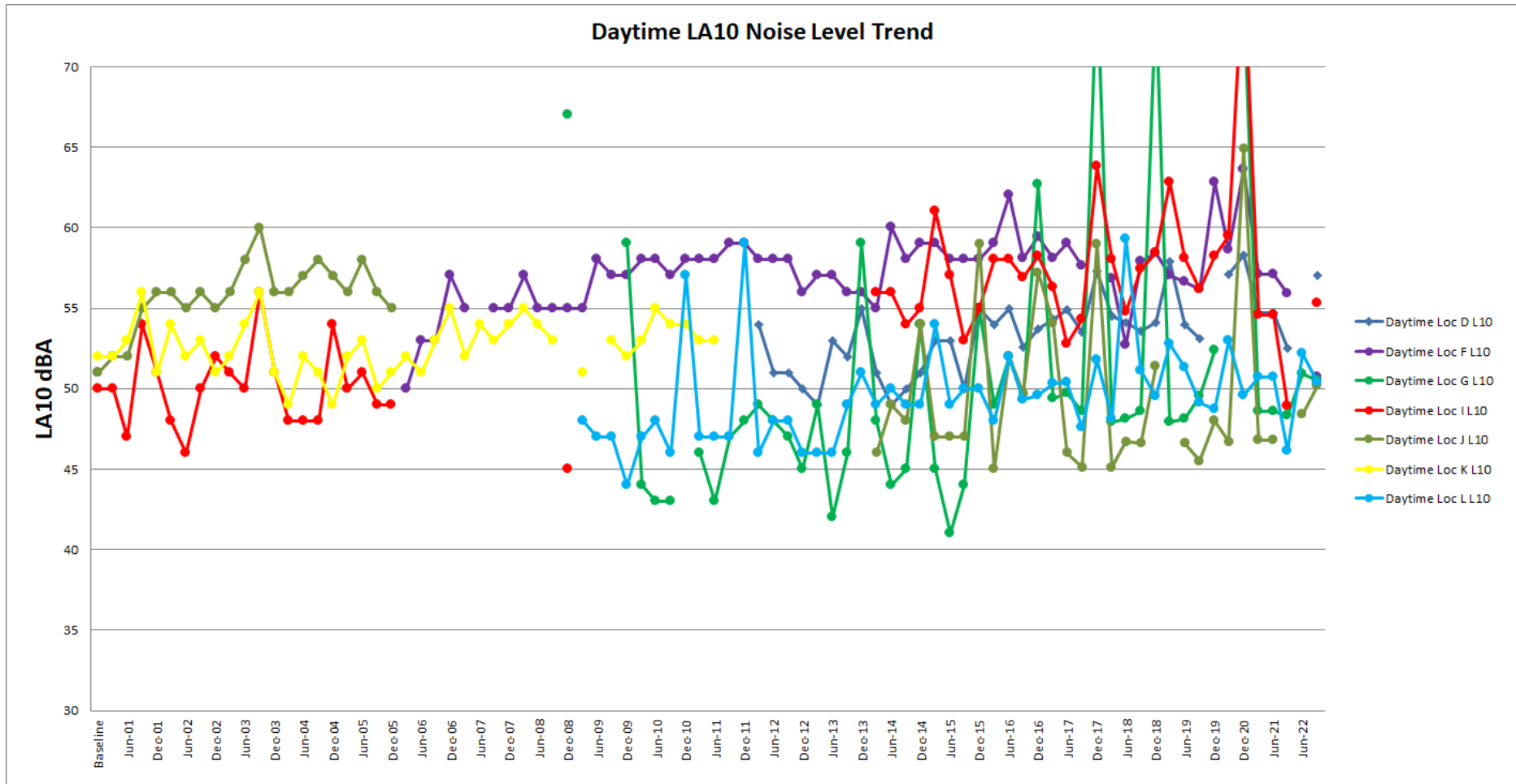


Figure 5 Long term Evening LA10 Noise Levels

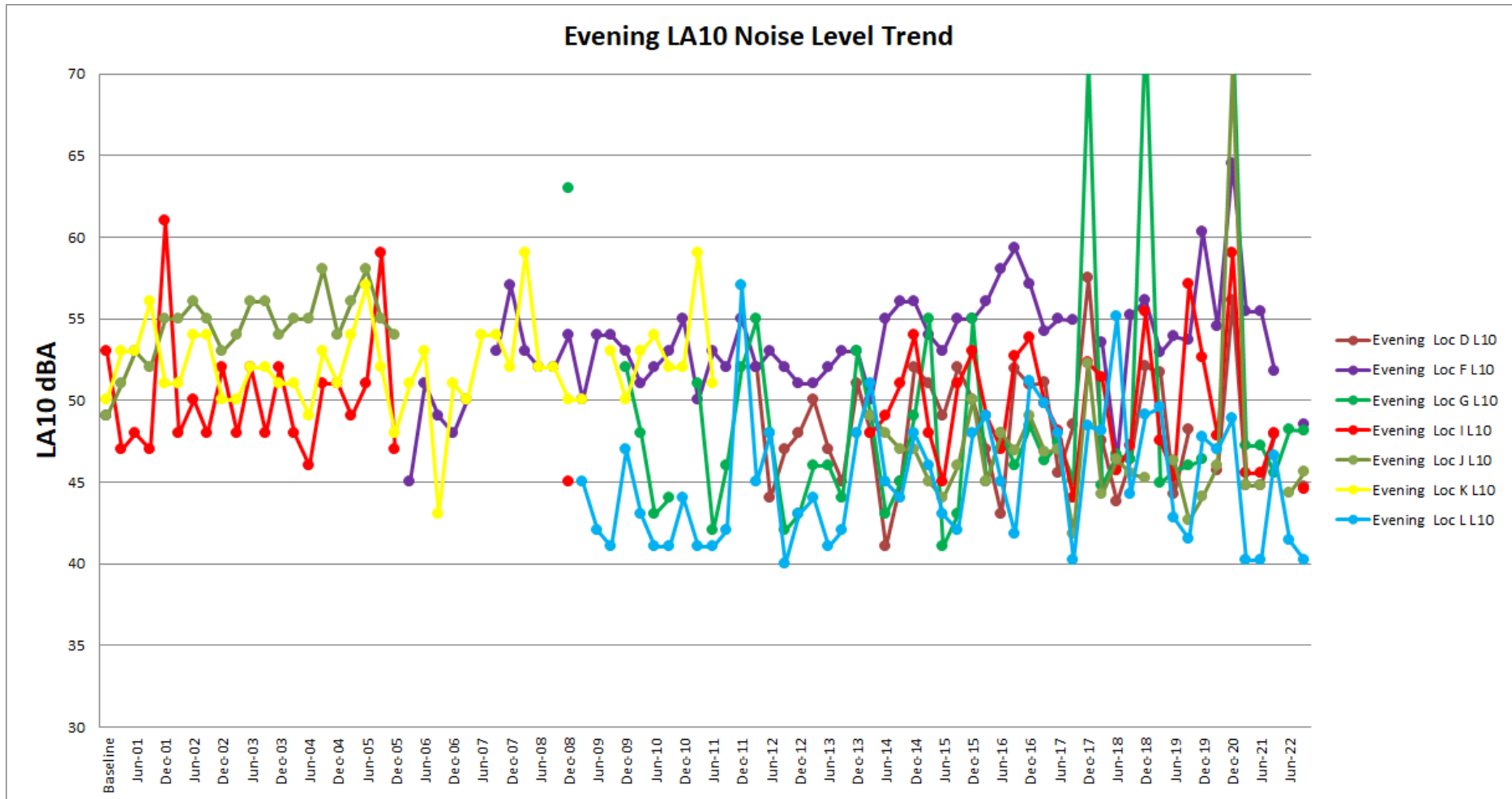
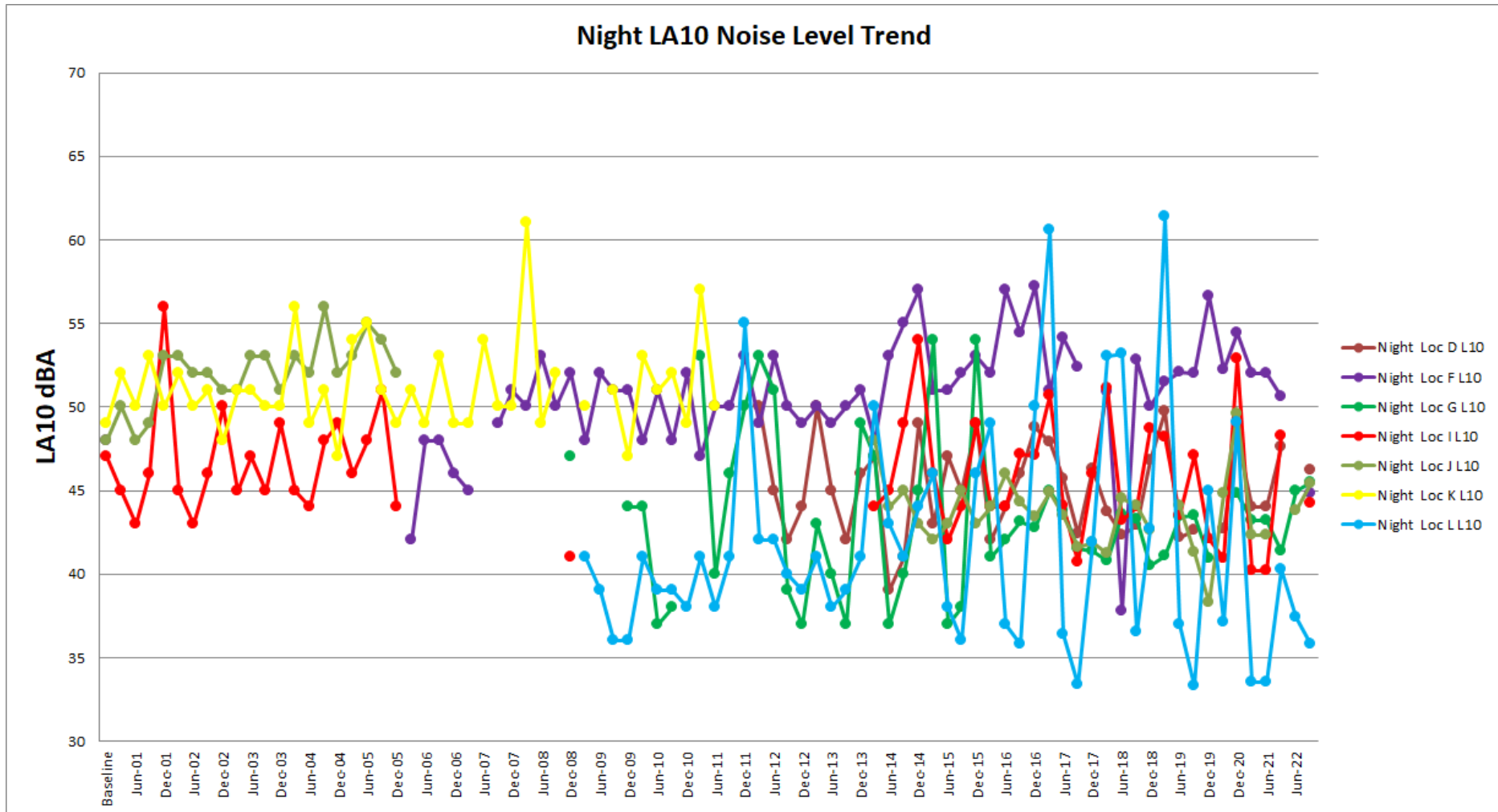


Figure 6 Long term Night LA10 Noise Levels



5.2.2.1 Baseline

Table 15 presents the ambient LA10 noise levels recorded for the current monitoring period compared to the levels recorded during the baseline monitoring period.

Table 15 LA10 Results Comparison – Baseline

Monitoring Location	Period ¹	Long term Night-time LA10 Noise Levels		Difference dB ³
		Baseline	June/July 2023	
D – Black Hill School, Black Hill	Day	N/A ²	57	N/A ²
	Evening	N/A ²	45	N/A ²
	Night	N/A ²	46	N/A ²
F – Black Hill Road, Black Hill	Day	51	51	0
	Evening	49	49	0
	Night	48	45	-3
G – Buchanan Road, Buchanan	Day	N/A ²	51	N/A ²
	Evening	N/A ²	48	N/A ²
	Night	N/A ²	46	N/A ²
I – Magnetic Drive, Ashtonfield	Day	50	55	5
	Evening	53	45	-8
	Night	47	44	-3
L – 65 Tipperary Dr, Ashtonfield	Day	N/A ²	50	N/A ²
	Evening	N/A ²	40	N/A ²
	Night	N/A ²	36	N/A ²
J – Parish Drive, Thornton	Day	51	50	-1
	Evening	49	46	-3
	Night	48	45	-3
<p>Note 1: Periods are as detailed the NPfl and are Daytime - 7.00 am to 6.00 pm Monday to Saturday, 8.00 am to 6.00 pm Sunday; Evening - 6.00 pm 10.00 pm; Night - 10.00 pm to 7.00 am pm Monday to Saturday, 10.00 pm to 8.00 am Sunday.</p> <p>Note 2: No data was available during baseline measurements, no comparisons can be made.</p> <p>Note 3: Rounded to the nearest whole dB.</p>				

5.2.2.2 Previous Half-year

Table 16 presents the ambient LA10 noise levels recorded for the current monitoring period compared to those measured during the previous monitoring period.



Table 16 LA10 Results Comparison – Previous Half-year

Monitoring Location	Period ¹	Long term Night-time LA10 Noise Levels		Difference dB ²
		December 2022	June/July 2023	
D – Black Hill School, Black Hill	Day	54	57	3
	Evening	53	45	-8
	Night	49	46	-3
F – Black Hill Road, Black Hill	Day	53	51	-2
	Evening	55	49	-6
	Night	47	45	-2
G – Buchanan Road, Buchanan	Day	73	51	-22
	Evening	61	48	-13
	Night	45	46	1
I – Magnetic Drive, Ashtonfield	Day	52	55	3
	Evening	52	45	-7
	Night	48	44	-4
L – 65 Tipperary Dr, Ashtonfield	Day	48	50	2
	Evening	49	40	9
	Night	37	36	-1
J – Parish Drive, Thornton	Day	55	50	-5
	Evening	50	46	-4
	Night	46	45	-1
Note 1: Periods are as detailed the NPfl and are Daytime - 7.00 am to 6.00 pm Monday to Saturday, 8.00 am to 6.00 pm Sunday; Evening - 6.00 pm 10.00 pm; Night - 10.00 pm to 7.00 am pm Monday to Saturday, 10.00 pm to 8.00 am Sunday. Note 2: Rounded to the nearest whole dB.				

5.2.2.3 Coinciding Period Last Year

Table 17 presents the ambient LA10 noise levels recorded for the current monitoring period compared to those measured during the coinciding monitoring period last year.

Table 17 LA10 Result Comparison – Coinciding Period Last Year

Monitoring Location	Period ¹	Long term Night-time LA10 Noise Levels		Difference dB ²
		June 2022	June/July 2023	
D – Black Hill School, Black Hill	Day	-2	57	-2
	Evening	-2	45	-2
	Night	-2	46	-2
	Day	-2	51	-2



Monitoring Location	Period ¹	Long term Night-time LA10 Noise Levels		Difference dB ²
		June 2022	June/July 2023	
F – Black Hill Road, Black Hill	Evening	-2	49	-2
	Night	-2	45	-2
G – Buchanan Road, Buchanan	Day	51	51	0
	Evening	48	48	0
	Night	45	46	1
I – Magnetic Drive, Ashtonfield	Day	-2	55	-2
	Evening	-2	45	-2
	Night	-2	44	-2
L – 65 Tipperary Dr, Ashtonfield	Day	52	50	-2
	Evening	41	40	-1
	Night	37	36	-1
J – Parish Drive, Thornton	Day	48	50	-2
	Evening	44	46	2
	Night	44	45	1
Note 1: Periods are as detailed the NPfl and are Daytime - 7.00 am to 6.00 pm Monday to Saturday, 8.00 am to 6.00 pm Sunday; Evening - 6.00 pm 10.00 pm; Night - 10.00 pm to 7.00 am pm Monday to Saturday, 10.00 pm to 8.00 am Sunday. Note 2: Rounded to the nearest whole dB.				

5.3 Rail Noise Monitoring

In order to determine compliance with the rail noise criteria, a noise logger was positioned at Location J. The train loading times during the noise monitoring period are presented in **Table 18**.

Table 18 Coal Train Loading Operations Log

Date	Coal Train Loading Time	Period
06/07/2023	10:55-15:18	Day
07/07/2023	07:00-11:36	Day
07/07/2023	14:00-18:18	Day and Evening

The measured $L_{Aeq(Period)}$ noise level for each period from rail traffic at Location J are presented in **Table 19**.

Table 19 Rail Noise Impact Monitoring Results

Location	Date	Period	Measured $L_{Aeq(Period)}$	Criteria $L_{Aeq(Period)}$	Compliance
J	06/07/2023	Day	38	55	Yes
	07/07/2023	Day	43	55	Yes
		Evening	40	45	Yes



Results presented in **Table 19** indicate that rail noise levels from the Bloomfield Rail Spur were in compliance with the Abel Mine Project Approval during the noise monitoring period.

6.0 Conclusion

SLR was engaged by Donaldson Coal Pty Ltd to conduct half-yearly noise monitoring surveys for Donaldson Coal Mine and Abel Coal Mine in accordance with the NMP, dated 3 June 2019.

Abel mine was placed in Care & Maintenance on 28th April 2016 and there were no operations onsite, excluding that from the Bloomfield CHPP which operates under the Abel Coal Mine project consent conditions.

Operator-attended and unattended noise measurements were conducted for the June 2023 half at six focus locations surrounding the mine.

Results of the attended noise monitoring have indicated that compliance with the Abel Mine *Project Approval* was achieved at all locations.

A comparison of ambient LA10 and LA90 noise levels recorded during the current monitoring period (June 2023), the baseline monitoring period, the last monitoring period (December 2022), and the coinciding monitoring period from last year (June 2022) has been conducted.

Rail noise levels from the Bloomfield Rail Spur were considered to be in compliance with the Abel Mine Project Approval during the noise monitoring period.



Appendix A Acoustic Terminology

Donaldson and Abel Coal Mines

Bi-Annual Noise Monitoring – Half-year Ending June 2023

Donaldson Coal Pty Ltd

SLR Project No.: 630.01053.20000

6 November 2023

1 Sound Level or Noise Level

The terms 'sound' and 'noise' are almost interchangeable, except that 'noise' often refers to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure. The human ear responds to changes in sound pressure over a very wide range with the loudest sound pressure to which the human ear can respond being ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or LP are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2×10^{-5} Pa.

2 'A' Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an 'A-weighting' filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4,000 Hz), and less sensitive at lower and higher frequencies. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect, whilst a 3 dB to 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels.

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as 'linear', and the units are expressed as dB(lin) or dB.

3 Sound Power Level

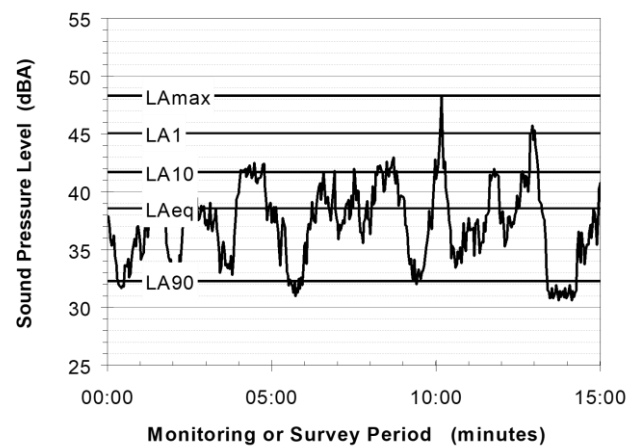
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure is similar to the effect of an electric radiator, which is characterised by a power rating but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4 Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

LA1 The noise level exceeded for 1% of the 15 minute interval.

LA10 The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

LAeq The A-weighted equivalent noise level (basically, the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

5 Frequency Analysis

Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

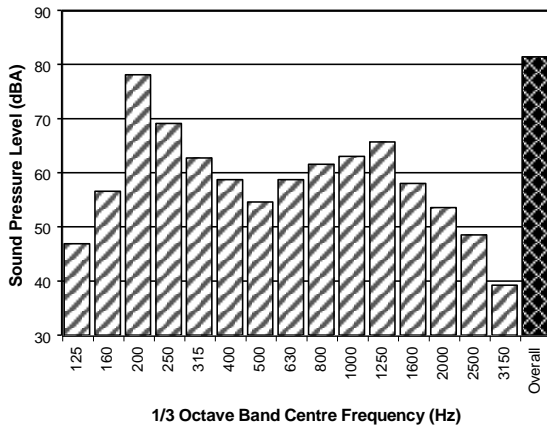
The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (three bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)



The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



6 Annoying Noise (Special Audible Characteristics)

A louder noise will generally be more annoying to nearby receivers than a quieter one. However, noise is often also found to be more annoying and result in larger impacts where the following characteristics are apparent:

- **Tonality** - tonal noise contains one or more prominent tones (ie differences in distinct frequency components between adjoining octave or 1/3 octave bands), and is normally regarded as more annoying than 'broad band' noise.
- **Impulsiveness** - an impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.
- **Intermittency** - intermittent noise varies in level with the change in level being clearly audible. An example would include mechanical plant cycling on and off.
- **Low Frequency Noise** - low frequency noise contains significant energy in the lower frequency bands, which are typically taken to be in the 10 to 160 Hz region.



Appendix B Noise Monitoring Locations

Donaldson and Abel Coal Mines

Bi-Annual Noise Monitoring – Half-year Ending June 2023

Donaldson Coal Pty Ltd

SLR Project No.: 630.01053.20000

6 November 2023

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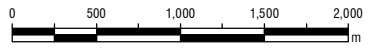


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Date:	11/01/2018
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Projection:	GDA 1994 MGA Zone 56

LEGEND

Noise Monitoring Locations



Donaldson Coal

Noise Monitoring Locations

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 SLR Consulting Australia Pty Ltd does not guarantee the accuracy of such information.

Appendix C Calibration Certificates

Donaldson and Abel Coal Mines

Bi-Annual Noise Monitoring – Half-year Ending June 2023

Donaldson Coal Pty Ltd

SLR Project No.: 630.01053.20000

6 November 2023

CERTIFICATE OF CALIBRATION

CERTIFICATE No: **SLM35321**

EQUIPMENT TESTED: Sound & Vibration Analyser

Manufacturer: Svantek
Type No: SVAN-977D **Serial No:** 98466
Mic. Type: MK255 **Serial No:** 23855
Pre-Amp. Type: SV12L **Serial No:** 123807
Filter Type: 1/3 Octave **Test No:** F035328
Owner: SLR Consulting Australia Pty Ltd
120 High Street
North Sydney, NSW 2060

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	994 hPa ± 1 hPa	Date of Receipt :	01/03/2023
Temperature	23 °C $\pm 1^\circ$ C	Date of Calibration :	01/03/2023
Relative Humidity	50 % $\pm 5\%$	Date of Issue :	03/03/2023

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

CHECKED BY:  **AUTHORISED SIGNATURE:** 

Jack Kielt

Accredited for compliance with ISO/IEC 17025 - Calibration

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

The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	<i>Clause</i>	<i>Result</i>
<i>Absolute Calibration</i>	10	Pass
<i>Acoustical Frequency Weighting</i>	12	Pass
<i>Self-Generated Noise</i>	11.1	Observed
<i>Electrical Noise</i>	11.2	Observed
<i>Long Term Stability</i>	15	Pass
<i>Electrical Frequency Weightings</i>	13	Pass
<i>Frequency and Time Weightings</i>	14	Pass
<i>Reference Level Linearity</i>	16	Pass
<i>Range Level Linearity</i>	17	Pass
<i>Toneburst</i>	18	Pass
<i>Peak C Sound Level</i>	19	Pass
<i>Overload Indicator</i>	20	Pass
<i>High Level Stability</i>	21	Pass

Statement of Compliance: The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:-2013, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of IEC 61672-1:-2013 because evidence was not publically available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:-2013 and because the periodic tests of IEC 61672-3:-2013 cover only a limited subset of the specifications in IEC 61672-1:-2013.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 61260-3:2016 and were conducted to test the following performance characteristics:

Tests performed	<i>Clause</i>	<i>Result</i>
<i>Test of relative attenuation at filter midband frequency</i>	10	Pass
<i>Linear operating range including range control if fitted</i>	11	Pass
<i>Test of lower limit of linear operating range</i>	12	Pass
<i>Measurement of relative attenuation (filter shape)</i>	13	Pass

The filter submitted for testing successfully completed the tests listed above for the environmental conditions under which the tests were performed. If the filter type has successfully completed the pattern-evaluation tests of IEC 61260-2 then it can be stated that the filter set continues to conform to the specifications of IEC 61260-1.

A full technical report is available on request.

CERTIFICATE OF CALIBRATION

CERTIFICATE No: **SLM35329**

EQUIPMENT TESTED: Sound & Vibration Analyser

Manufacturer: Svantek
Type No: SVAN-977D **Serial No:** 98465
Mic. Type: MK255 **Serial No:** 23871
Pre-Amp. Type: SV12L **Serial No:** 126906
Filter Type: 1/3 Octave **Test No:** F035331
Owner: SLR Consulting Australia Pty Ltd
120 High Street
North Sydney, NSW 2060

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	993 hPa ± 1 hPa	Date of Receipt :	01/03/2023
Temperature	23 $^{\circ}\text{C} \pm 1^{\circ}\text{C}$	Date of Calibration :	01/03/2023
Relative Humidity	48 % $\pm 5\%$	Date of Issue :	03/03/2023

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

CHECKED BY:  **AUTHORISED SIGNATURE:** 

Jack Kielt

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The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	Clause	Result
<i>Absolute Calibration</i>	10	Pass
<i>Acoustical Frequency Weighting</i>	12	Pass
<i>Self-Generated Noise</i>	11.1	Observed
<i>Electrical Noise</i>	11.2	Observed
<i>Long Term Stability</i>	15	Pass
<i>Electrical Frequency Weightings</i>	13	Pass
<i>Frequency and Time Weightings</i>	14	Pass
<i>Reference Level Linearity</i>	16	Pass
<i>Range Level Linearity</i>	17	Pass
<i>Toneburst</i>	18	Pass
<i>Peak C Sound Level</i>	19	Pass
<i>Overload Indicator</i>	20	Pass
<i>High Level Stability</i>	21	Pass

Statement of Compliance: The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:-2013, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of IEC 61672-1:-2013 because evidence was not publically available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:-2013 and because the periodic tests of IEC 61672-3:-2013 cover only a limited subset of the specifications in IEC 61672-1:-2013.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 61260-3:2016 and were conducted to test the following performance characteristics:

Tests performed	Clause	Result
<i>Test of relative attenuation at filter midband frequency</i>	10	Pass
<i>Linear operating range including range control if fitted</i>	11	Pass
<i>Test of lower limit of linear operating range</i>	12	Pass
<i>Measurement of relative attenuation (filter shape)</i>	13	Pass

The filter submitted for testing successfully completed the tests listed above for the environmental conditions under which the tests were performed. If the filter type has successfully completed the pattern-evaluation tests of IEC 61260-2 then it can be stated that the filter set continues to conform to the specifications of IEC 61260-1.

A full technical report is available on request.

CERTIFICATE OF CALIBRATION

CERTIFICATE No: **SLM32604**

EQUIPMENT TESTED: Sound Level Meter

Manufacturer: Svantek
Type No: SVAN-977C **Serial No:** 98070
Mic. Type: MK255 **Serial No:** 21096
Pre-Amp. Type: SV12L **Serial No:** 118240
Filter Type: 1/3 Octave **Test No:** F032610

Owner: SLR Consulting Australia Pty Ltd
120 High Street
North Sydney, NSW 2060

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	1003 hPa ± 1 hPa	Date of Receipt :	17/05/2022
Temperature	24 °C $\pm 1^\circ$ C	Date of Calibration :	17/05/2022
Relative Humidity	51 % $\pm 5\%$	Date of Issue :	18/05/2022

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

CHECKED BY: *RB* **AUTHORISED SIGNATURE:** *Bruce McDrum*

Bruce McDrum

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The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	<i>Clause</i>	<i>Result</i>
<i>Absolute Calibration</i>	10	Pass
<i>Acoustical Frequency Weighting</i>	12	Pass
<i>Self-Generated Noise</i>	11.1	Observed
<i>Electrical Noise</i>	11.2	Observed
<i>Long Term Stability</i>	15	Pass
<i>Electrical Frequency Weightings</i>	13	Pass
<i>Frequency and Time Weightings</i>	14	Pass
<i>Reference Level Linearity</i>	16	Pass
<i>Range Level Linearity</i>	17	Pass
<i>Toneburst</i>	18	Pass
<i>Peak C Sound Level</i>	19	Pass
<i>Overload Indicator</i>	20	Pass
<i>High Level Stability</i>	21	Pass

Statement of Compliance: The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:-2013, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of IEC 61672-1:-2013 because evidence was not publically available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:-2013 and because the periodic tests of IEC 61672-3:-2013 cover only a limited subset of the specifications in IEC 61672-1:-2013.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 61260-3:2016 and were conducted to test the following performance characteristics:

Tests performed	<i>Clause</i>	<i>Result</i>
<i>Test of relative attenuation at filter midband frequency</i>	10	Pass
<i>Linear operating range including range control if fitted</i>	11	Pass
<i>Test of lower limit of linear operating range</i>	12	Pass
<i>Measurement of relative attenuation (filter shape)</i>	13	Pass

The filter submitted for testing successfully completed the tests listed above for the environmental conditions under which the tests were performed. If the filter type has successfully completed the pattern-evaluation tests of IEC 61260-2 then it can be stated that the filter set continues to conform to the specifications of IEC 61260-1.

A full technical report is available on request.

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: **SLM32291**

EQUIPMENT TESTED: Sound & Vibration Analyser

Manufacturer: Svantek
Type No: Svan-957
Mic. Type: 7052E
Pre-Amp. Type: SV12L
Serial No: 20664
Serial No: 46859
Serial No: 25327
Filter Type: 1/3 Octave
Test No: F032292

Owner: SLR Consulting Australia Pty Ltd
120 High Street
North Sydney, NSW 2060

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

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

CONDITIONS OF TEST:

Ambient Pressure	1002 hPa ± 1 hPa	Date of Receipt :	11/04/2022
Temperature	22 $^{\circ}\text{C} \pm 1^{\circ}\text{C}$	Date of Calibration :	12/04/2022
Relative Humidity	55 % $\pm 5\%$	Date of Issue :	26/04/2022

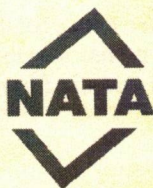
Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: **AUTHORISED SIGNATURE:**

Jack Kiett

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The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	<i>Clause</i>	<i>Result</i>
<i>Absolute Calibration</i>	10	Pass
<i>Acoustical Frequency Weighting</i>	12	Pass
<i>Self-Generated Noise</i>	11.1	Observed
<i>Electrical Noise</i>	11.2	Observed
<i>Long Term Stability</i>	15	Pass
<i>Electrical Frequency Weightings</i>	13	Pass
<i>Frequency and Time Weightings</i>	14	Pass
<i>Reference Level Linearity</i>	16	Pass
<i>Range Level Linearity</i>	17	Pass
<i>Toneburst</i>	18	Pass
<i>Peak C Sound Level</i>	19	Pass
<i>Overload Indicator</i>	20	Pass
<i>High Level Stability</i>	21	Pass

Statement of Compliance: The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:-2013, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of IEC 61672-1:-2013 because evidence was not publically available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:-2013 and because the periodic tests of IEC 61672-3:-2013 cover only a limited subset of the specifications in IEC 61672-1:-2013.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 61260-3:2016 and were conducted to test the following performance characteristics:

Tests performed	<i>Clause</i>	<i>Result</i>
<i>Test of relative attenuation at filter midband frequency</i>	10	Pass
<i>Linear operating range including range control if fitted</i>	11	Pass
<i>Test of lower limit of linear operating range</i>	12	Pass
<i>Measurement of relative attenuation (filter shape)</i>	13	Pass

The filter submitted for testing successfully completed the tests listed above for the environmental conditions under which the tests were performed. If the filter type has successfully completed the pattern-evaluation tests of IEC 61260-2 then it can be stated that the filter set continues to conform to the specifications of IEC 61260-1.

A full technical report is available on request.



Sound Level Meter AS 1259-1:1990 - AS 1259-2:1990 Calibration Certificate

Calibration Number C22130

Client Details SLR Consulting Australia Pty Ltd
Level 16, 175 Eagle Street
Brisbane QLD 4000

Equipment Tested/ Model Number : ARL EL-316
Instrument Serial Number : 16-203-526
Microphone Serial Number : 322264
Pre-amplifier Serial Number : 28144

Atmospheric Conditions

Ambient Temperature : 25.4°C
Relative Humidity : 61.4%
Barometric Pressure : 100.09kPa

Calibration Technician : Lucky Jaiswal **Secondary Check:** Rhys Gravelle
Calibration Date : 1 Mar 2022 **Report Issue Date :** 1 Mar 2022

Approved Signatory : Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
10.2.2: Absolute sensitivity	Pass	10.3.4: Inherent system noise level	Pass
10.2.3: Frequency weighting	Pass	10.4.2: Time weighting characteristic F and S	Pass
10.3.2: Overload indications	Pass	10.4.3: Time weighting characteristic I	Pass
10.3.3: Accuracy of level range control	Pass	10.4.5: R.M.S performance	Pass
8.9: Detector-indicator linearity	Pass	9.3.2: Time averaging	Pass
8.10: Differential level linearity	Pass	9.3.5: Overload indication	Pass

Uncertainties of Measurement -

Acoustic Tests 31.5 Hz to 8kHz ±0.14dB 12.5kHz ±0.19dB 16kHz ±0.29dB Electrical Tests 31.5 Hz to 20 kHz ±0.11dB	Environmental Conditions Temperature ±0.1°C Relative Humidity ±1.9% Barometric Pressure ±0.014kPa
--	--

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

The sound level meter under test has been shown to conform to the type 1 requirements for periodic testing as described in AS 1259.1:1990 and AS 1259.2:1990 for the tests stated above.



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

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

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

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

CERTIFICATE OF CALIBRATION

CERTIFICATE No: SLM30625

EQUIPMENT TESTED: Sound Level Meter

Manufacturer: B & K
Type No: 2270
Mic. Type: 4189
Pre-Amp. Type: ZC0032
Serial No: 2679354
Serial No: 2695417
Serial No: 12254
Filter Type: 1/3 Octave
Test No: FILT 6666


Owner: SLR Consulting Australia Pty Ltd
120 High Street
North Sydney, NSW 2060

Tests Performed: IEC 61672-3:2013,
IEC 1260:1995, & AS/NZS 4476:1997
Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	994 hPa ± 1 hPa	Date of Receipt :	17/09/2021
Temperature	24 °C $\pm 1^\circ$ C	Date of Calibration :	21/09/2021
Relative Humidity	27 % $\pm 5\%$	Date of Issue :	21/09/2021

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

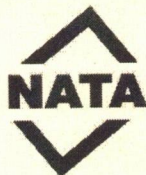
CHECKED BY: 

AUTHORISED SIGNATURE: 

Jack Kiett

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%.



**WORLD RECOGNISED
ACCREDITATION**

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

The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	<i>Clause</i>	<i>Result</i>
<i>Absolute Calibration</i>	10	Pass
<i>Acoustical Frequency Weighting</i>	12	Pass
<i>Self-Generated Noise</i>	11.1	Observed
<i>Electrical Noise</i>	11.2	Observed
<i>Long Term Stability</i>	15	Pass
<i>Electrical Frequency Weightings</i>	13	Pass
<i>Frequency and Time Weightings</i>	14	Pass
<i>Reference Level Linearity</i>	16	Pass
<i>Range Level Linearity</i>	17	Not Applicable
<i>Toneburst</i>	18	Pass
<i>Peak C Sound Level</i>	19	Pass
<i>Overload Indicator</i>	20	Pass
<i>High Level Stability</i>	21	Pass

Statement of Compliance: The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:-2013, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of IEC 61672-1:-2013 because evidence was not publically available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:-2013 and because the periodic tests of IEC 61672-3:-2013 cover only a limited subset of the specifications in IEC 61672-1:-2013.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 1260: 1995 and AS/NZS 4476 - 1997 and were conducted to test the following performance characteristics:

1. Relative attenuation clause 5.3

A full technical report is available on request.

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM33812

EQUIPMENT TESTED: Sound Level Meter

Manufacturer: B&K

Type No: 2250-L

Serial No: 3003389

Mic. Type: 4950

Serial No: 2913816

Pre-Amp. Type: ZC0032

Serial No: 20519

Filter Type: 1/3 Octave

Test No: F033825

Owner: SLR Consulting Australia Pty Ltd
120 High Street
North Sydney, NSW 2060

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 1001 hPa ± 1 hPa

Date of Receipt : 26/09/2022

Temperature 22 $^{\circ}\text{C} \pm 1^{\circ}\text{C}$

Date of Calibration : 26/09/2022

Relative Humidity 52 % $\pm 5\%$

Date of Issue : 28/09/2022

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

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%.



WORLD RECOGNISED
ACCREDITATION

Accredited Lab No. 9262
Acoustic and Vibration
Measurements

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

The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	<i>Clause</i>	<i>Result</i>
<i>Absolute Calibration</i>	10	Pass
<i>Acoustical Frequency Weighting</i>	12	Pass
<i>Self-Generated Noise</i>	11.1	Observed
<i>Electrical Noise</i>	11.2	Observed
<i>Long Term Stability</i>	15	Pass
<i>Electrical Frequency Weightings</i>	13	Pass
<i>Frequency and Time Weightings</i>	14	Pass
<i>Reference Level Linearity</i>	16	Pass
<i>Range Level Linearity</i>	17	Not Applicable
<i>Toneburst</i>	18	Pass
<i>Peak C Sound Level</i>	19	Pass
<i>Overload Indicator</i>	20	Pass
<i>High Level Stability</i>	21	Pass

Statement of Compliance: The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:-2013, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of IEC 61672-1:-2013 because evidence was not publically available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:-2013 and because the periodic tests of IEC 61672-3:-2013 cover only a limited subset of the specifications in IEC 61672-1:-2013.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 61260-3:2016 and were conducted to test the following performance characteristics:

Tests performed	<i>Clause</i>	<i>Result</i>
<i>Test of relative attenuation at filter midband frequency</i>	10	Pass
<i>Linear operating range including range control if fitted</i>	11	N/A
<i>Test of lower limit of linear operating range</i>	12	Pass
<i>Measurement of relative attenuation (filter shape)</i>	13	Pass

The filter submitted for testing successfully completed the tests listed above for the environmental conditions under which the tests were performed. If the filter type has successfully completed the pattern-evaluation tests of IEC 61260-2 then it can be stated that the filter set continues to conform to the specifications of IEC 61260-1.

A full technical report is available on request.

Appendix D Statistical Ambient Noise Levels

Donaldson and Abel Coal Mines

Bi-Annual Noise Monitoring – Half-year Ending June 2023

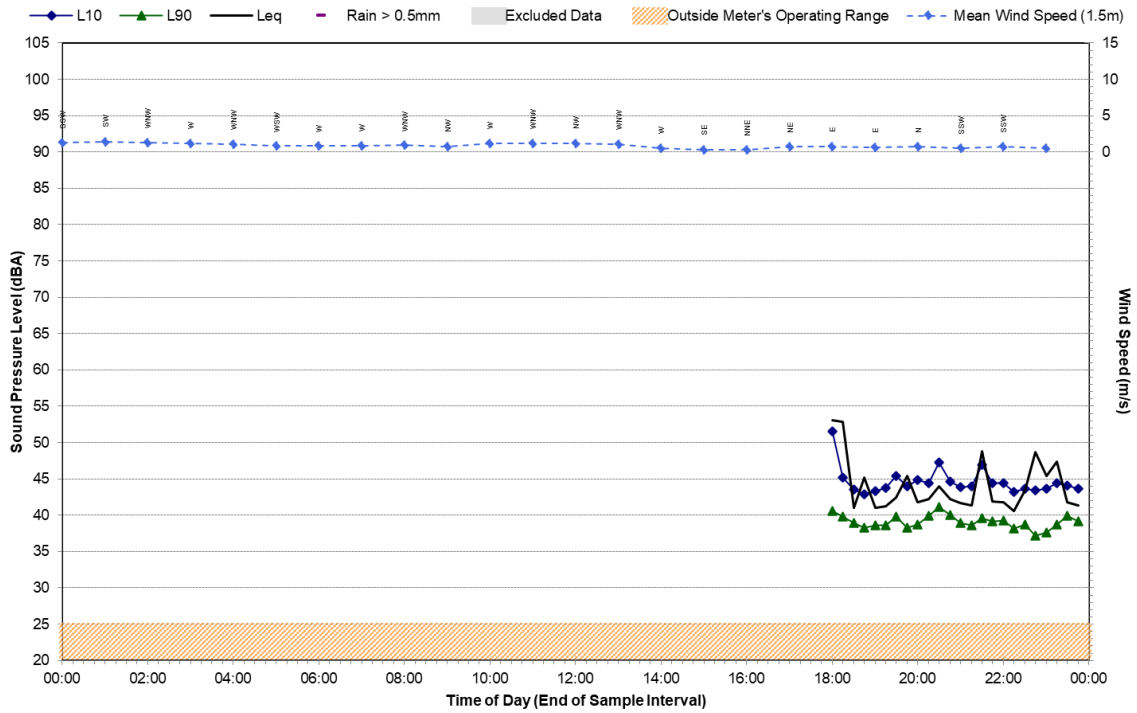
Donaldson Coal Pty Ltd

SLR Project No.: 630.01053.20000

6 November 2023

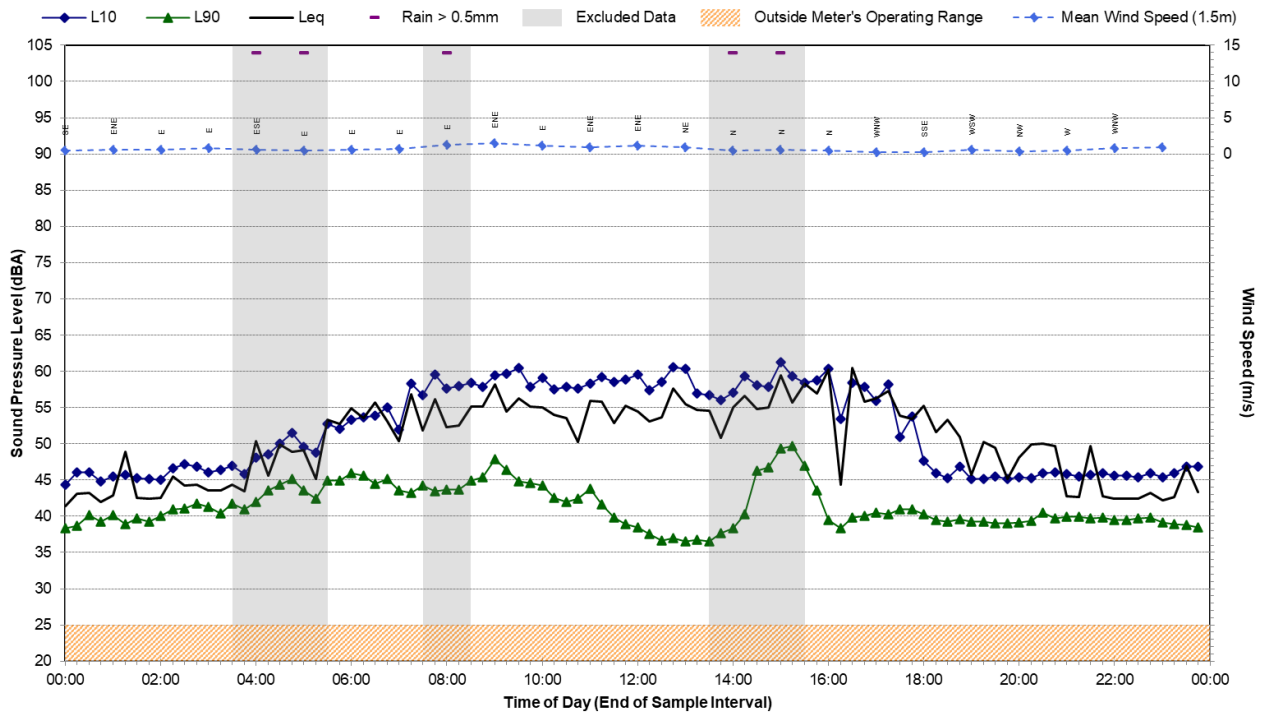
Statistical Ambient Noise Levels

Location D - Monday, 3 July 2023



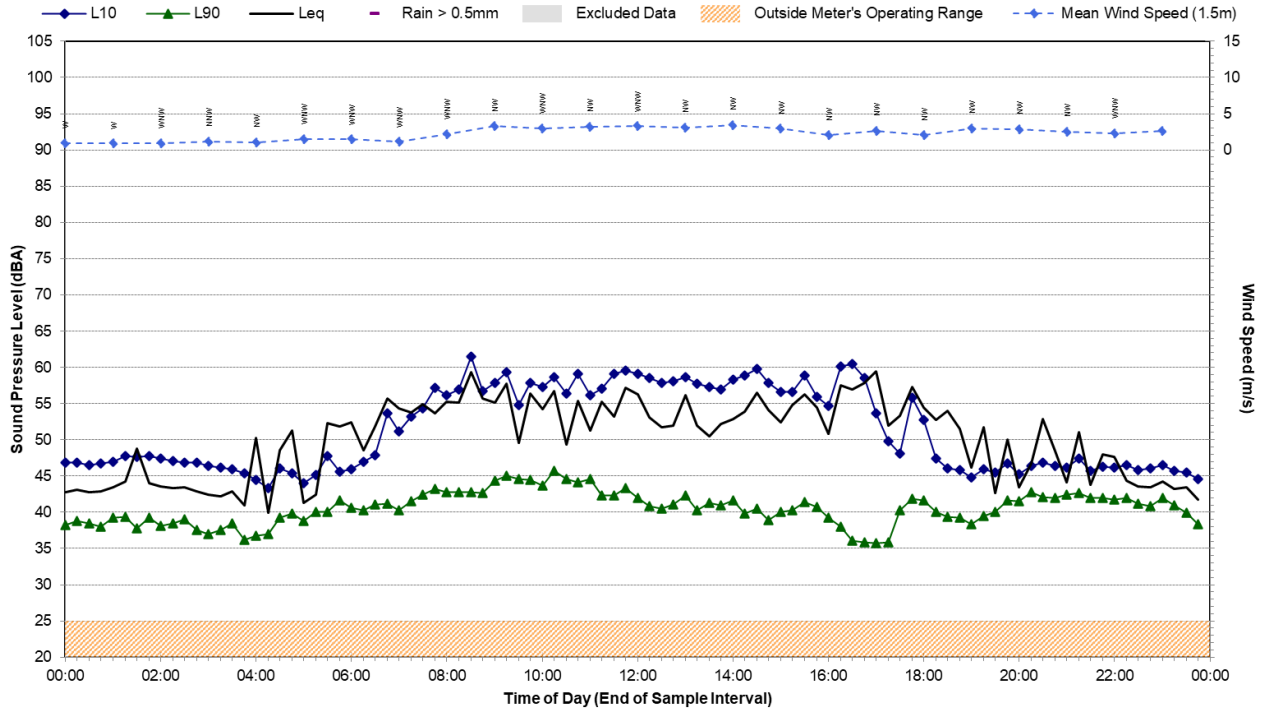
Statistical Ambient Noise Levels

Location D - Tuesday, 4 July 2023



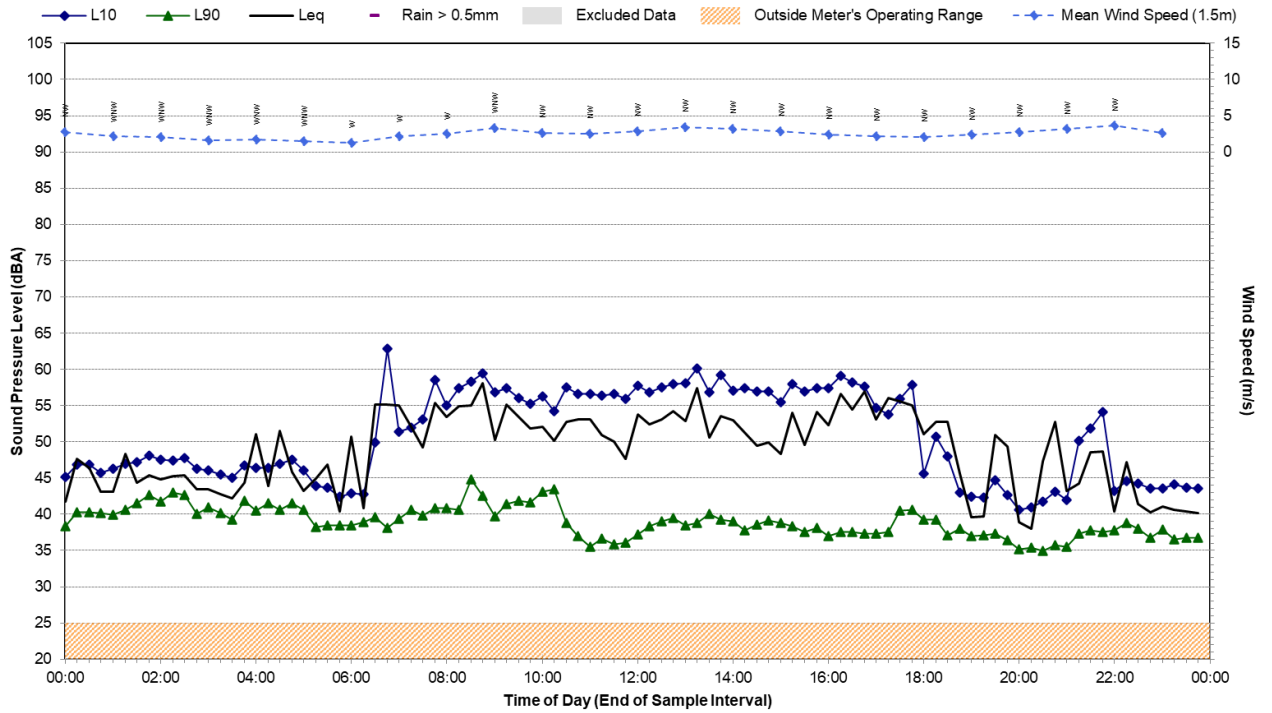
Statistical Ambient Noise Levels

Location D - Wednesday, 5 July 2023



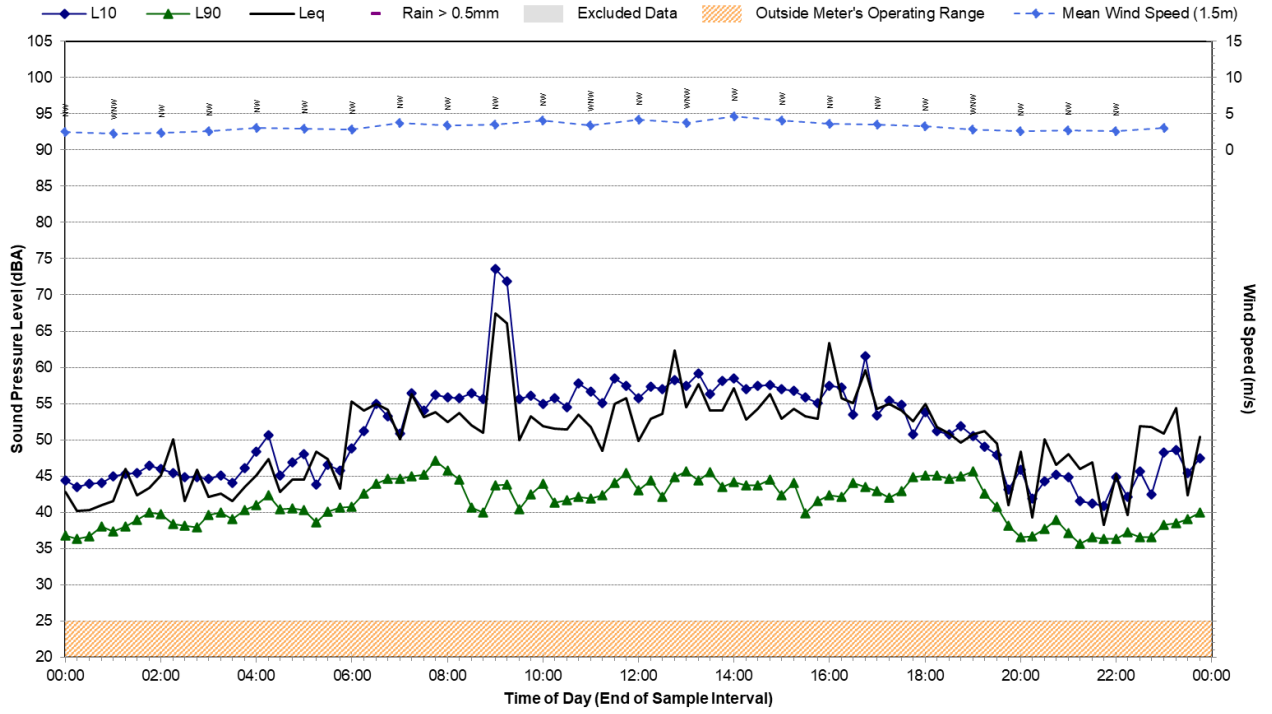
Statistical Ambient Noise Levels

Location D - Thursday, 6 July 2023



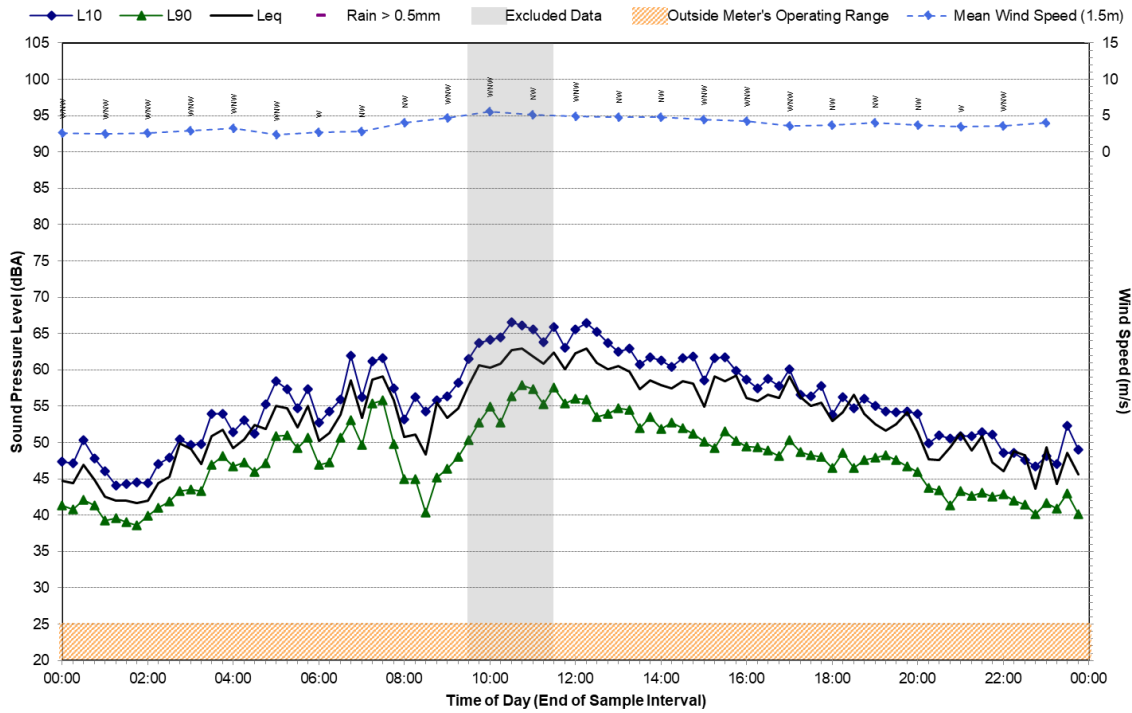
Statistical Ambient Noise Levels

Location D - Friday, 7 July 2023



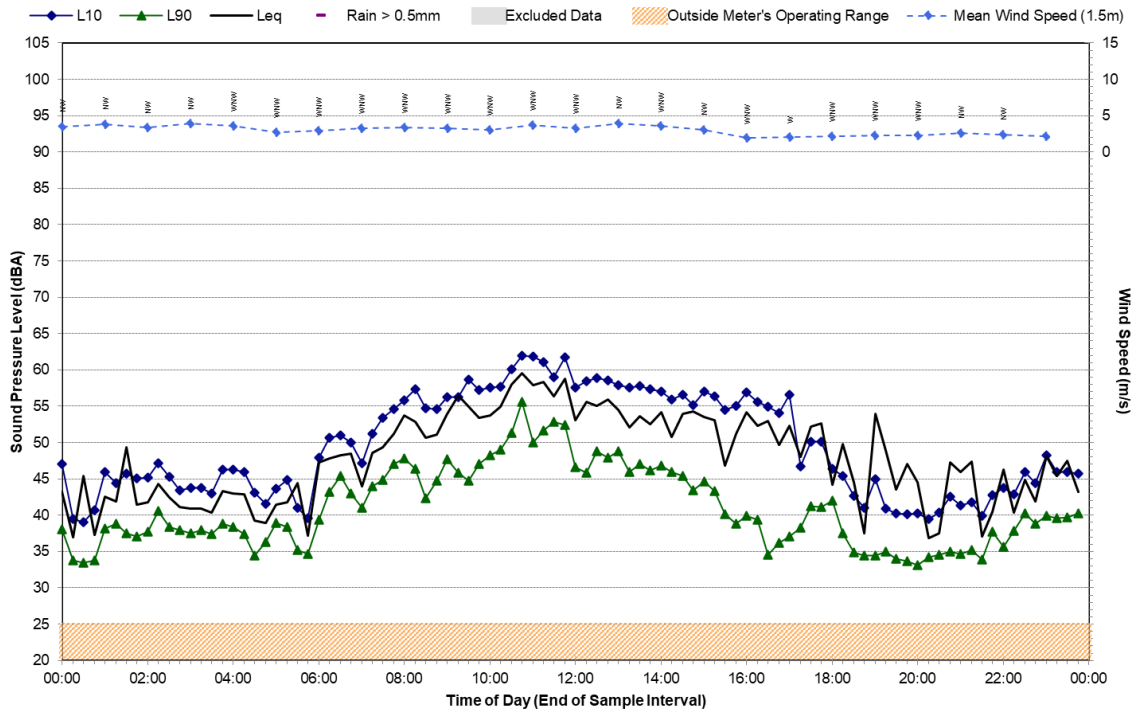
Statistical Ambient Noise Levels

Location D - Saturday, 8 July 2023



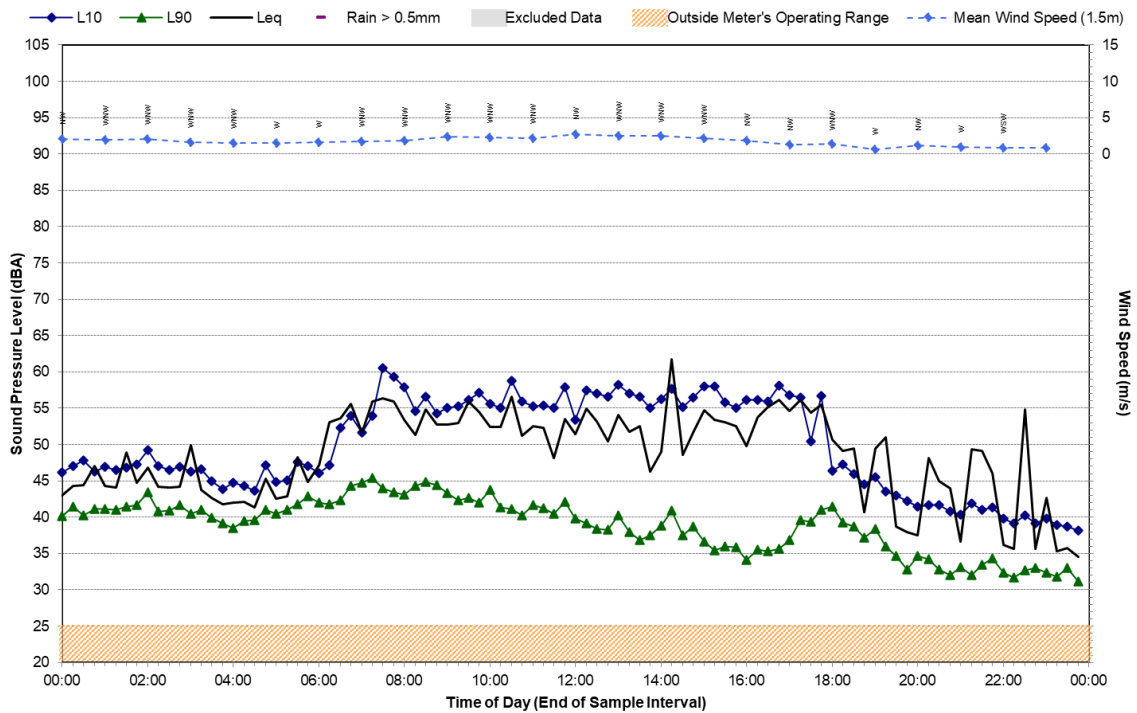
Statistical Ambient Noise Levels

Location D - Sunday, 9 July 2023



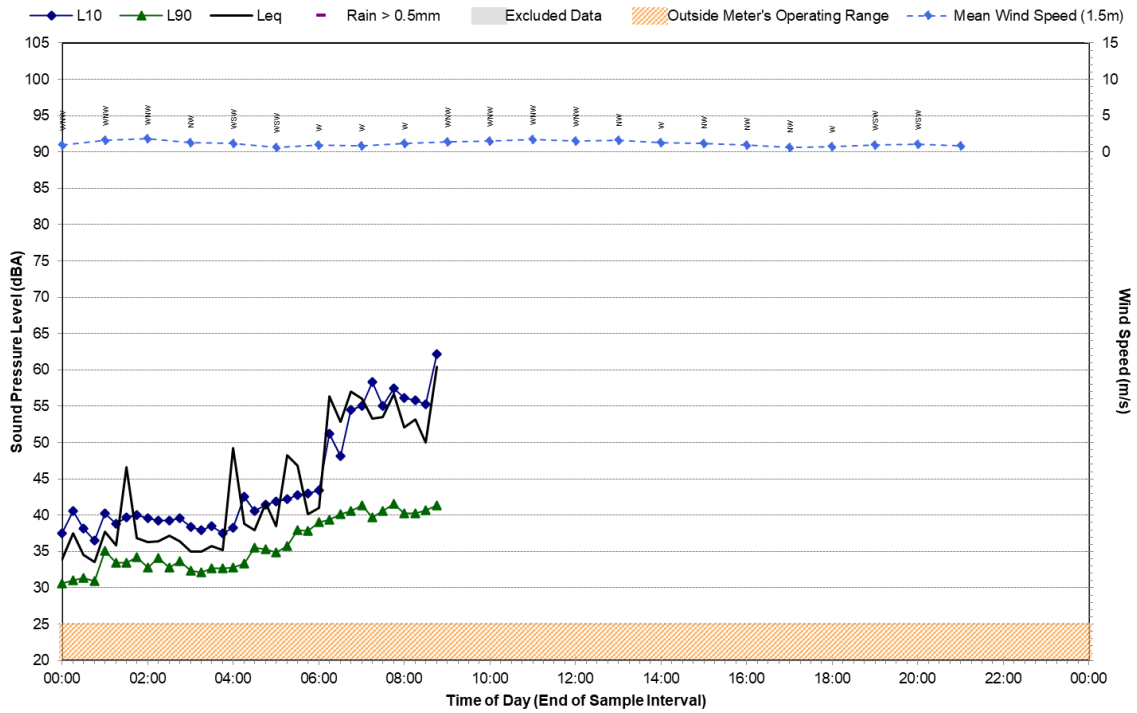
Statistical Ambient Noise Levels

Location D - Monday, 10 July 2023



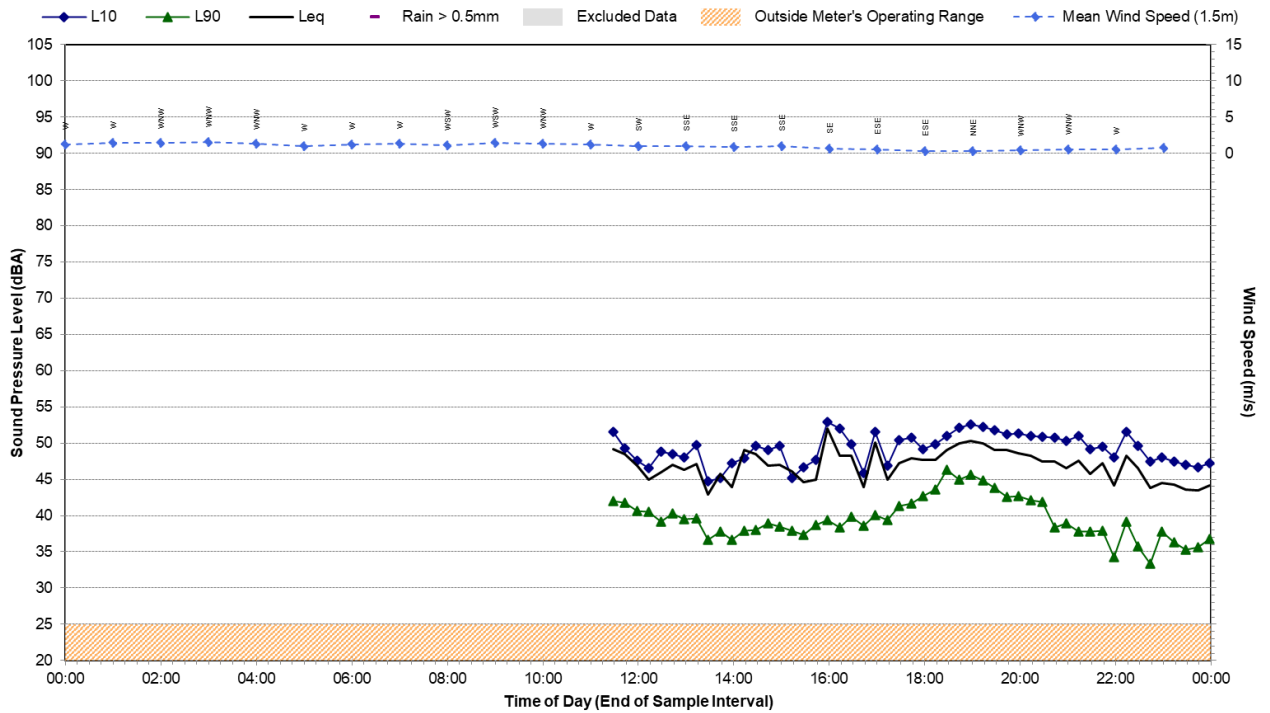
Statistical Ambient Noise Levels

Location D - Tuesday, 11 July 2023



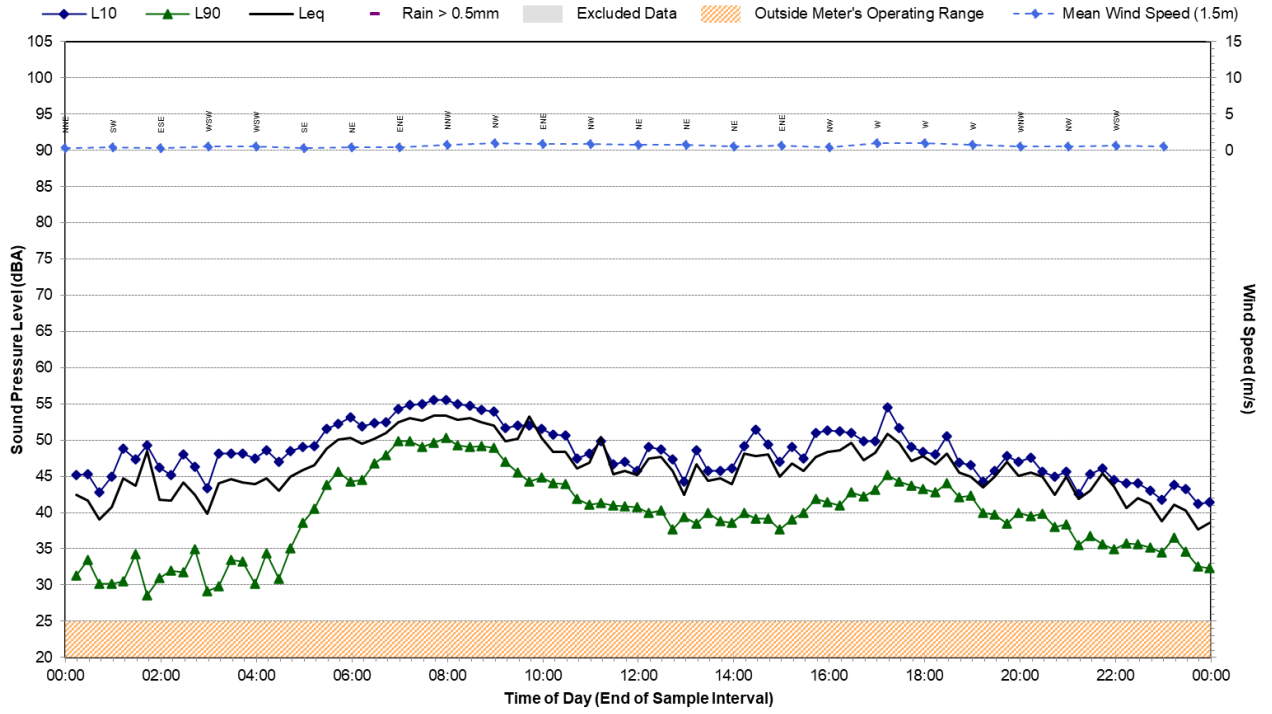
Statistical Ambient Noise Levels

Location F - Wednesday, 21 June 2023



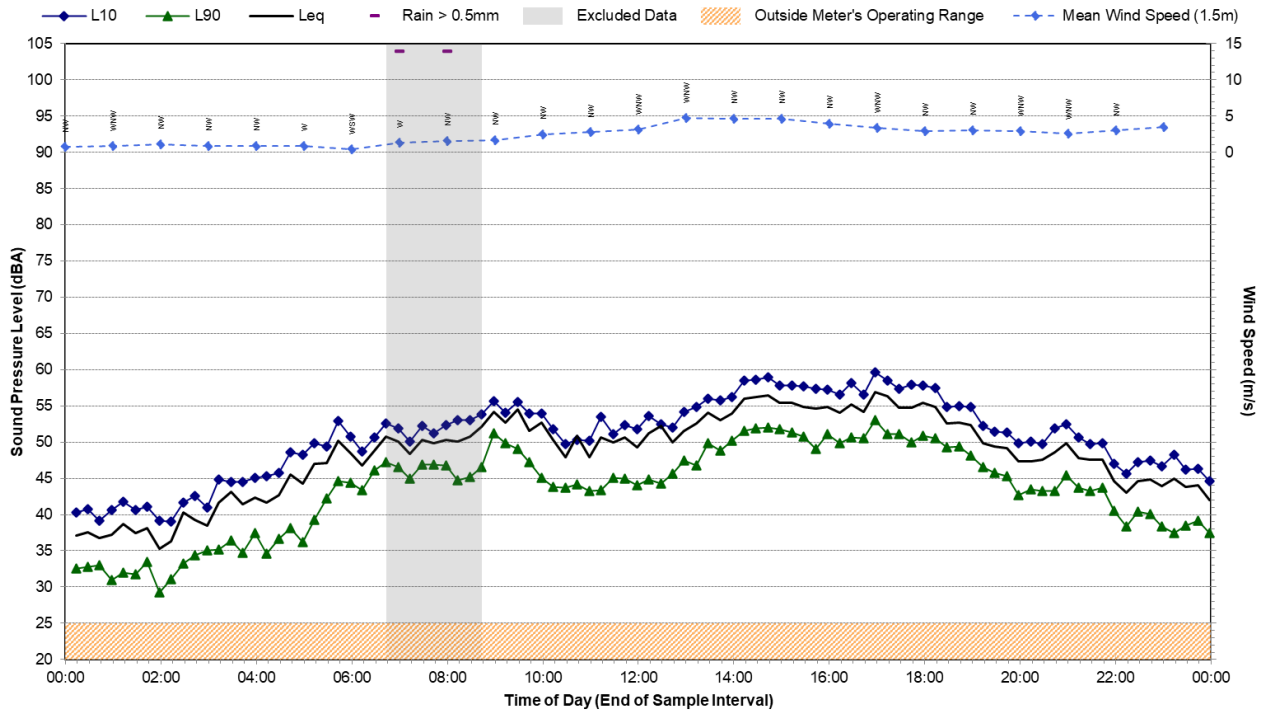
Statistical Ambient Noise Levels

Location F - Thursday, 22 June 2023



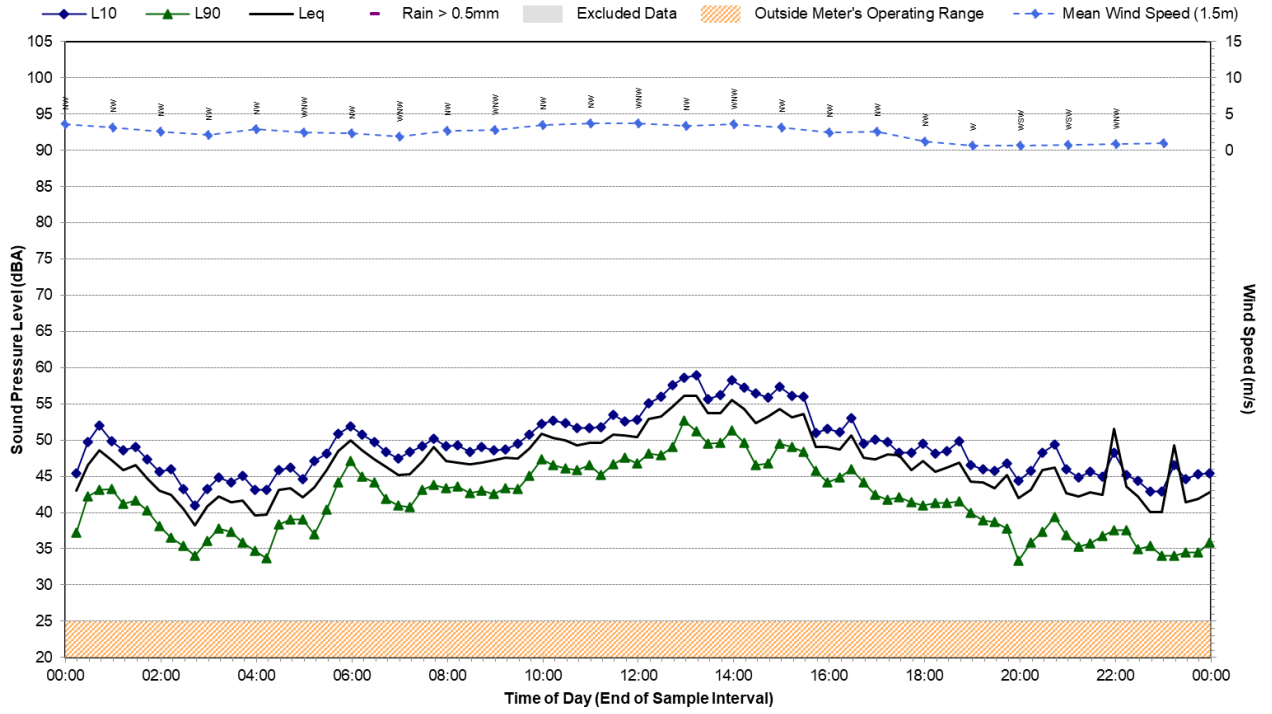
Statistical Ambient Noise Levels

Location F - Friday, 23 June 2023



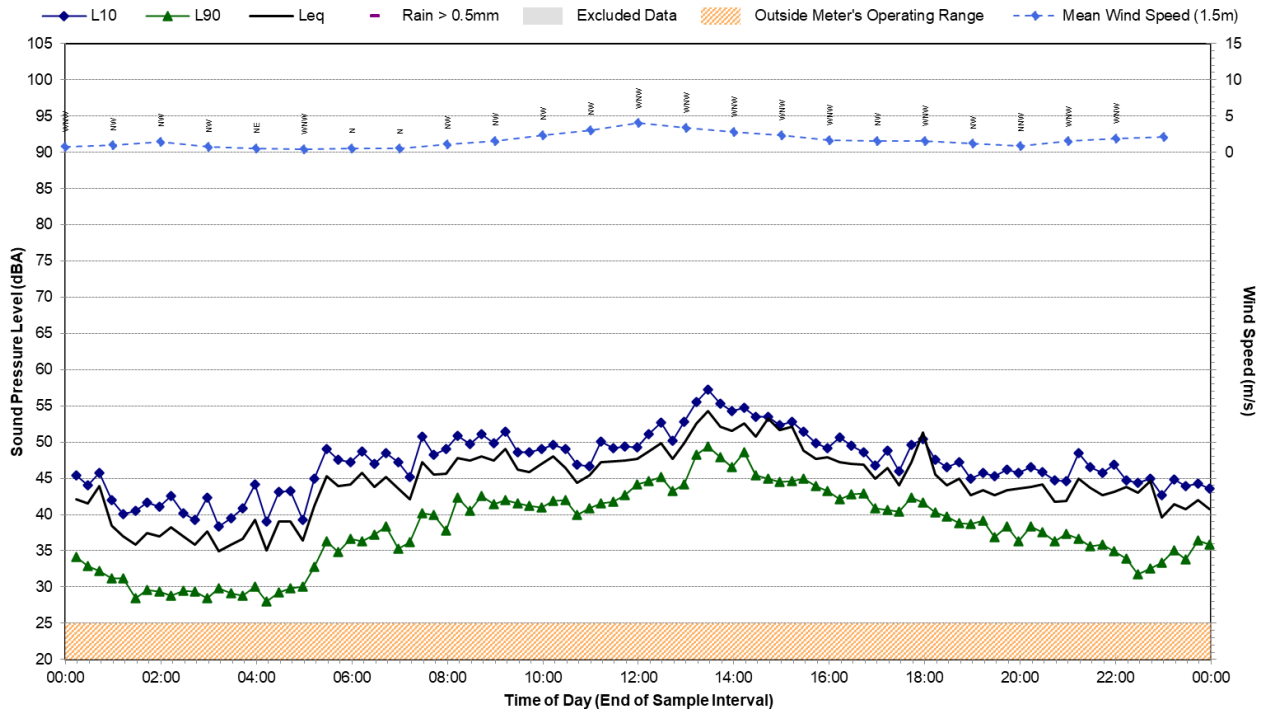
Statistical Ambient Noise Levels

Location F - Saturday, 24 June 2023



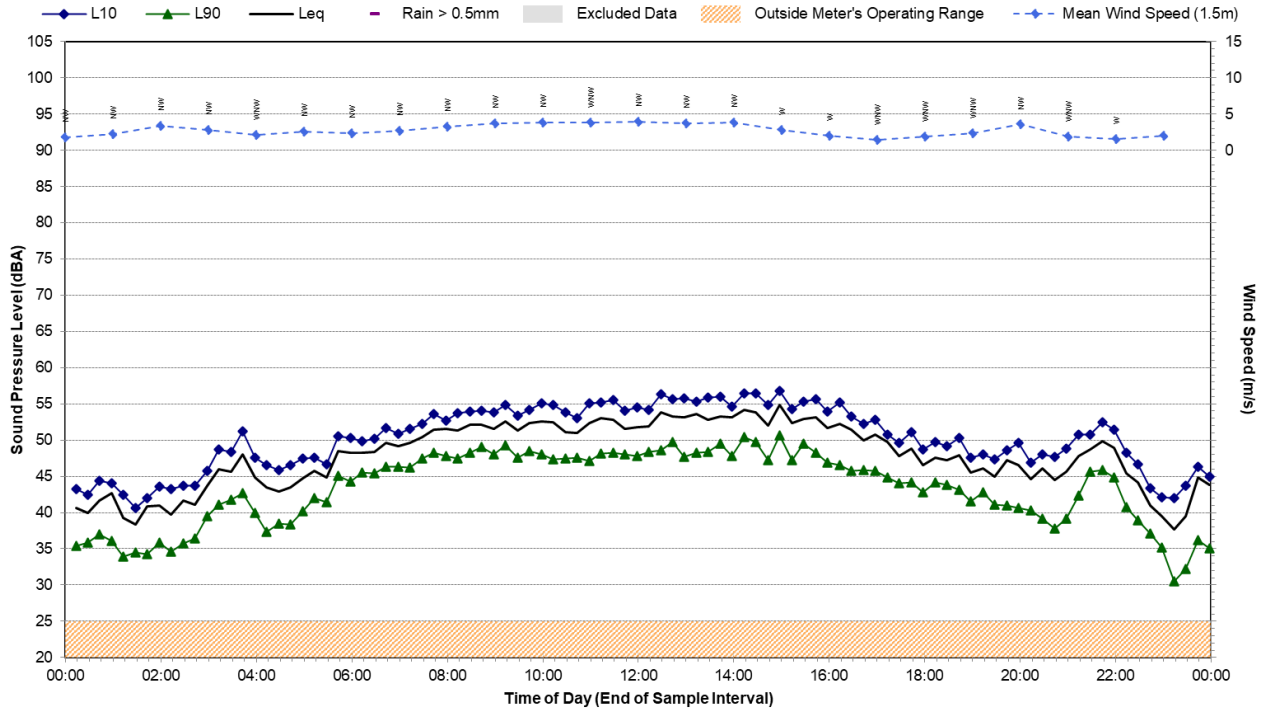
Statistical Ambient Noise Levels

Location F - Sunday, 25 June 2023



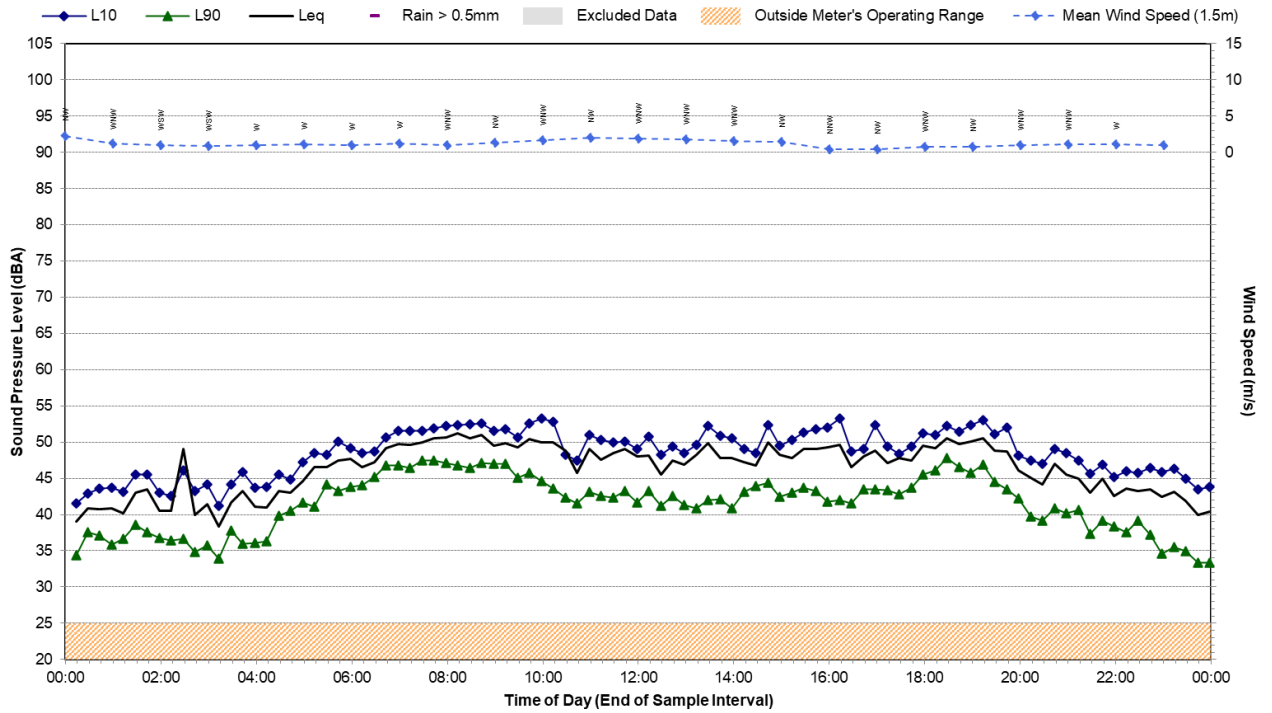
Statistical Ambient Noise Levels

Location F - Monday, 26 June 2023



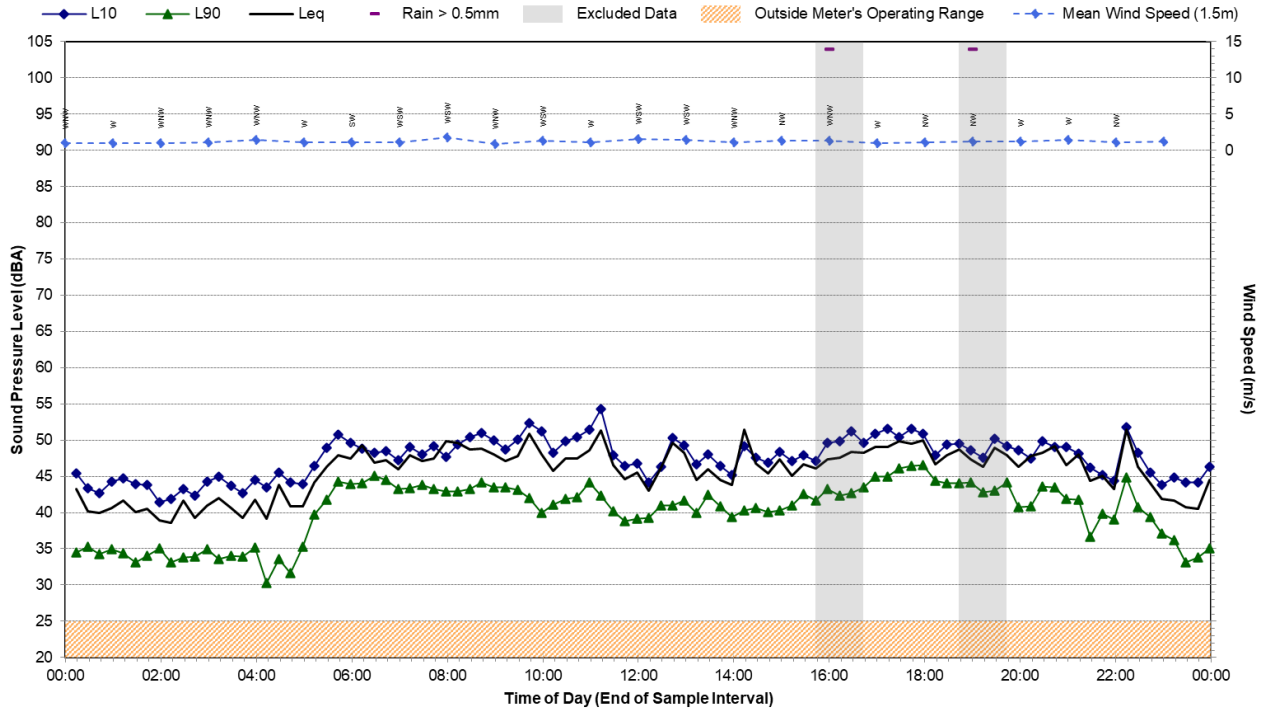
Statistical Ambient Noise Levels

Location F - Tuesday, 27 June 2023



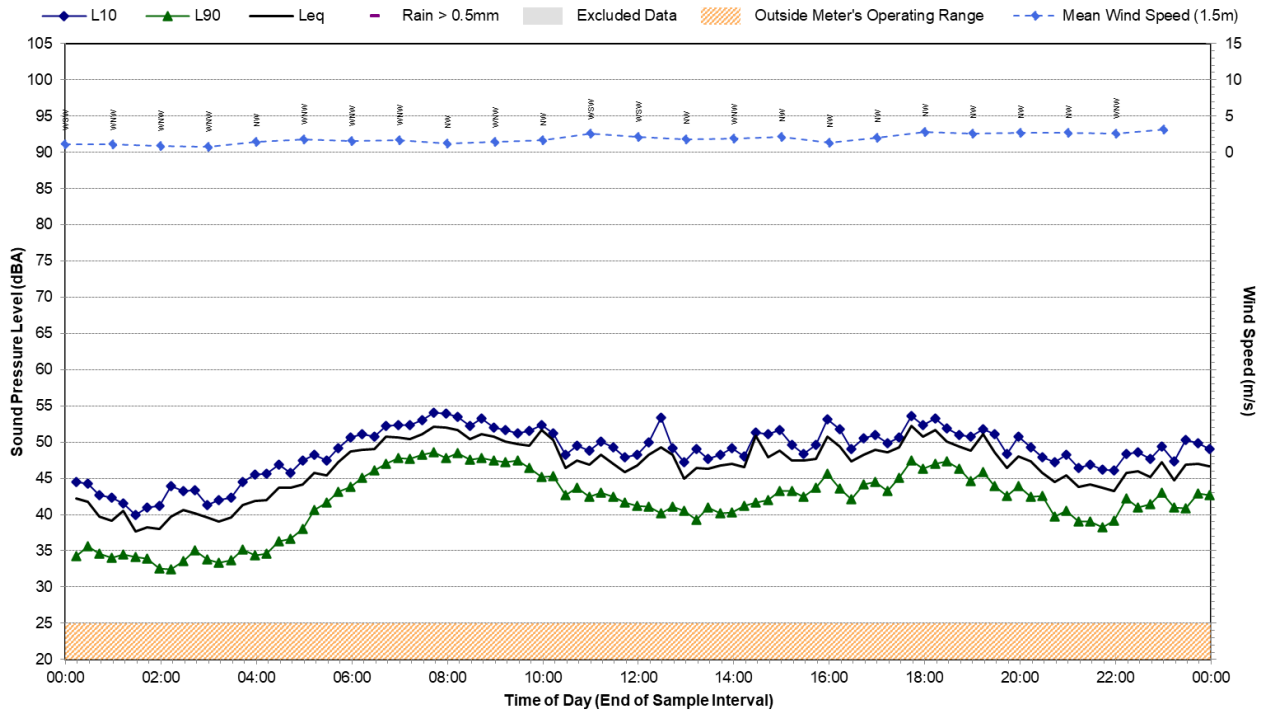
Statistical Ambient Noise Levels

Location F - Wednesday, 28 June 2023



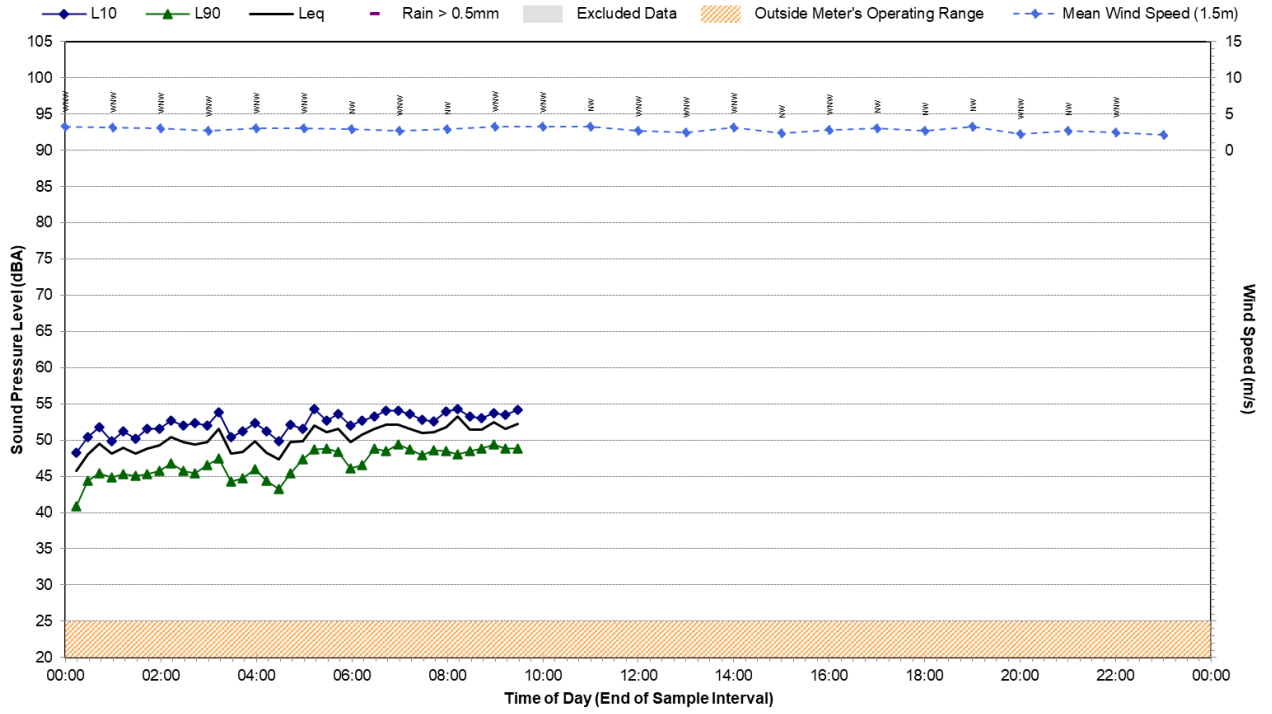
Statistical Ambient Noise Levels

Location F - Thursday, 29 June 2023



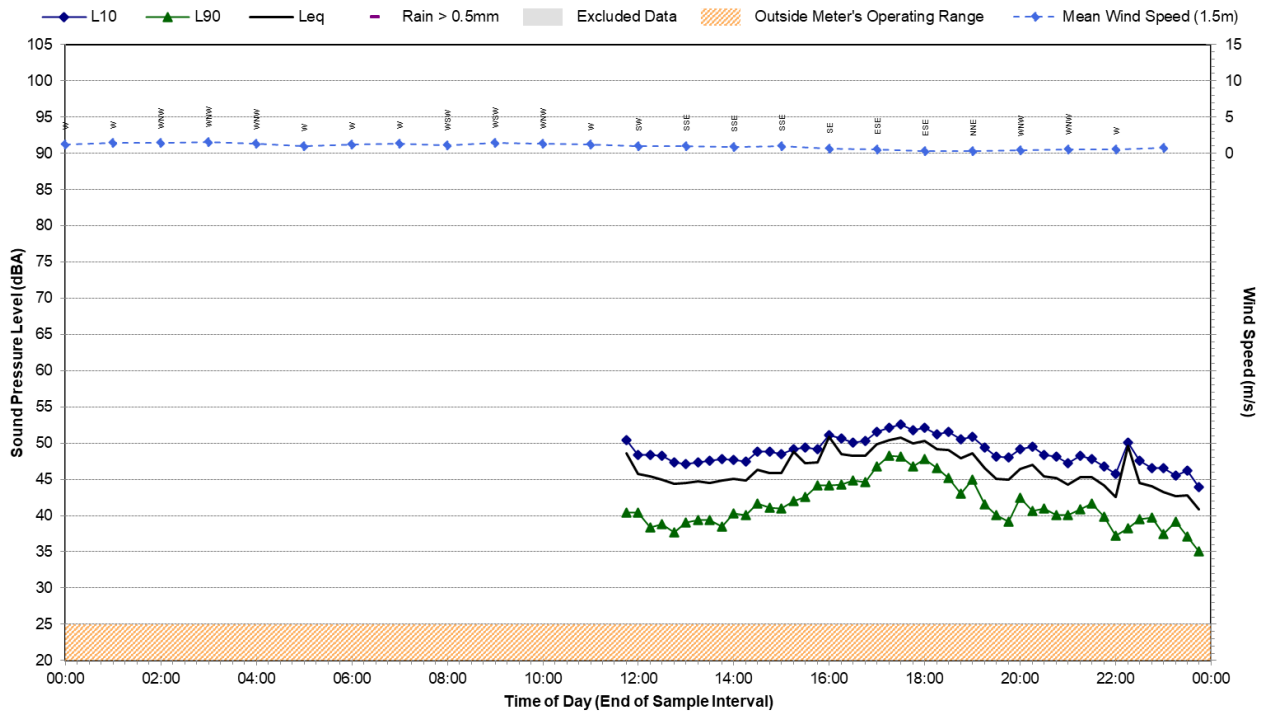
Statistical Ambient Noise Levels

Location F - Friday, 30 June 2023



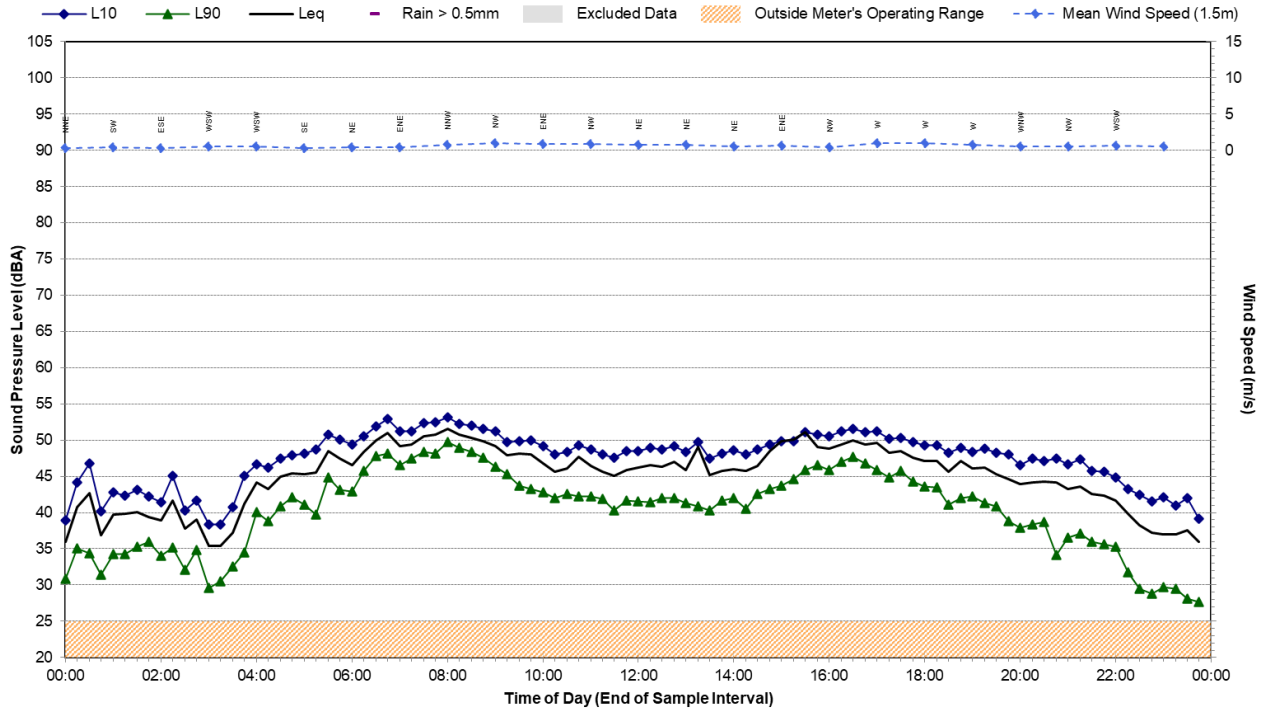
Statistical Ambient Noise Levels

Location G - Wednesday, 21 June 2023



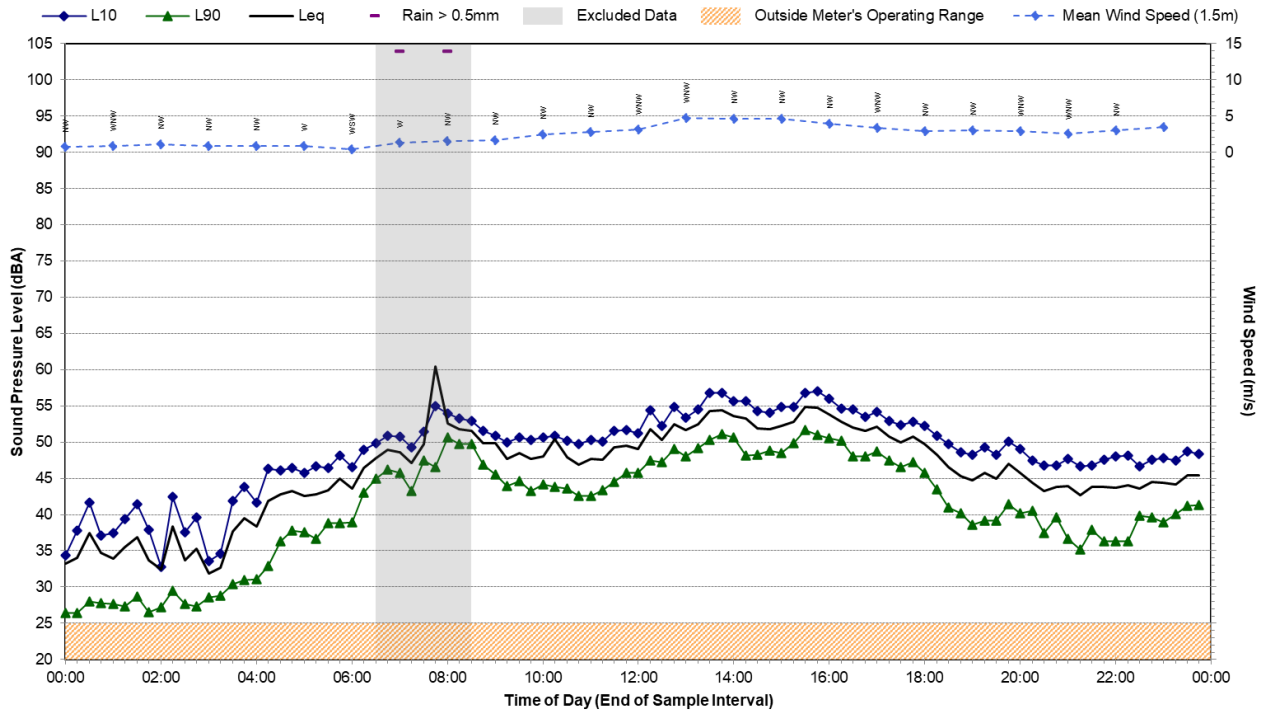
Statistical Ambient Noise Levels

Location G - Thursday, 22 June 2023



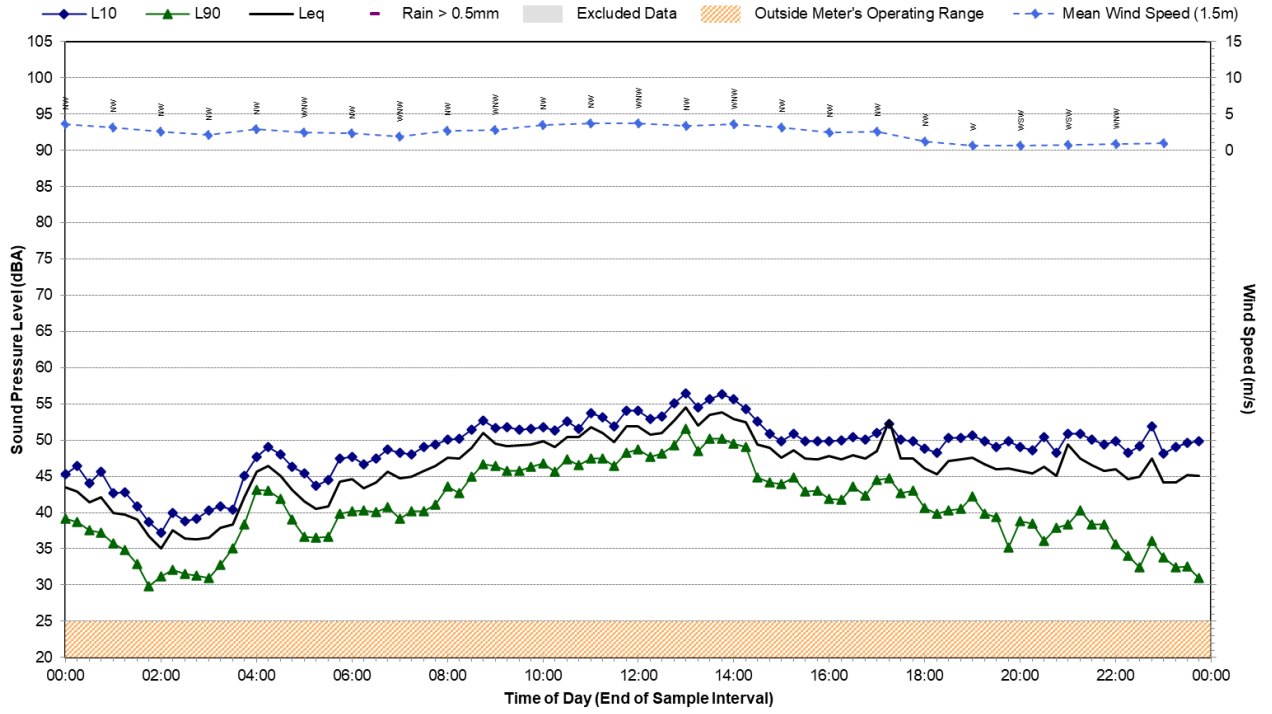
Statistical Ambient Noise Levels

Location G - Friday, 23 June 2023



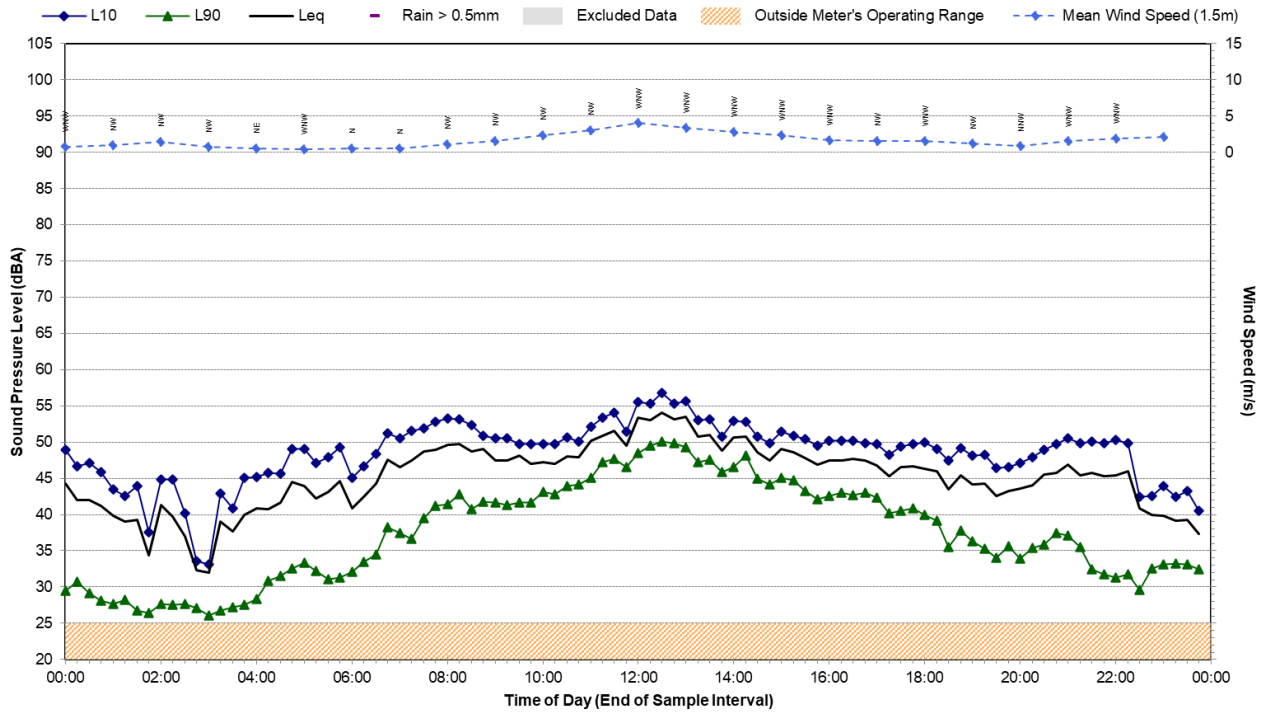
Statistical Ambient Noise Levels

Location G - Saturday, 24 June 2023



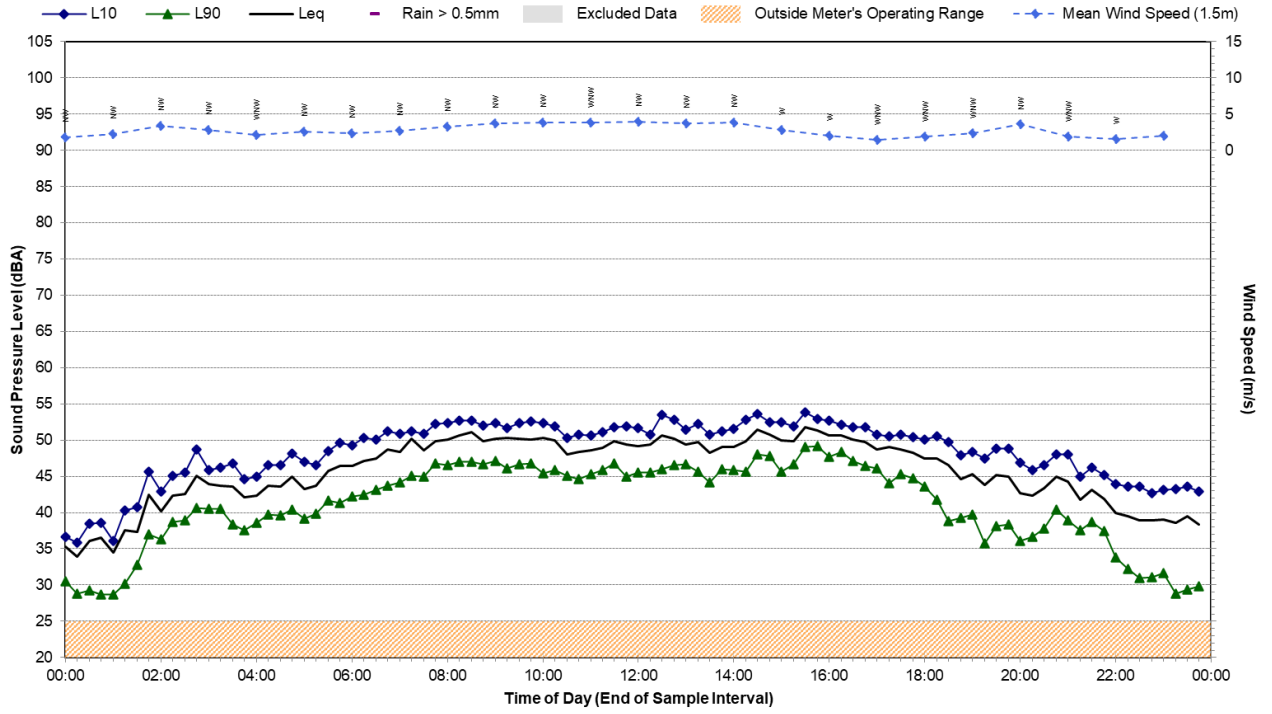
Statistical Ambient Noise Levels

Location G - Sunday, 25 June 2023



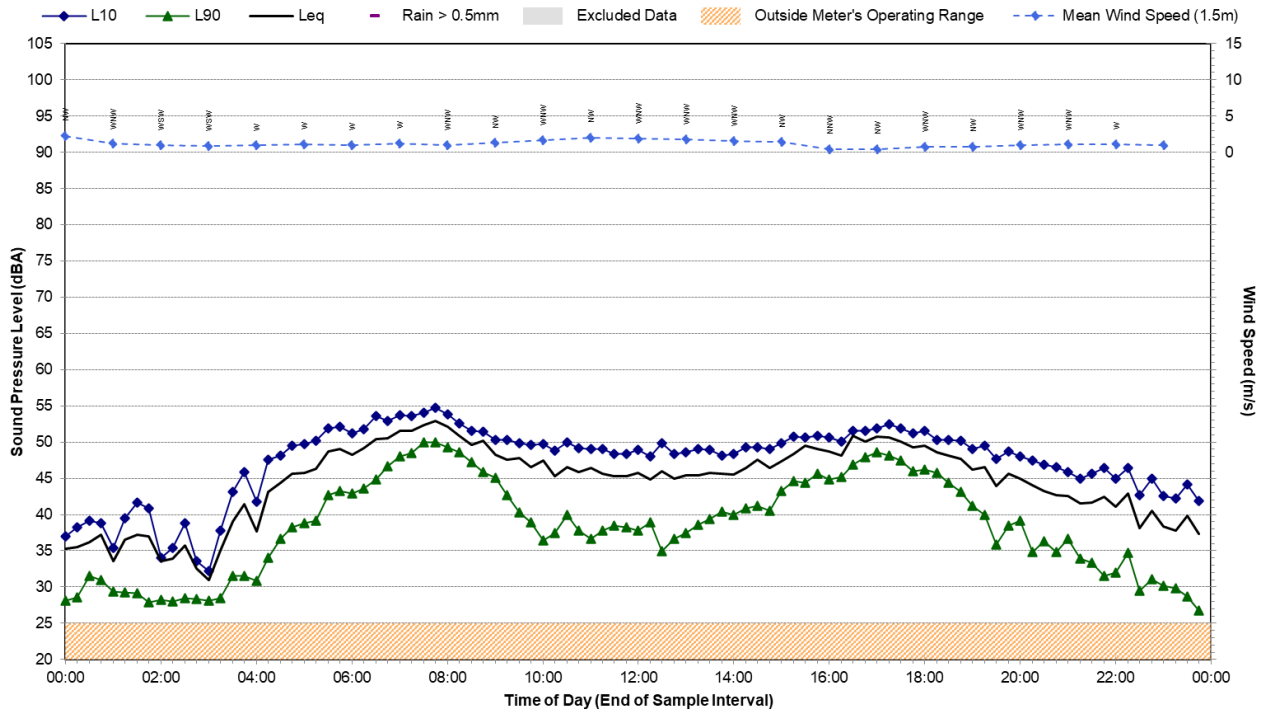
Statistical Ambient Noise Levels

Location G - Monday, 26 June 2023



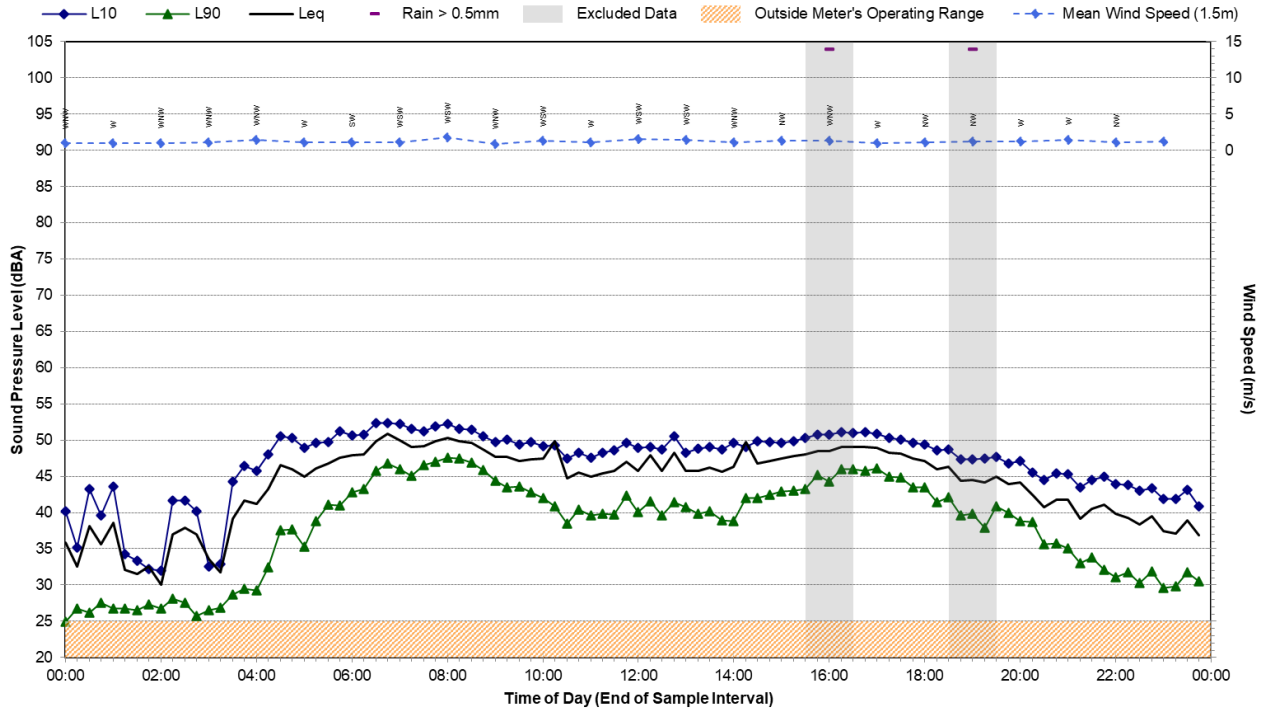
Statistical Ambient Noise Levels

Location G - Tuesday, 27 June 2023



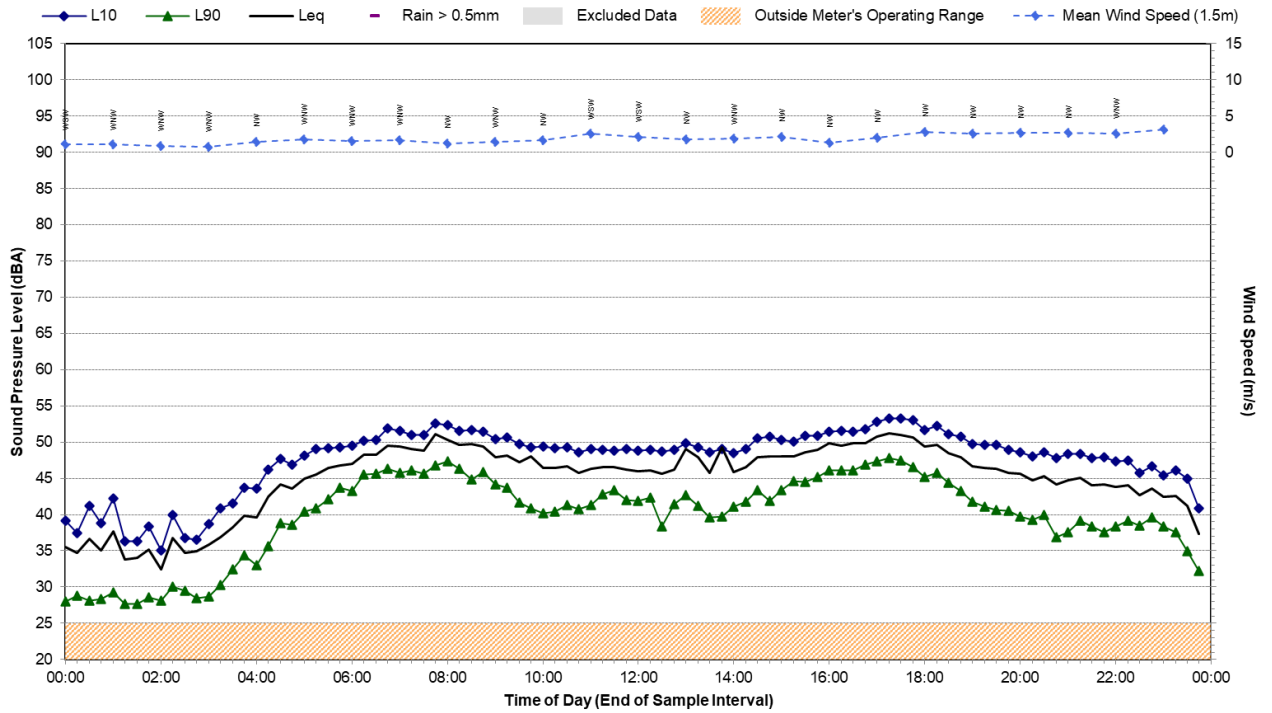
Statistical Ambient Noise Levels

Location G - Wednesday, 28 June 2023



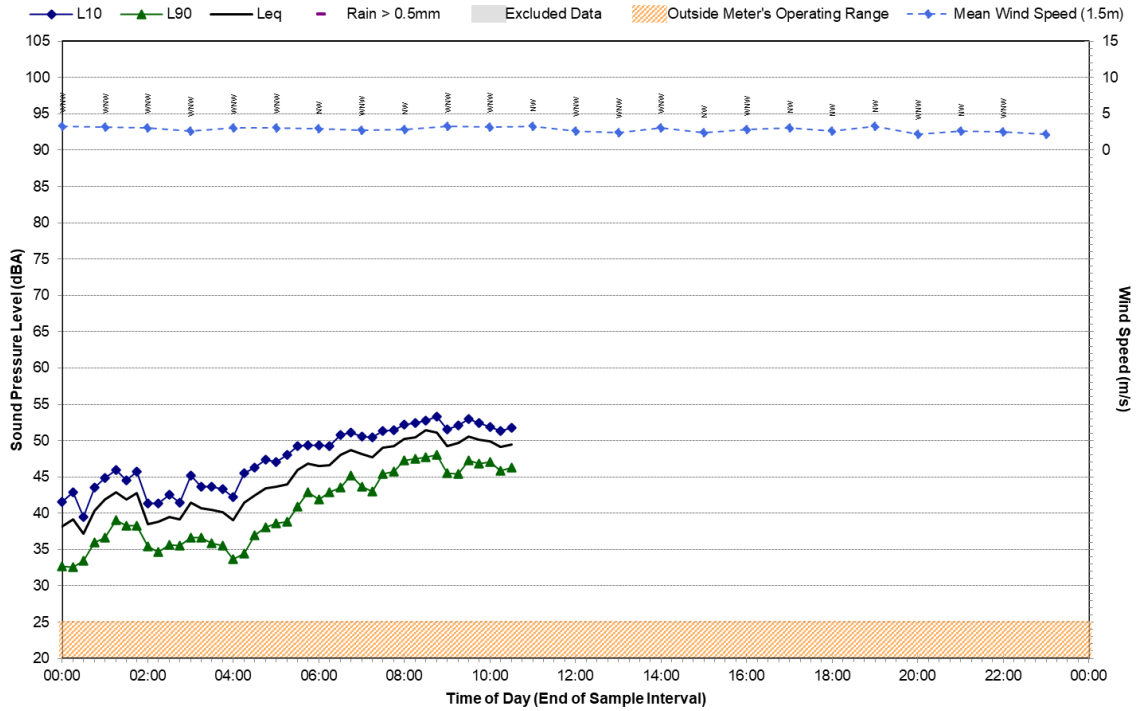
Statistical Ambient Noise Levels

Location G - Thursday, 29 June 2023



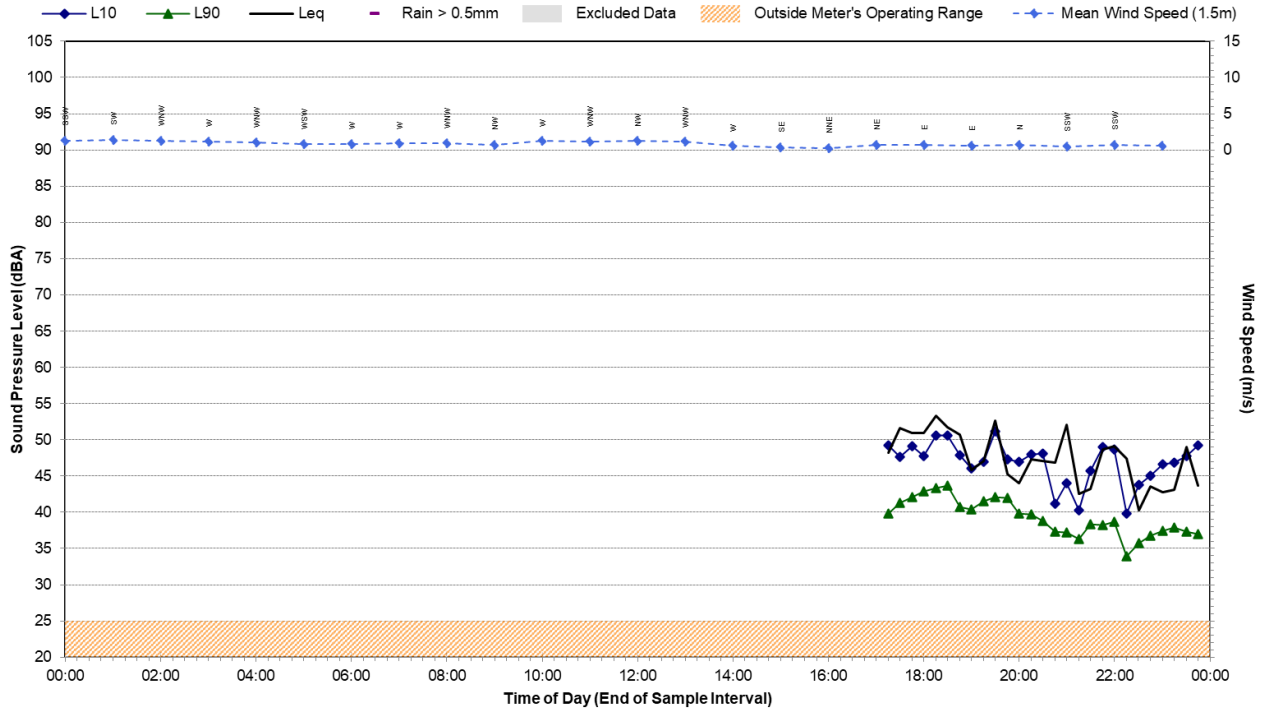
Statistical Ambient Noise Levels

Location G - Friday, 30 June 2023



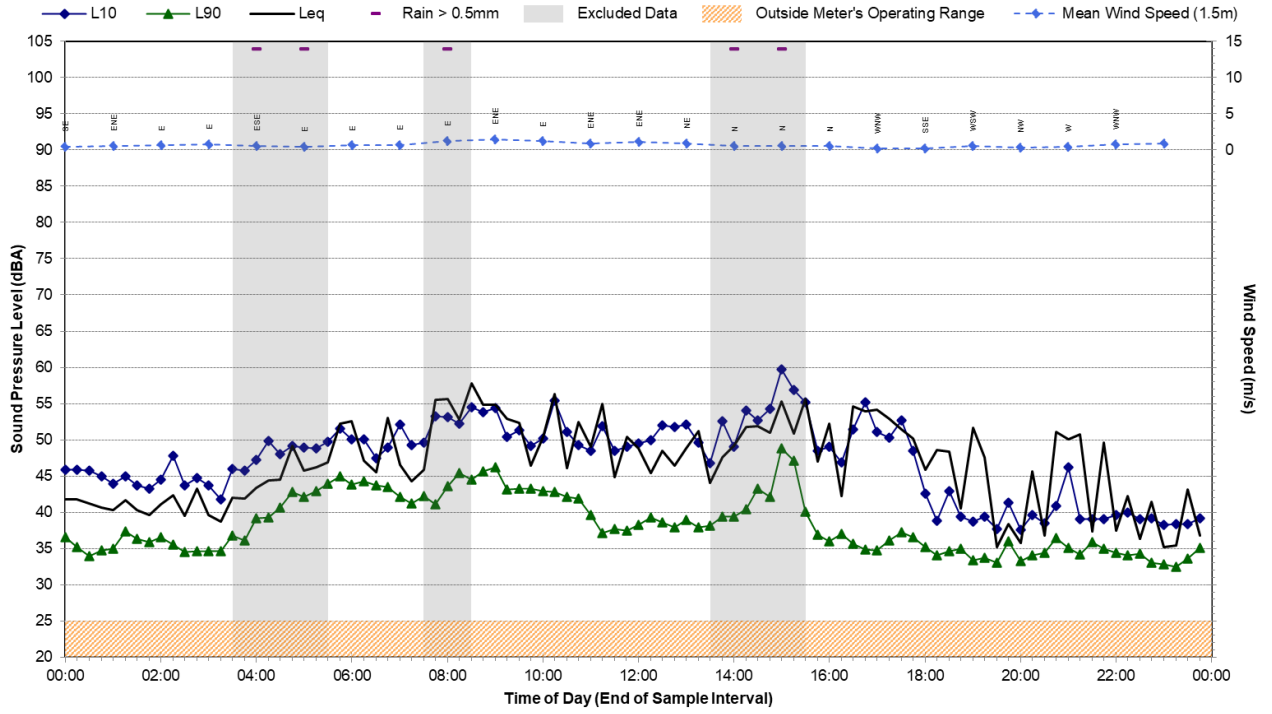
Statistical Ambient Noise Levels

Location I - Monday, 3 July 2023



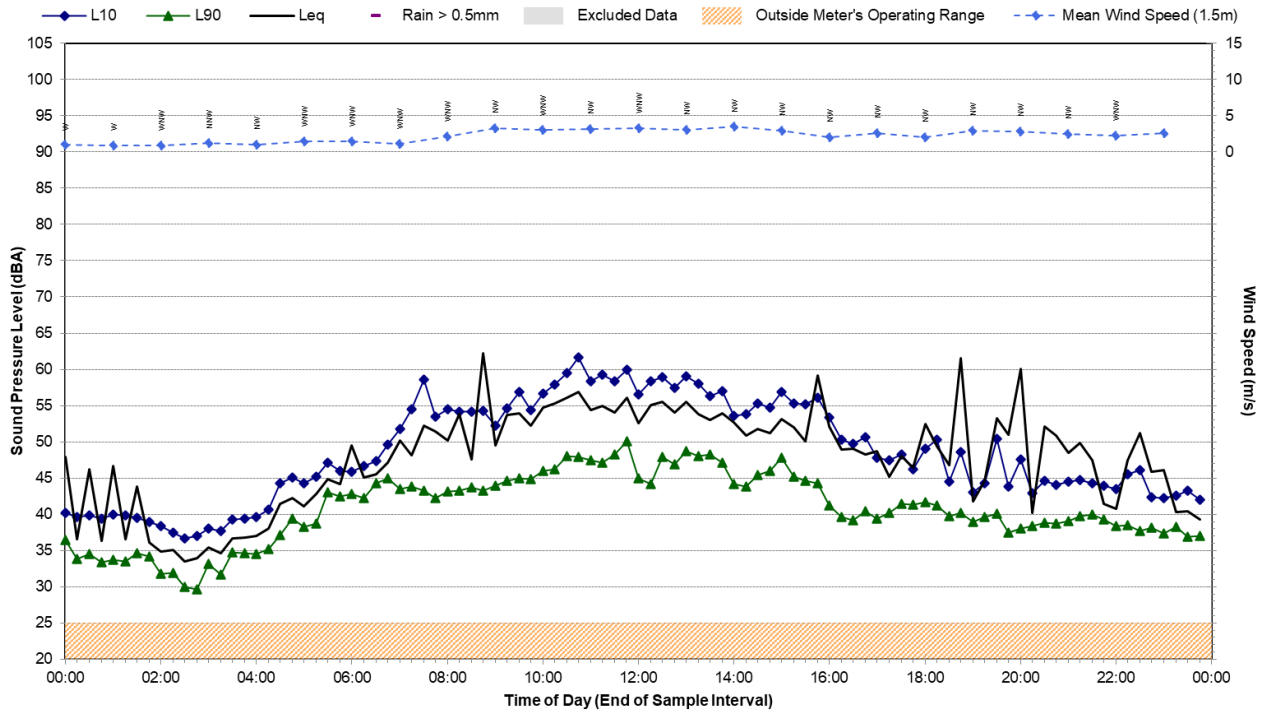
Statistical Ambient Noise Levels

Location I - Tuesday, 4 July 2023



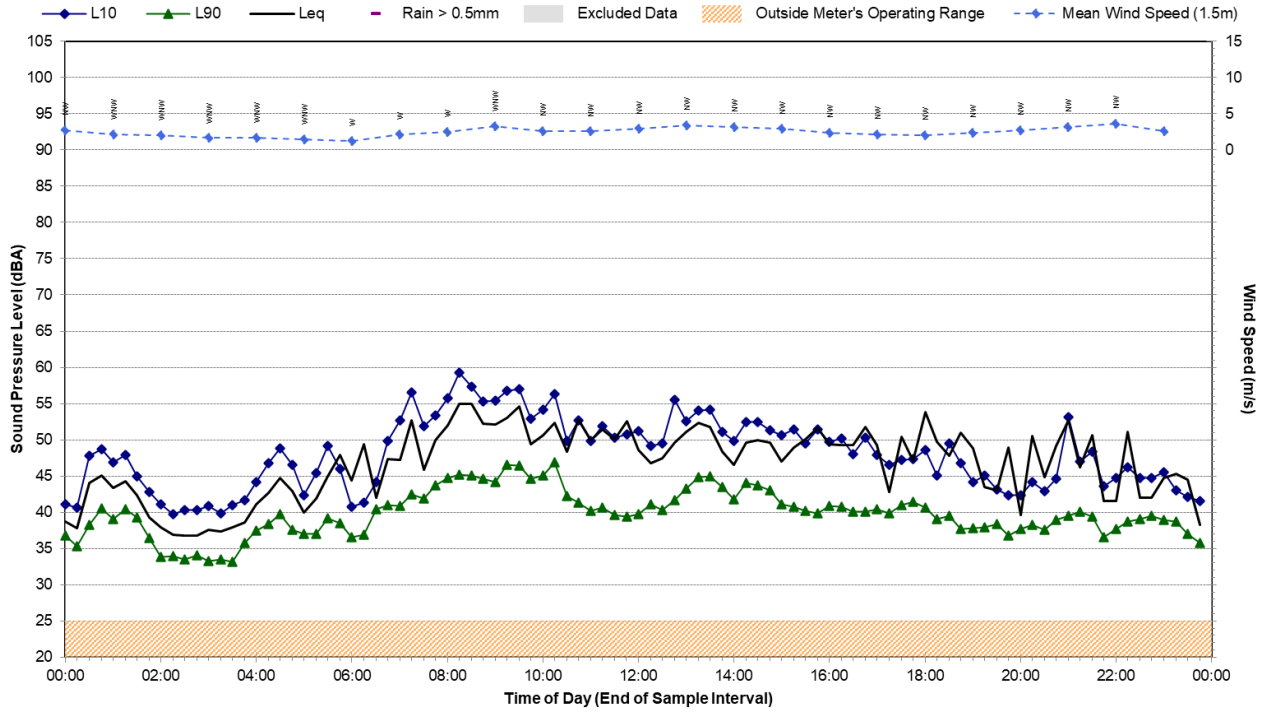
Statistical Ambient Noise Levels

Location I - Wednesday, 5 July 2023



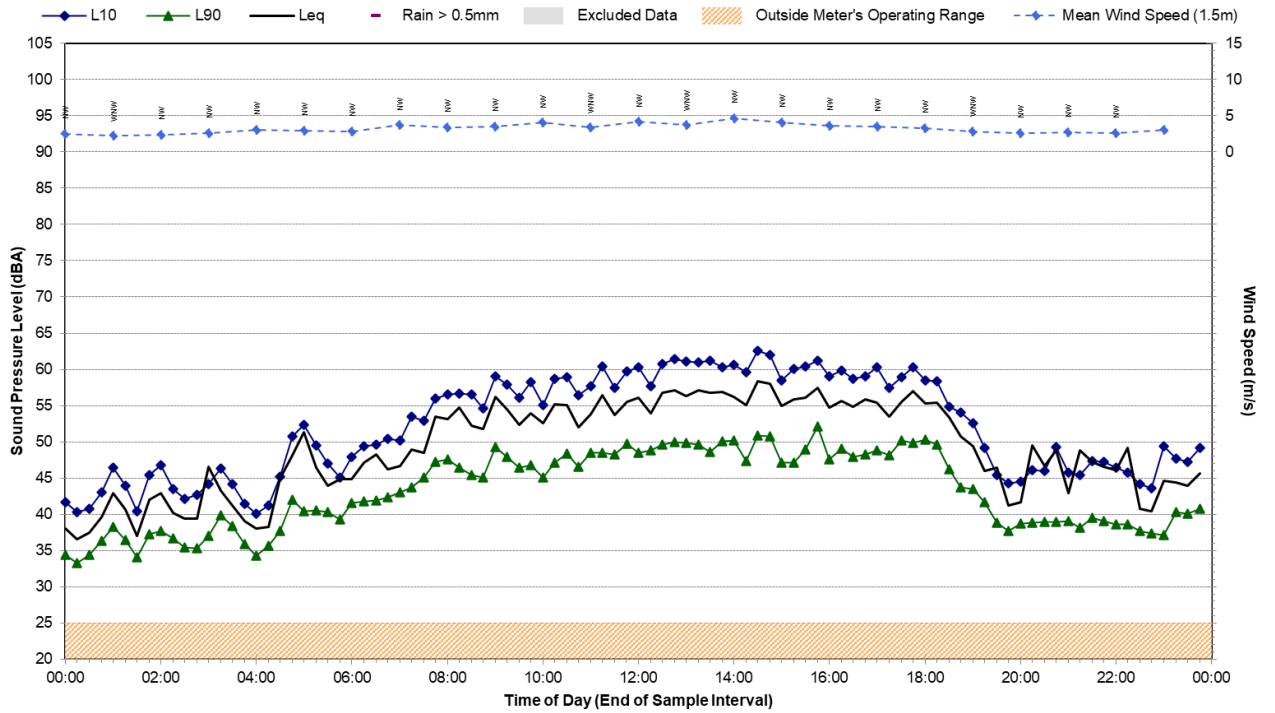
Statistical Ambient Noise Levels

Location I - Thursday, 6 July 2023



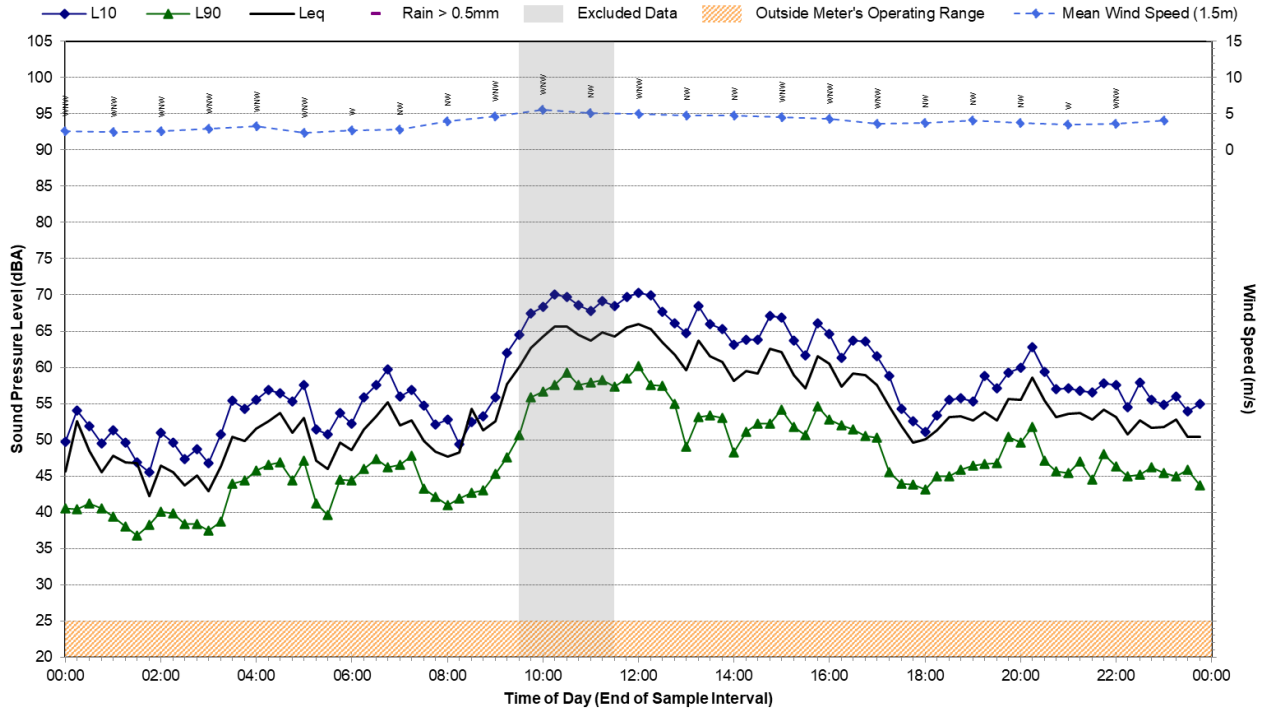
Statistical Ambient Noise Levels

Location I - Friday, 7 July 2023



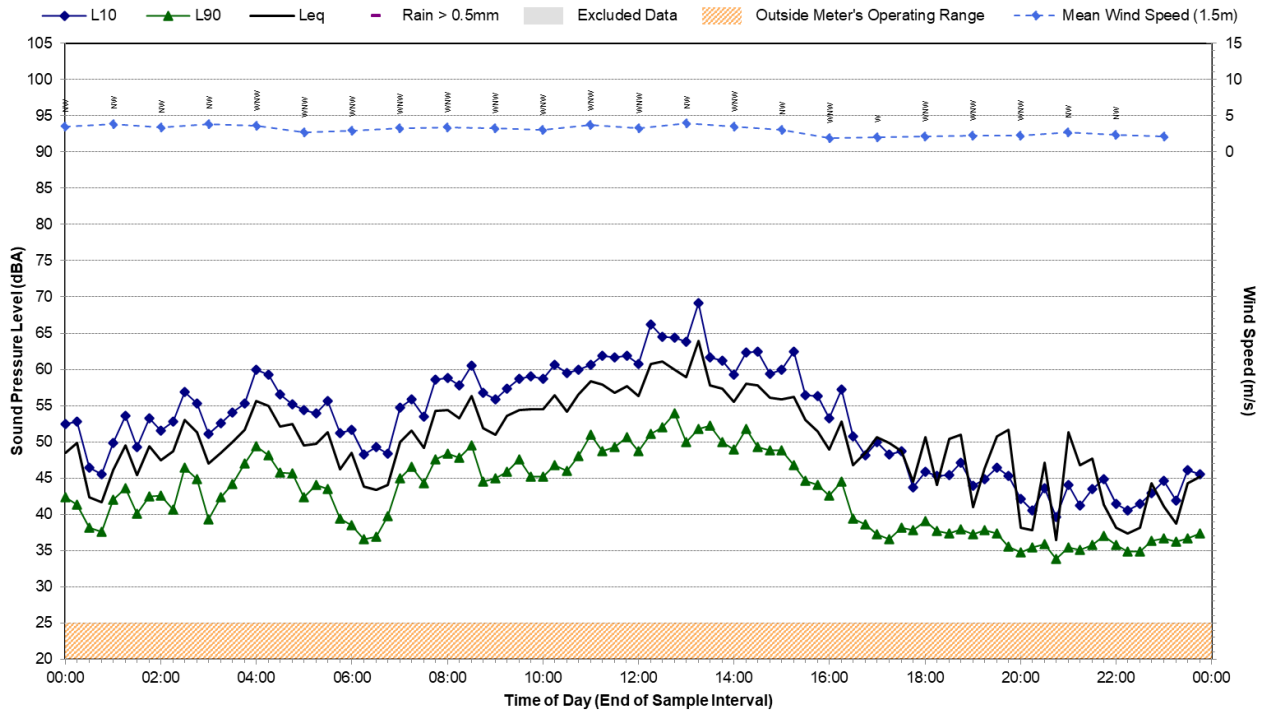
Statistical Ambient Noise Levels

Location I - Saturday, 8 July 2023



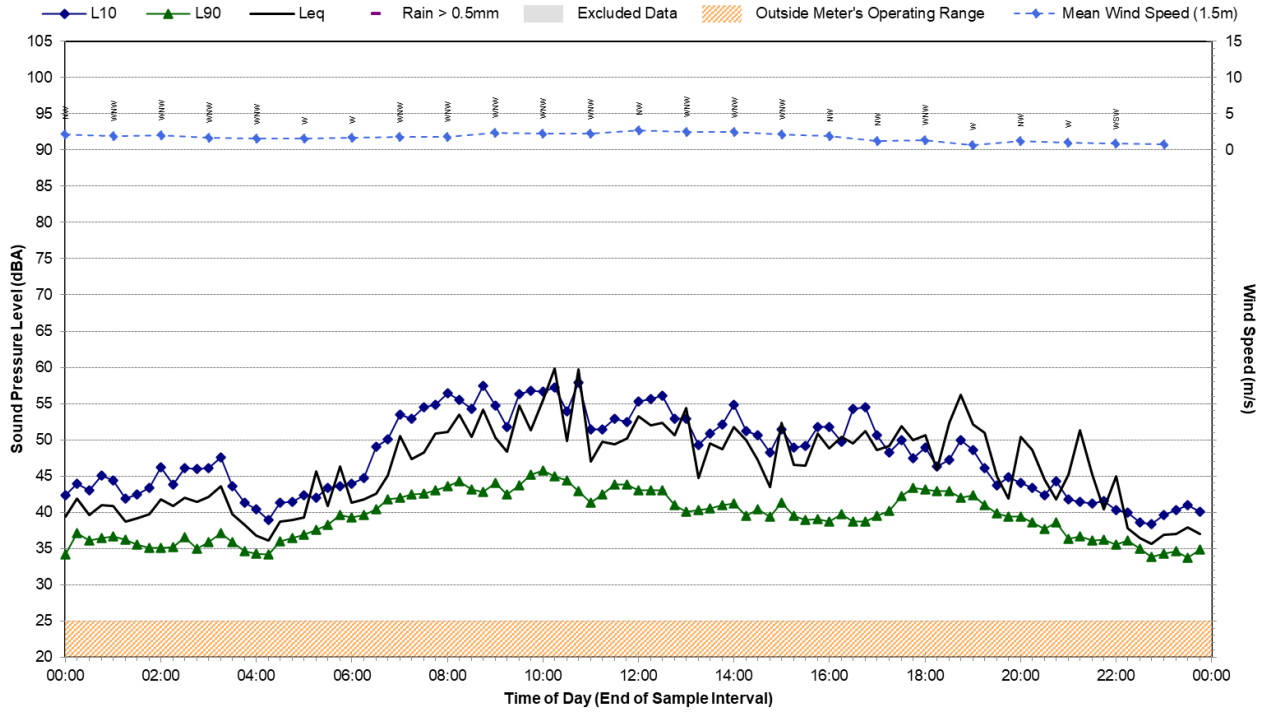
Statistical Ambient Noise Levels

Location I - Sunday, 9 July 2023



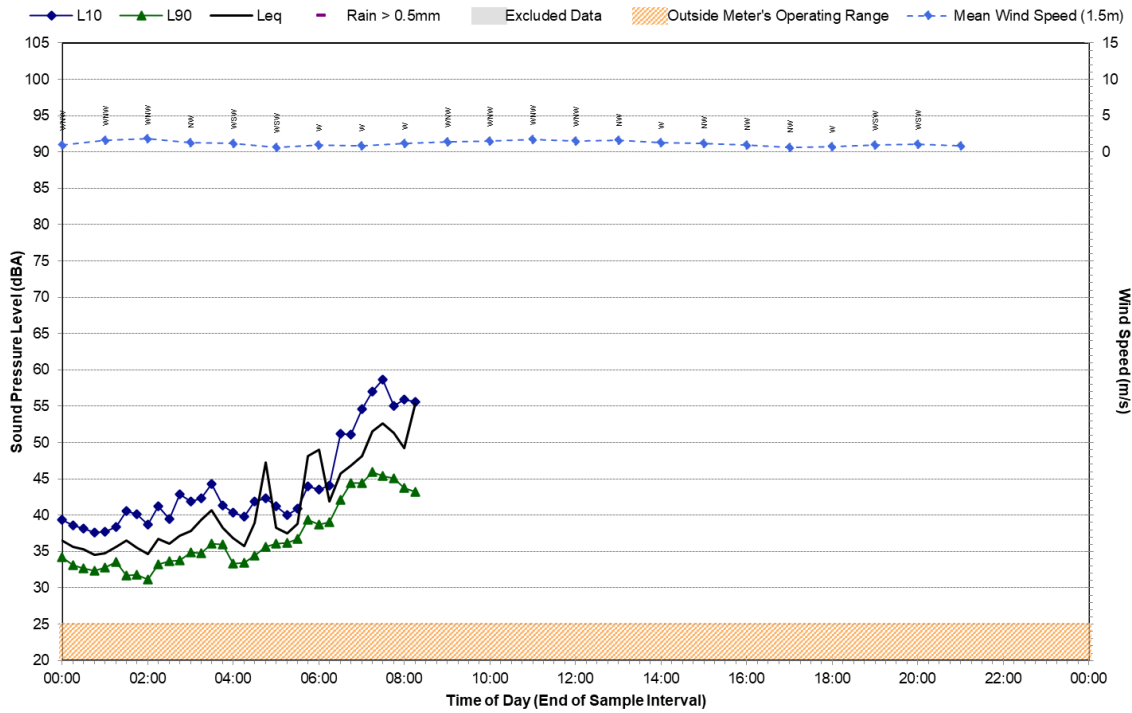
Statistical Ambient Noise Levels

Location I - Monday, 10 July 2023



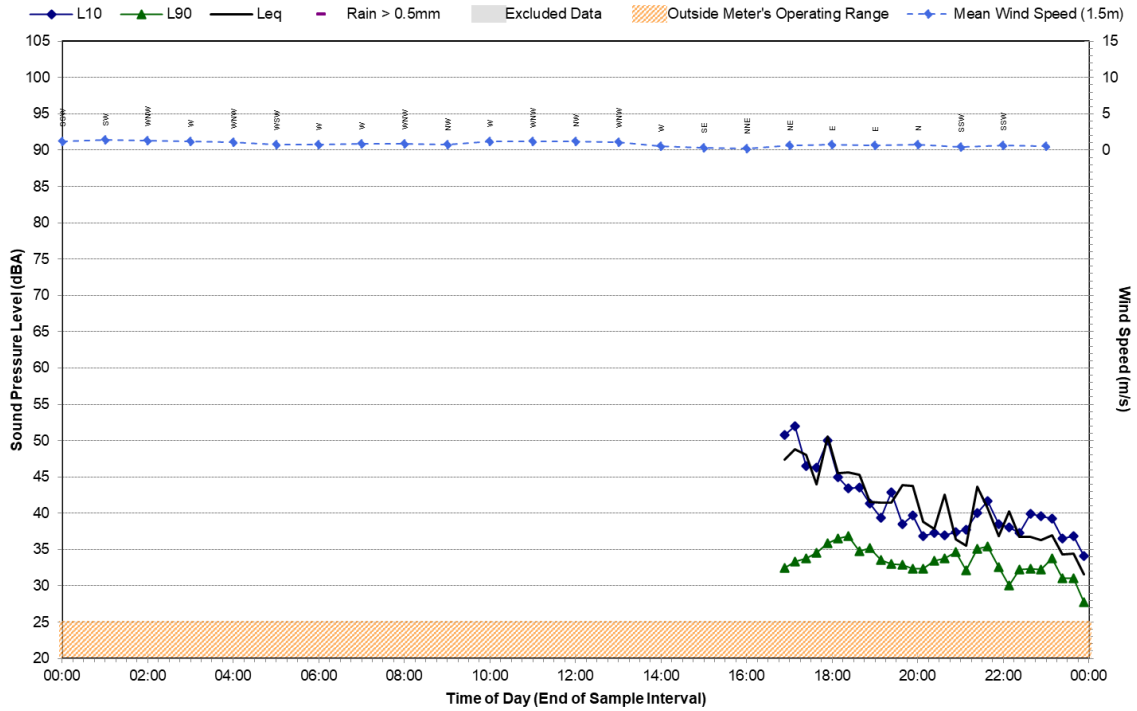
Statistical Ambient Noise Levels

Location I - Tuesday, 11 July 2023



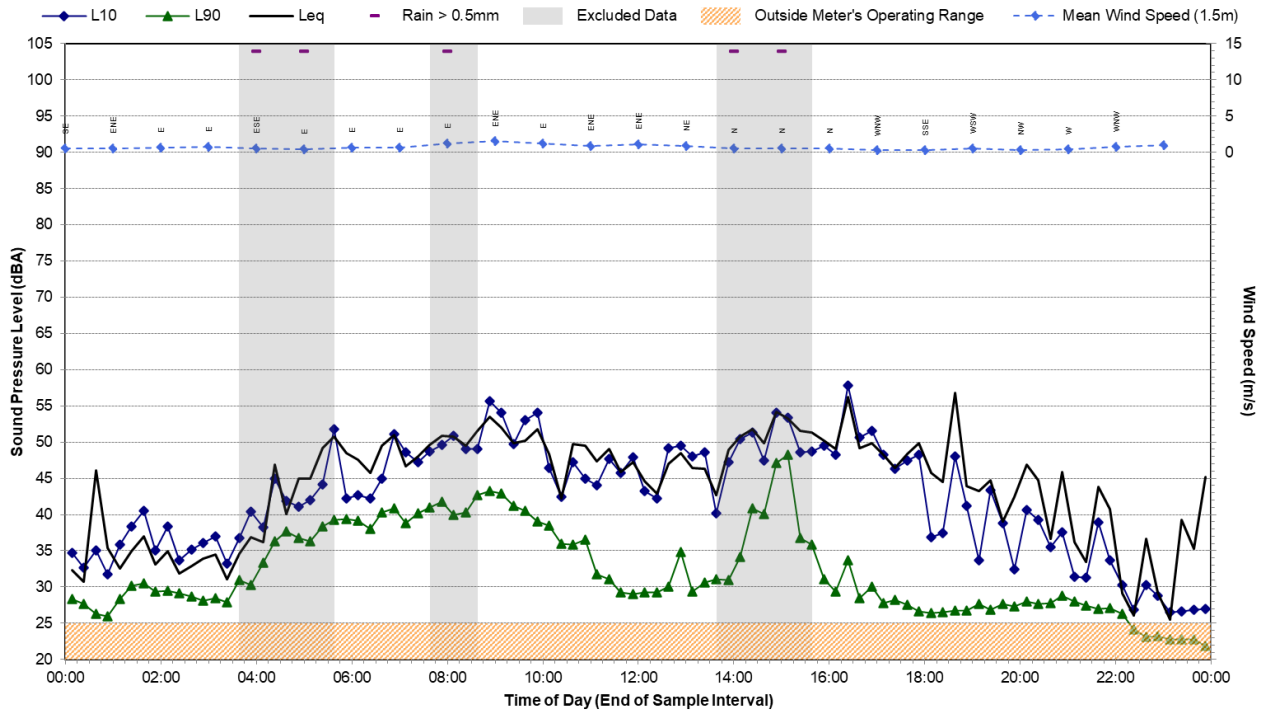
Statistical Ambient Noise Levels

Location L - Monday, 3 July 2023



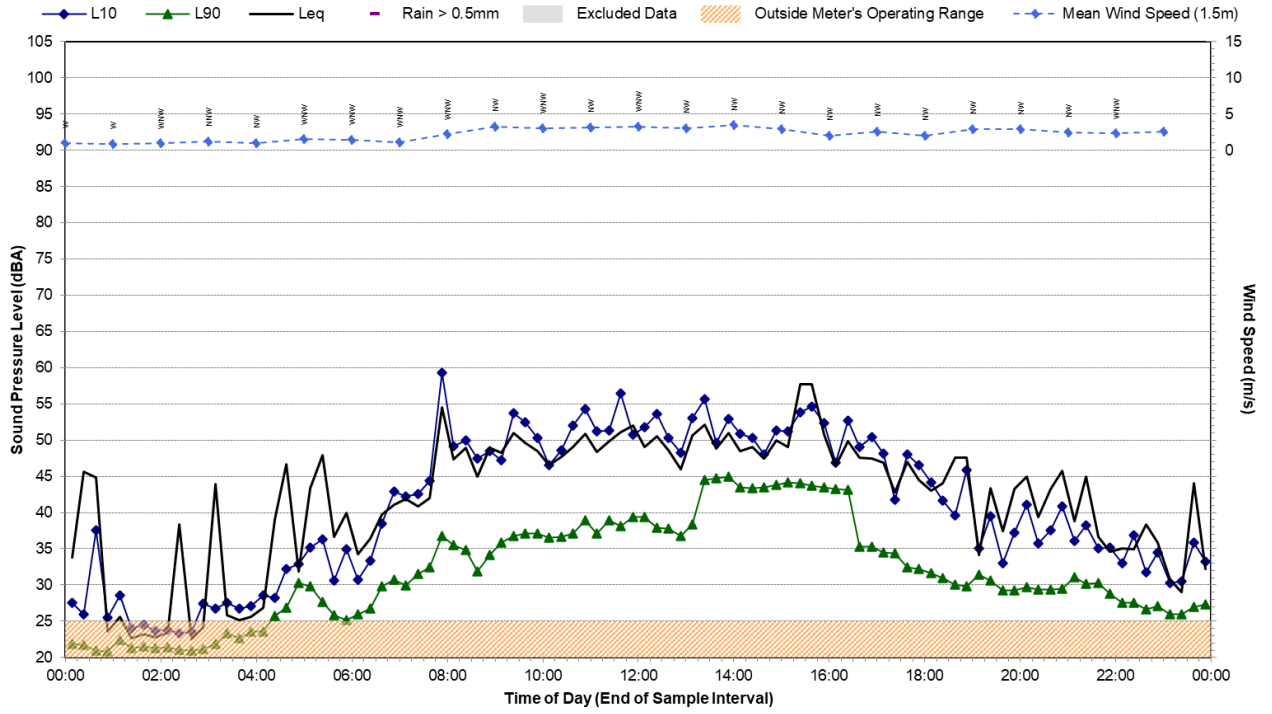
Statistical Ambient Noise Levels

Location L - Tuesday, 4 July 2023



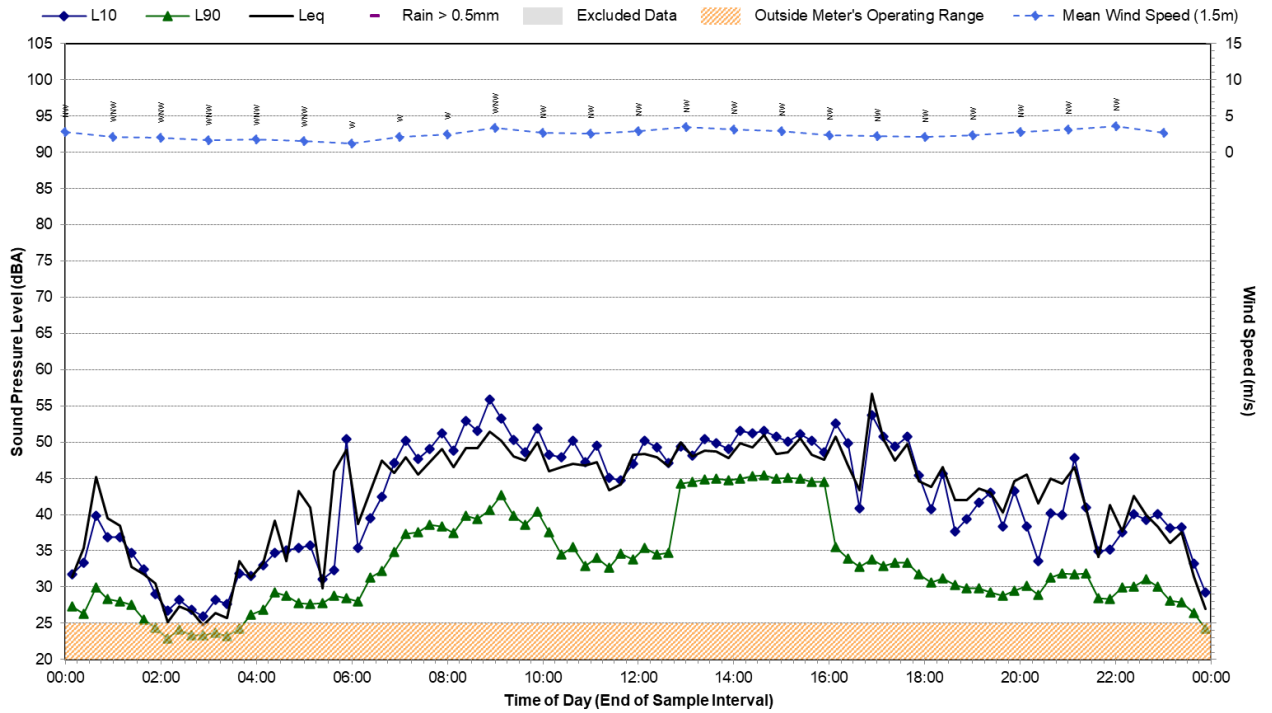
Statistical Ambient Noise Levels

Location L - Wednesday, 5 July 2023



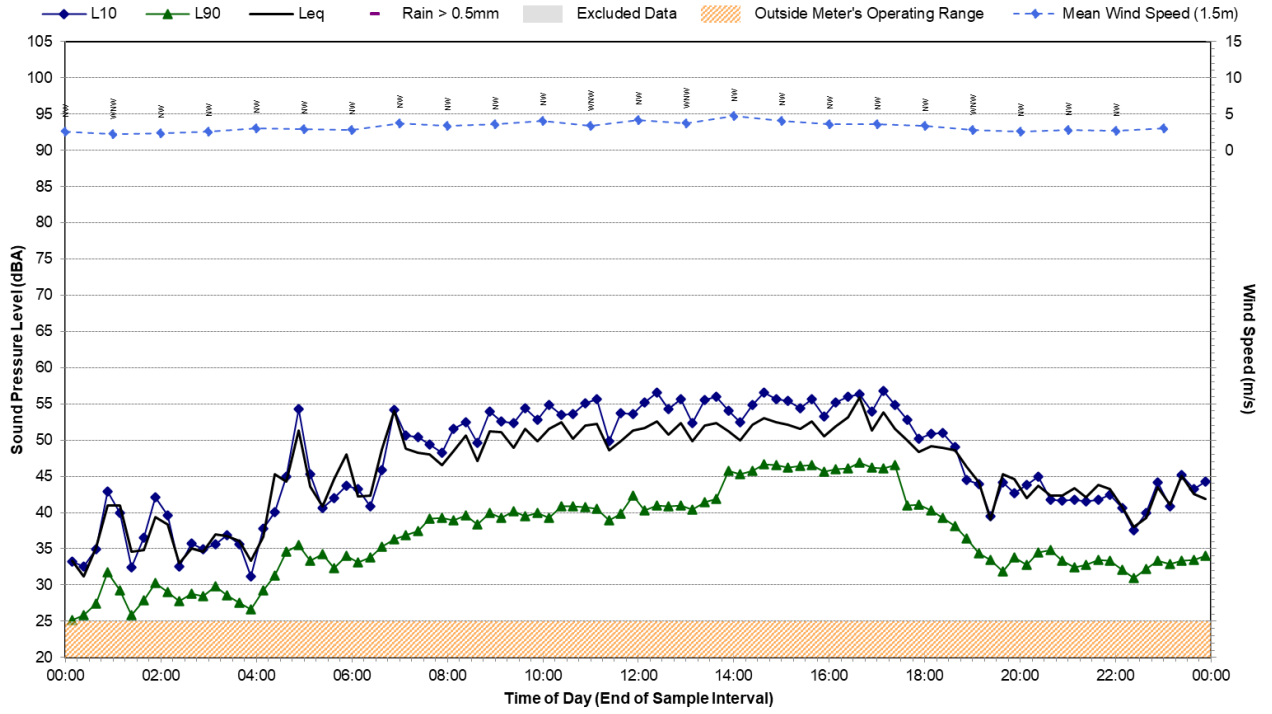
Statistical Ambient Noise Levels

Location L - Thursday, 6 July 2023



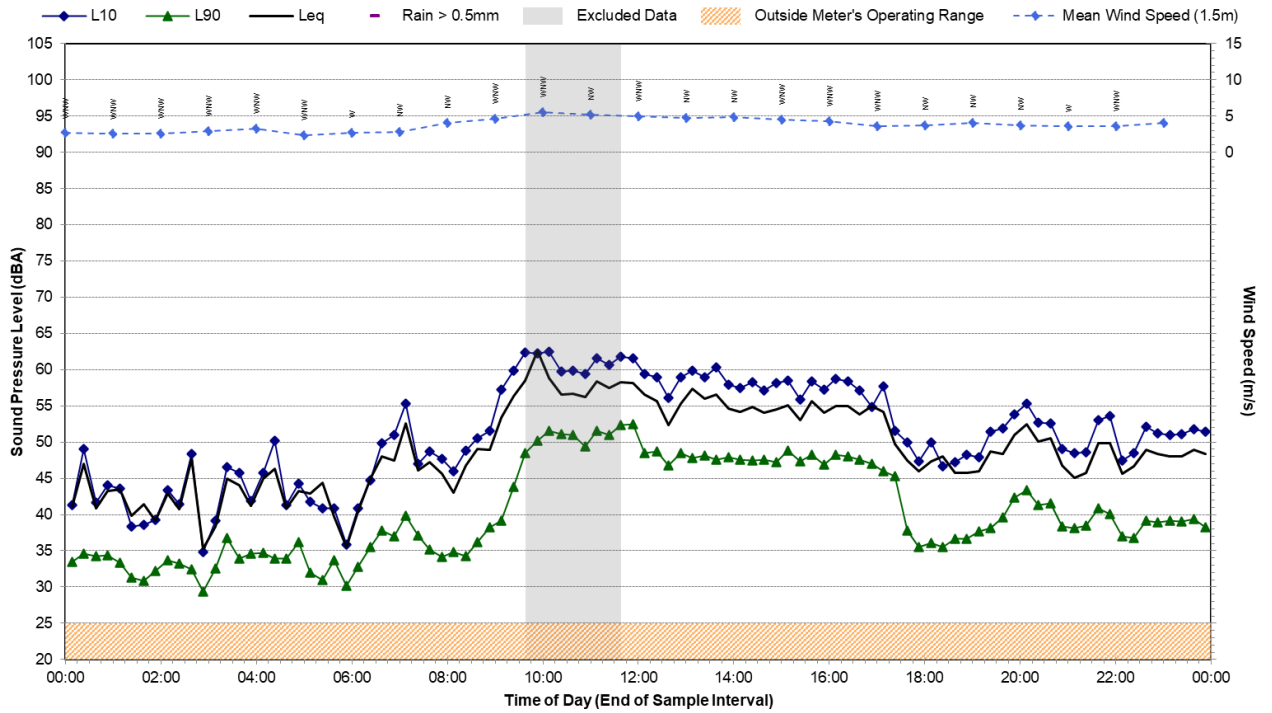
Statistical Ambient Noise Levels

Location L - Friday, 7 July 2023



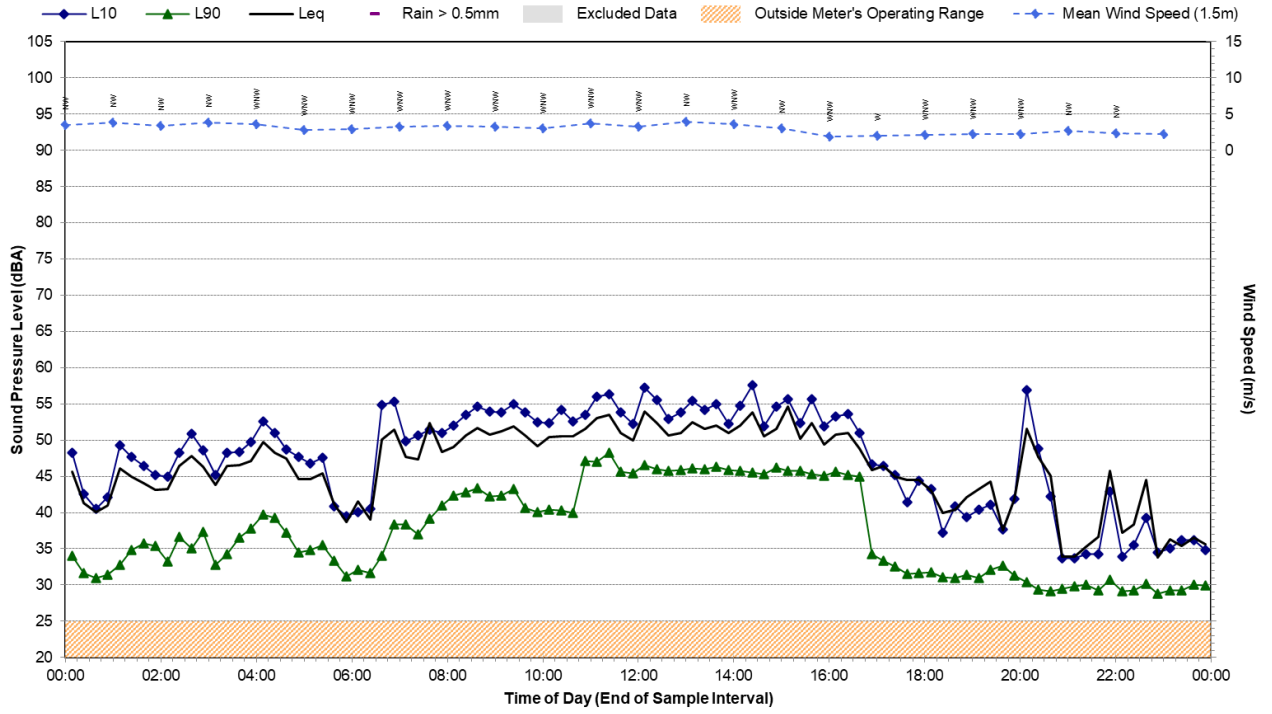
Statistical Ambient Noise Levels

Location L - Saturday, 8 July 2023



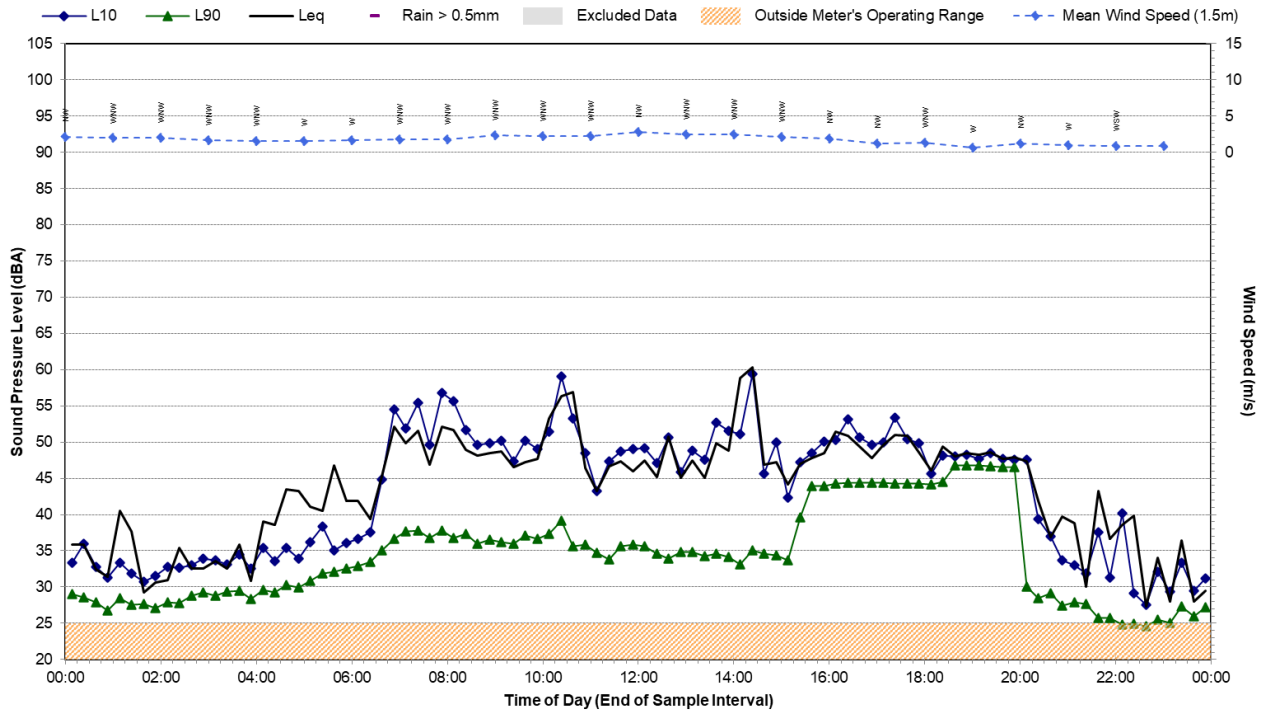
Statistical Ambient Noise Levels

Location L - Sunday, 9 July 2023



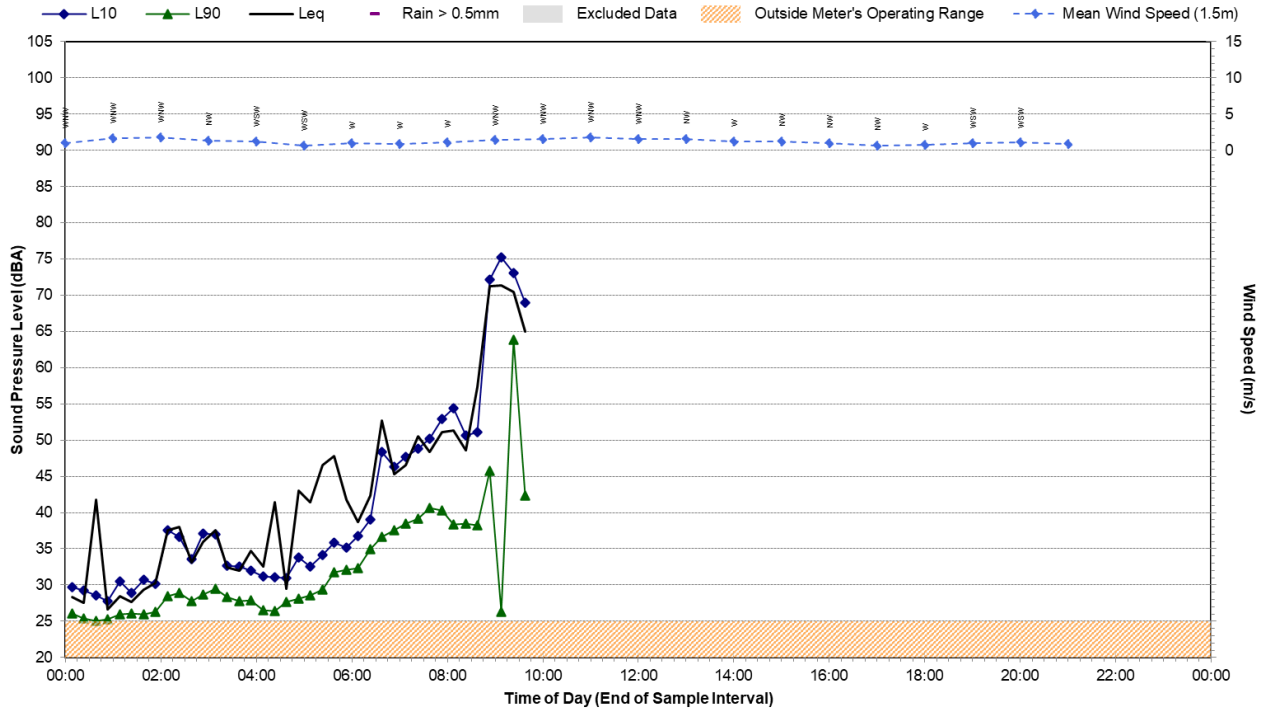
Statistical Ambient Noise Levels

Location L - Monday, 10 July 2023



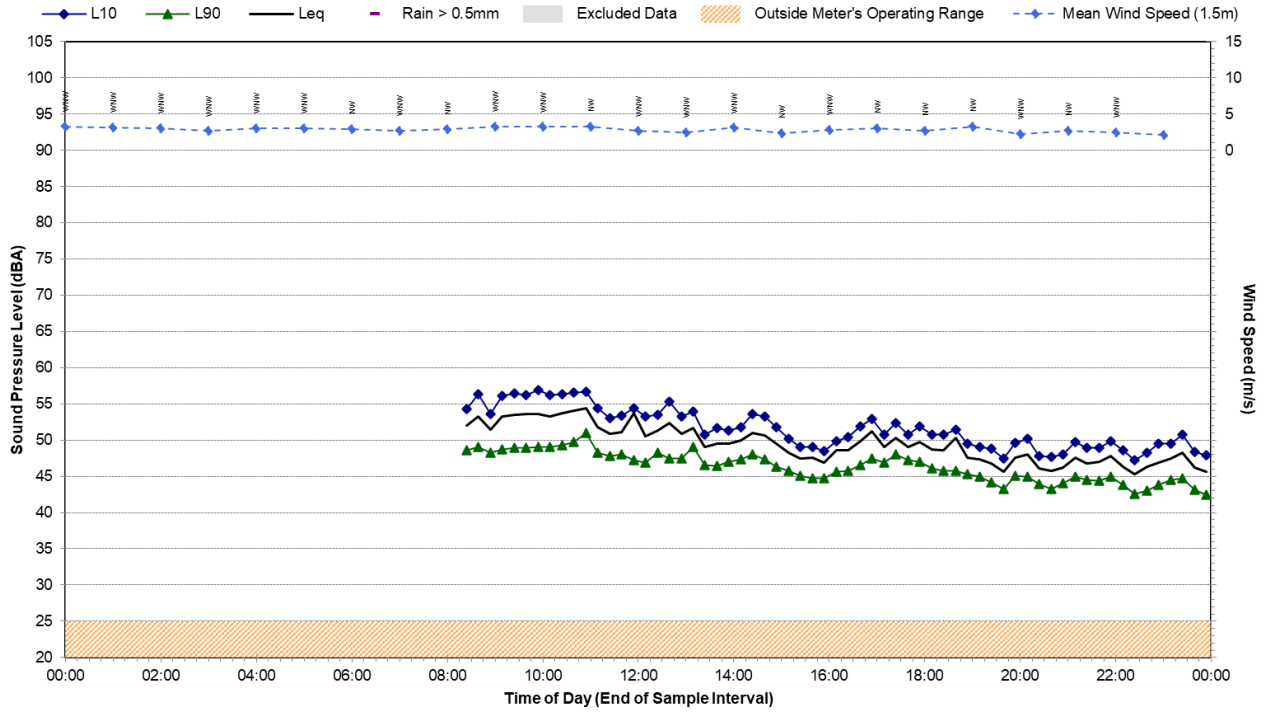
Statistical Ambient Noise Levels

Location L - Tuesday, 11 July 2023



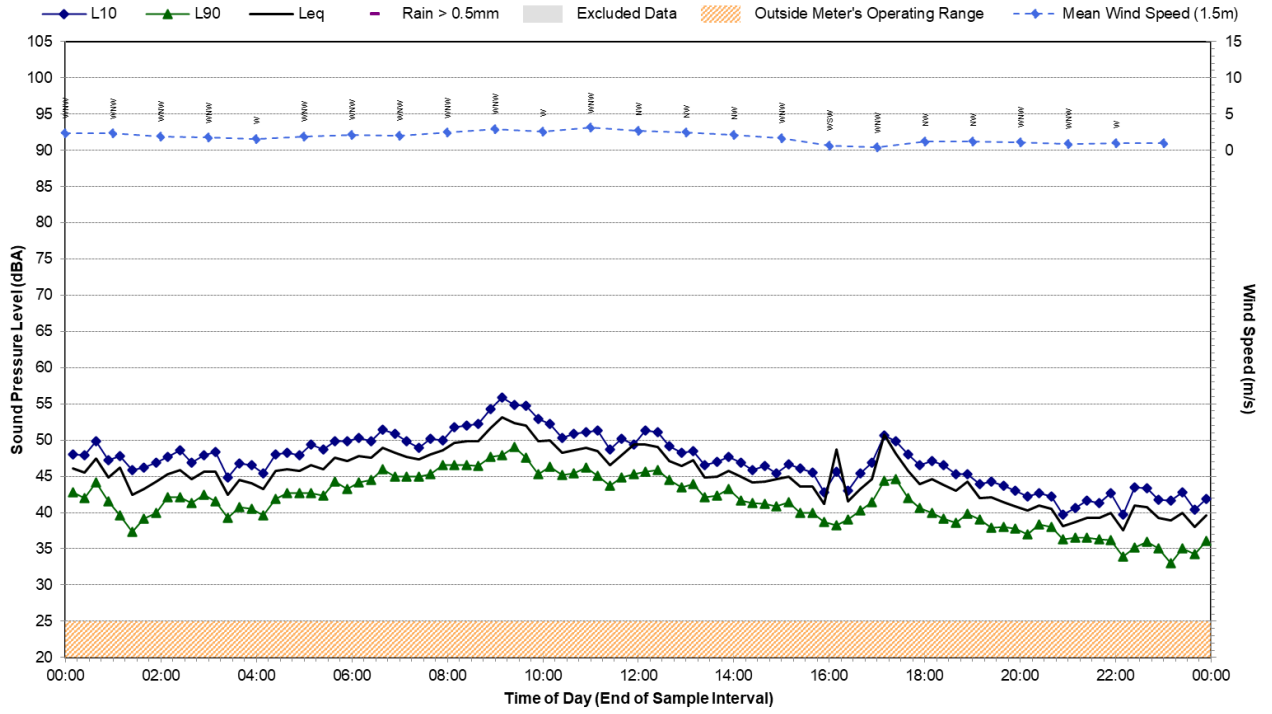
Statistical Ambient Noise Levels

Location J - Friday, 30 June 2023



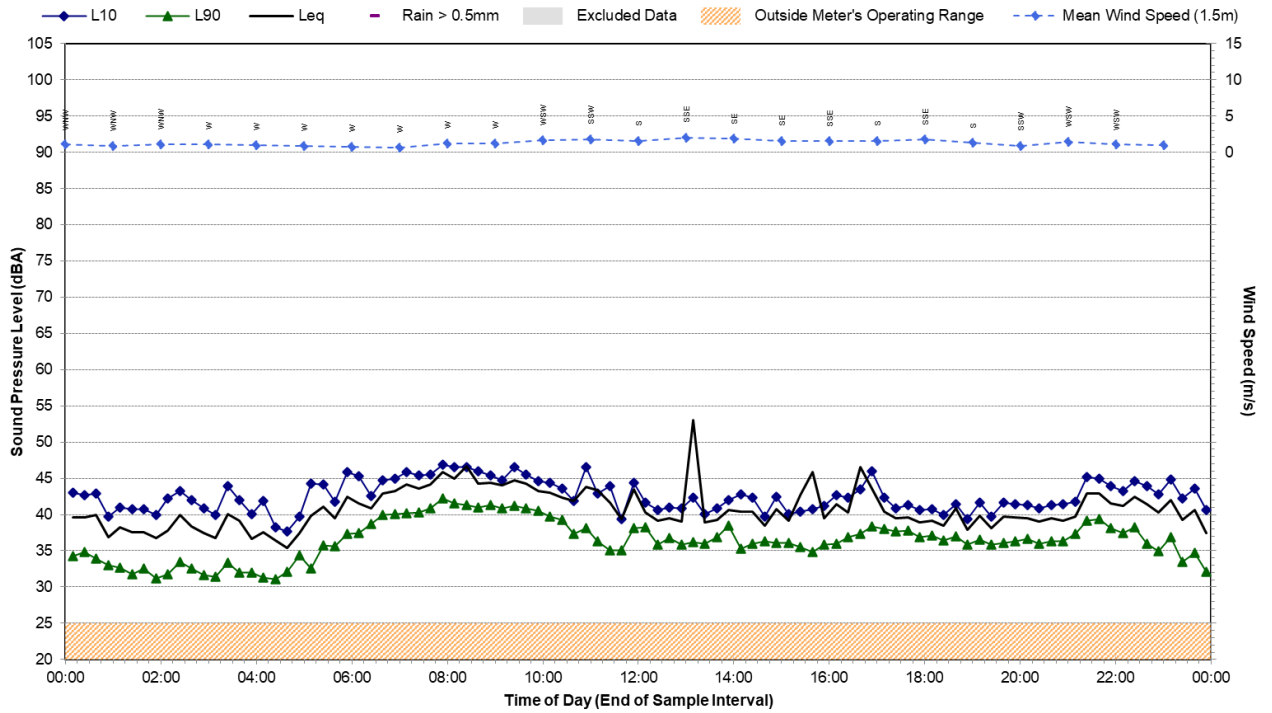
Statistical Ambient Noise Levels

Location J - Saturday, 1 July 2023



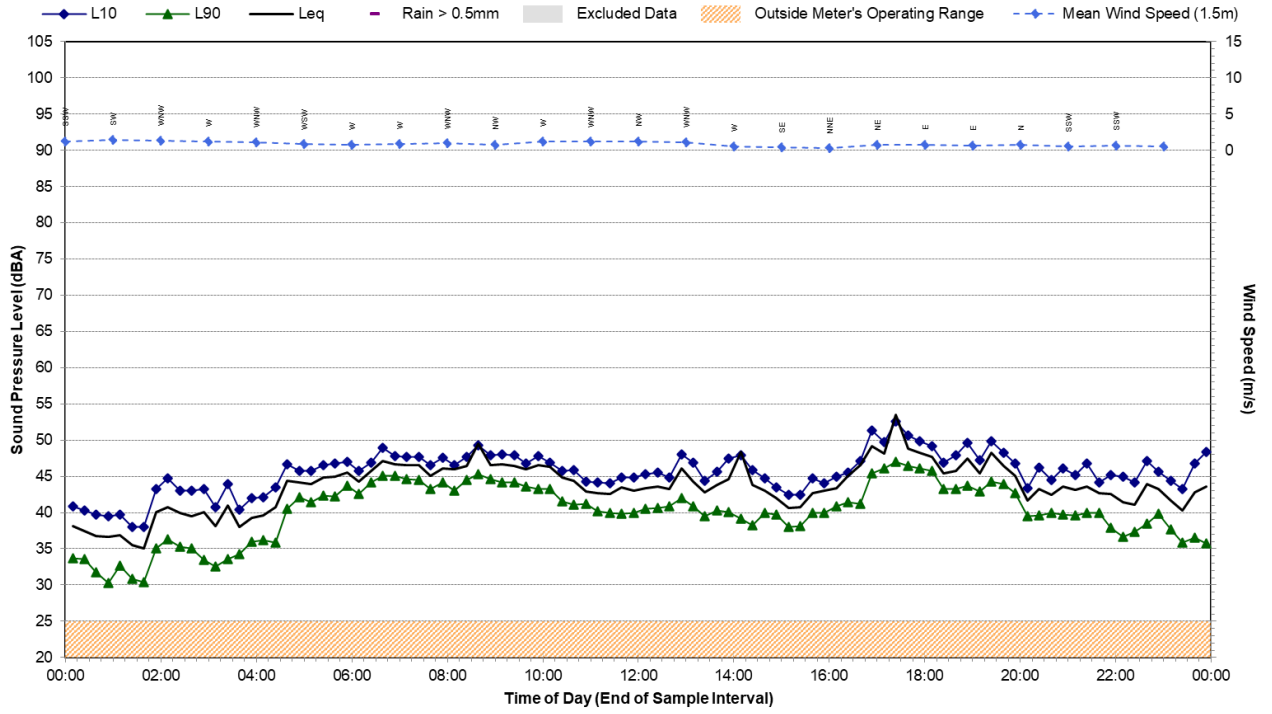
Statistical Ambient Noise Levels

Location J - Sunday, 2 July 2023



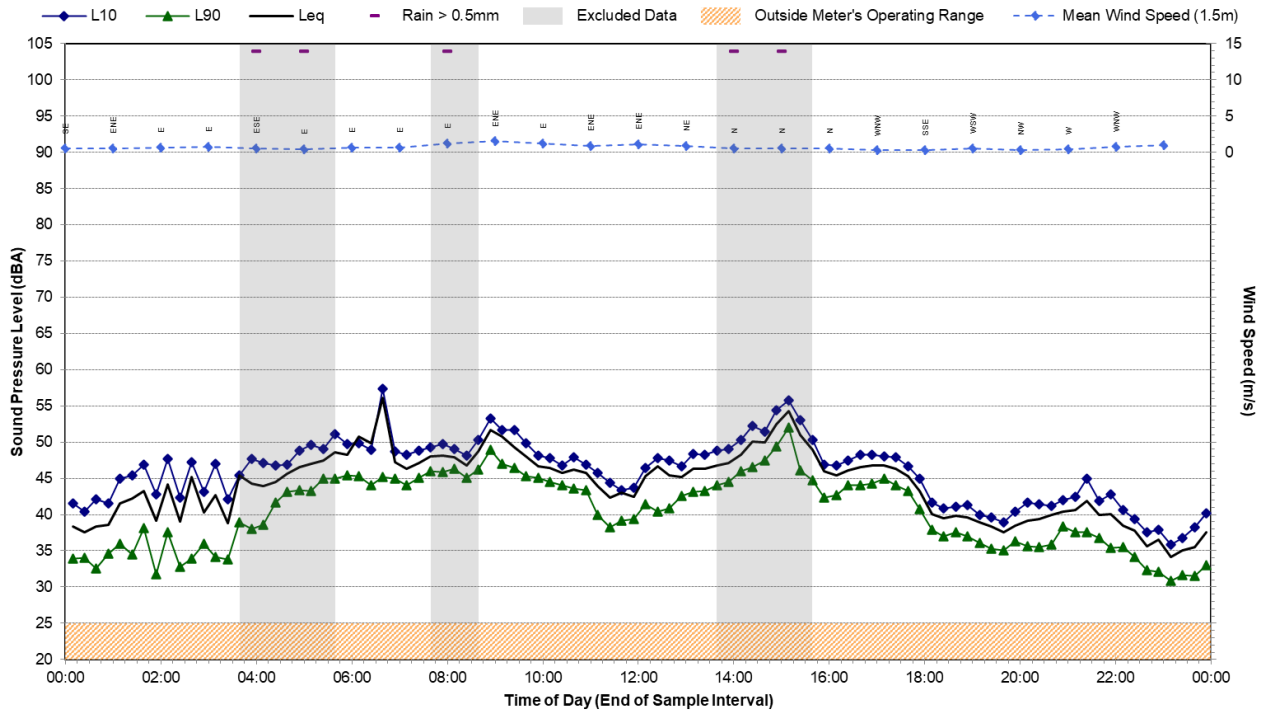
Statistical Ambient Noise Levels

Location J - Monday, 3 July 2023



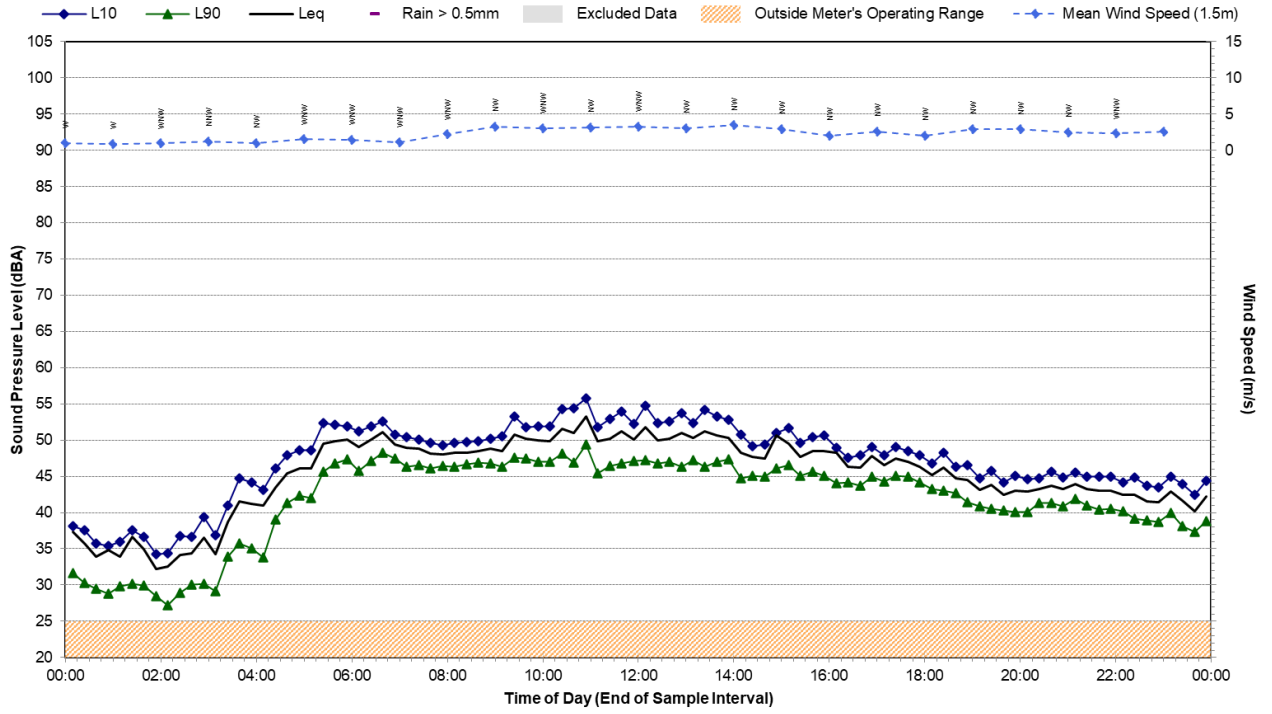
Statistical Ambient Noise Levels

Location J - Tuesday, 4 July 2023



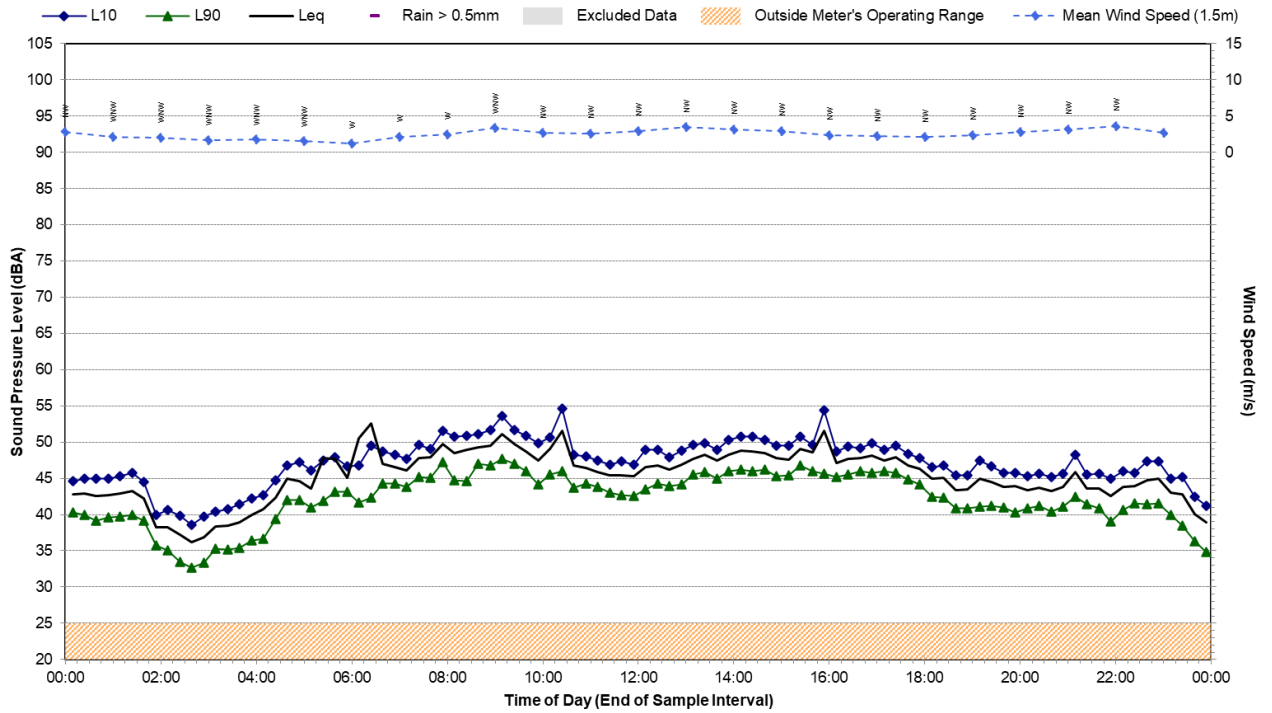
Statistical Ambient Noise Levels

Location J - Wednesday, 5 July 2023



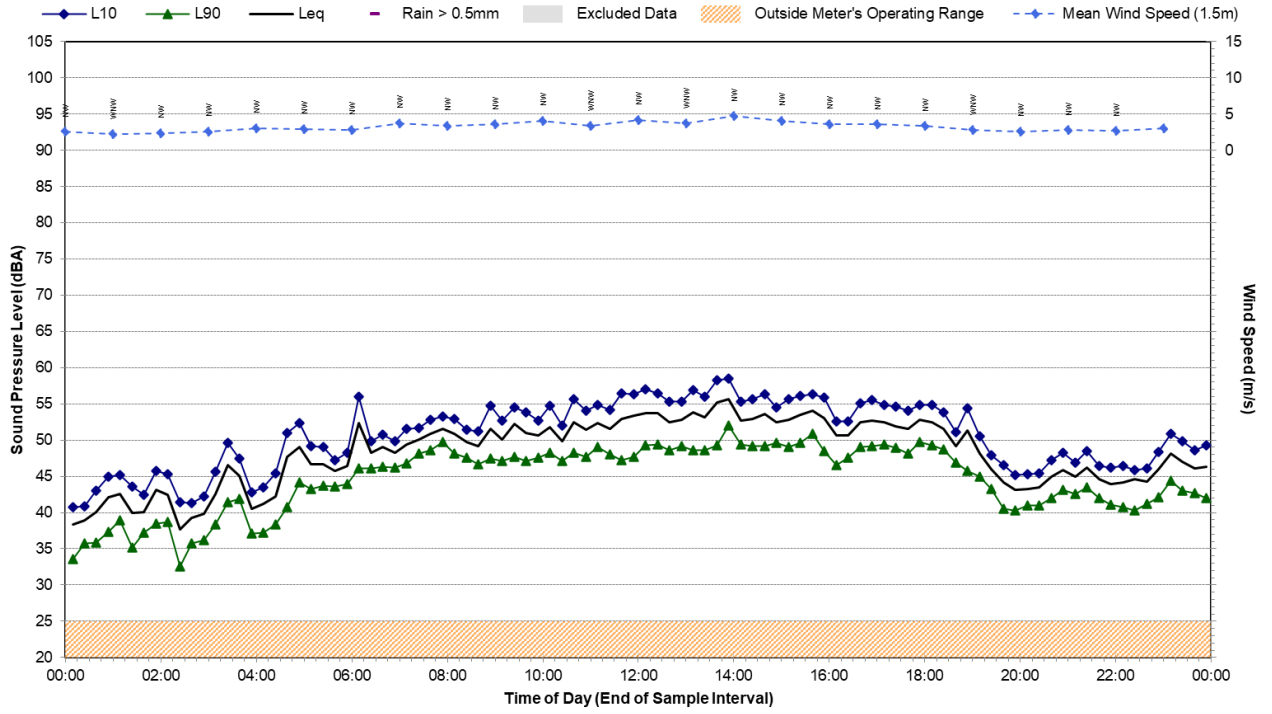
Statistical Ambient Noise Levels

Location J - Thursday, 6 July 2023



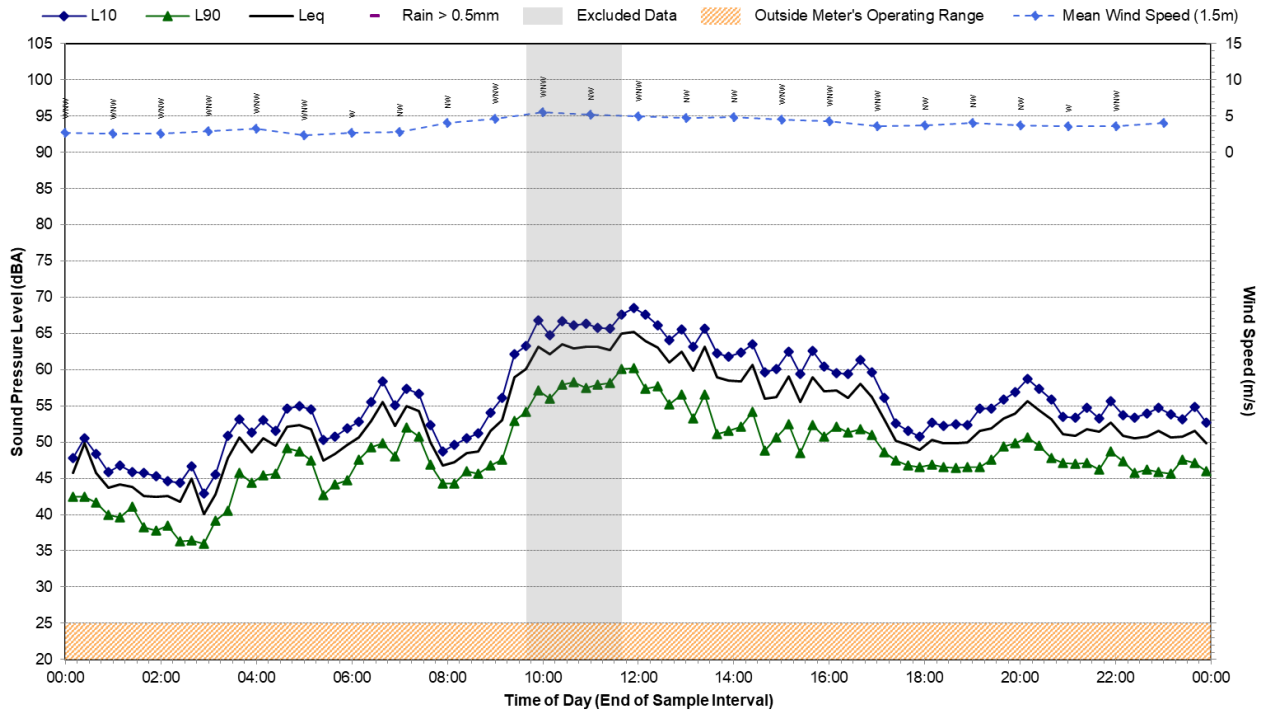
Statistical Ambient Noise Levels

Location J - Friday, 7 July 2023



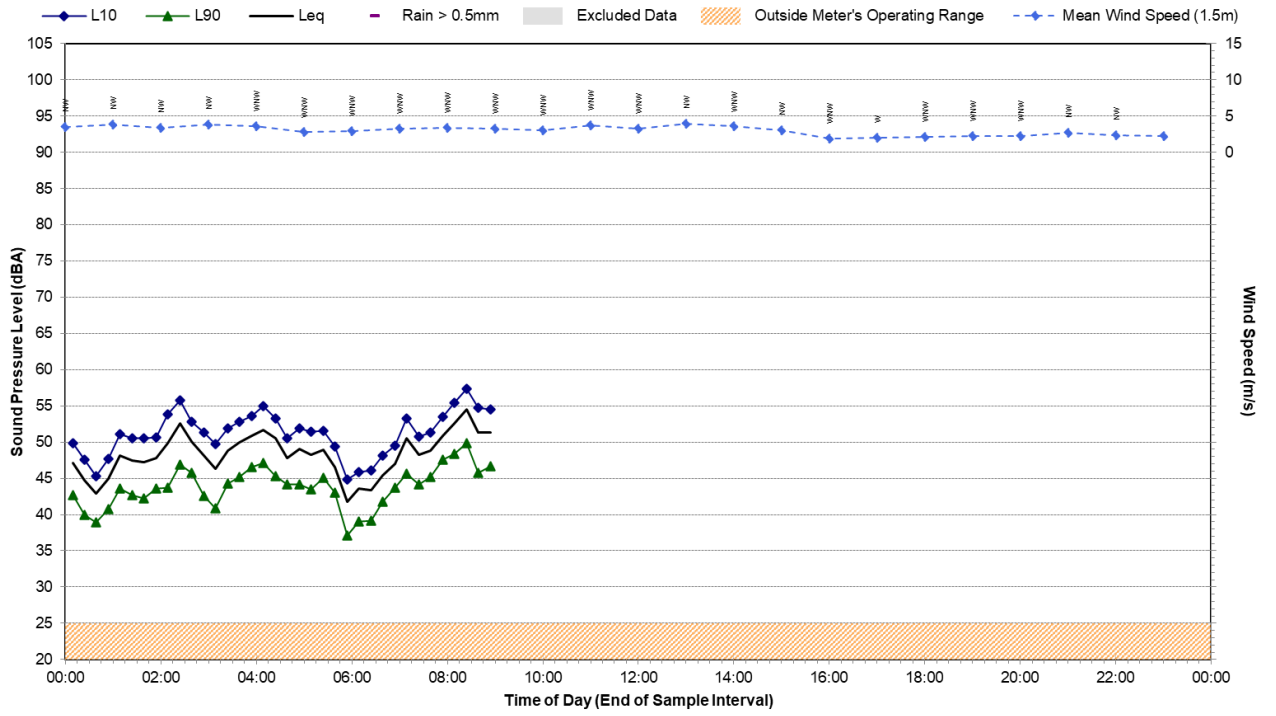
Statistical Ambient Noise Levels

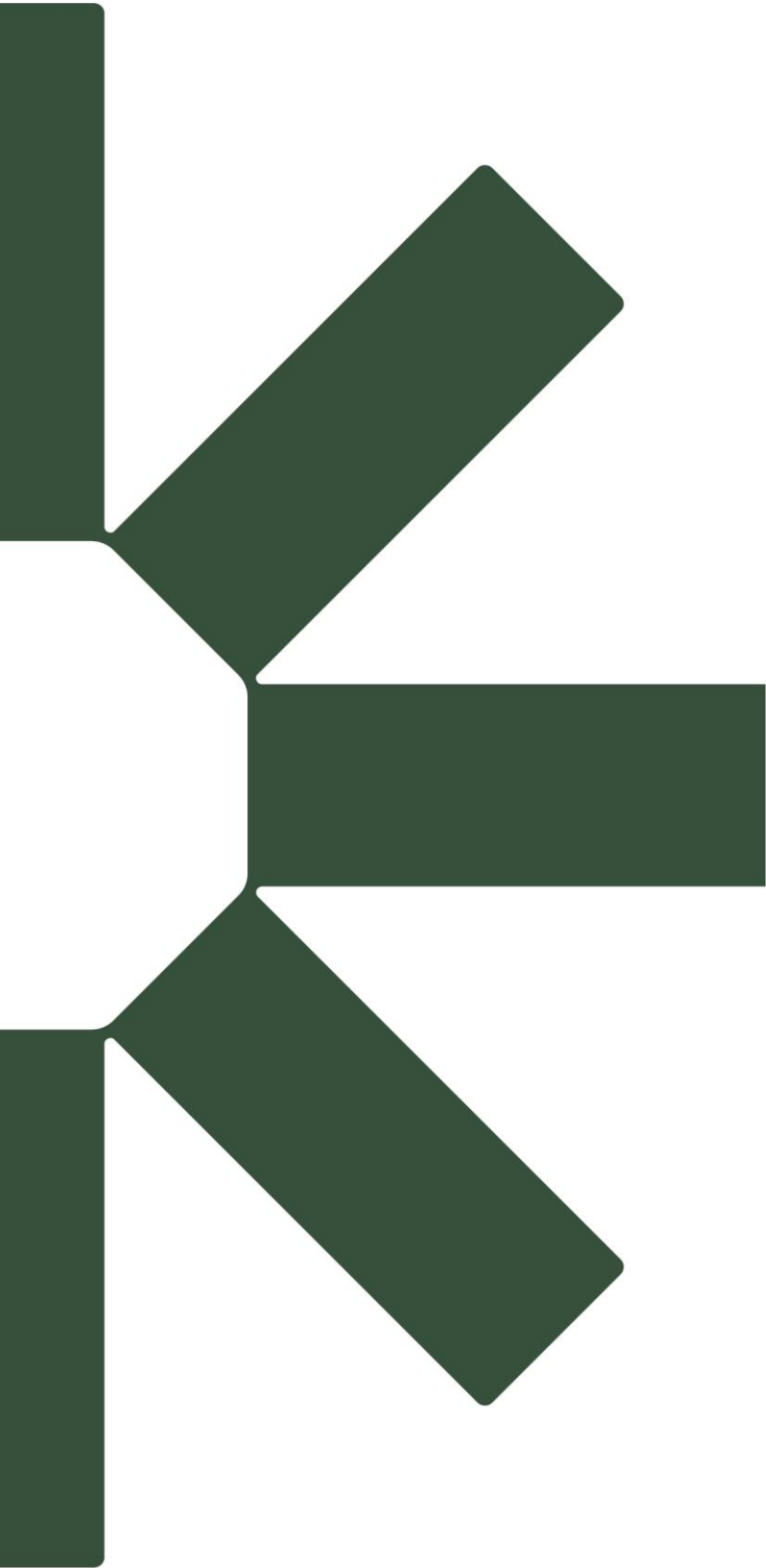
Location J - Saturday, 8 July 2023



Statistical Ambient Noise Levels

Location J - Sunday, 9 July 2023





Making Sustainability Happen



Donaldson and Abel Coal Mines

Bi-Annual Noise Monitoring – Half-year Ending December 2023

Donaldson Coal Pty Ltd

Box 5, L5, 28 Honeysuckle Drive
Newcastle NSW 2300

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Australia

SLR Project No.: 630.01053.20000

5 March 2024

Revision: v0.1

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
v0.1	5 March 2024	Martin Davenport	Jonathan Caine	Martin Davenport

Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Donaldson Coal Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.



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Appendices

Appendix A	Acoustic Terminology
Appendix B	Noise Monitoring Locations
Appendix C	Calibration Certificates
Appendix D	Statistical Ambient Noise Levels



1.0 Introduction

1.1 Background

Donaldson Coal Pty Ltd has commissioned SLR Consulting Australia Pty Ltd (SLR) to conduct half-yearly noise monitoring surveys for the Donaldson Coal Mine and Abel Coal Mine during the December 2023 half in accordance with the *Donaldson Coal Mine and Abel Underground Coal Mine - Noise Management Plan Care and Maintenance* (the NMP) dated 3 June 2019.

1.2 Objectives of this Report

The objectives of the noise monitoring survey for this half-year were as follows:

- Measure the ambient noise levels at six focus receptor locations (potentially worst affected) surrounding Donaldson Coal Mine and Abel Coal Mine.
- Qualify all sources of noise within each of the attended surveys, including estimated contribution or maximum level of individual noise sources.
- Assess the noise emissions of Donaldson Coal Mine and Abel Coal Mine with respect to the limits contained in the Development Consent.

1.3 Acoustic Terminology

The following report uses specialist acoustic terminology. An explanation of common terms is provided in **Appendix A**.

2.0 Development Consent Project Approval

Development consent was obtained by Donaldson Coal Pty Ltd for the Donaldson Mine in October 1999 following a Commission of Inquiry. Development Consent number N97/00147 was issued by the Minister for Urban Affairs pursuant to Section 101 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

Project Approval (Application No. 05_0136) granted by the Minister of Planning was obtained by Donaldson Coal Pty Ltd for Abel Coal Mine in 2007.

2.1 Donaldson Coal Mine Development Consent Conditions

The Development Consent nominates hours of operation and mine noise emission goals in the Sections entitled “*Operation of Development, Condition No. 3(1) and 3(2)*”, and “*Noise and Vibrational Noise Limits: Condition No. 15*” as follows:

3.(1) Subject to (2) the approved hours of operation are as follows:

Works	Period	Hours
Construction, including construction of any bunds	Monday to Friday Saturday	7 am to 6 pm 8 am to 1 pm
Mining operations, including mining, haulage of waste to dumps and coal processing	Monday to Friday Saturday, Sunday	24 hours per day 7 am to 6 pm



Works	Period	Hours
Road Transportation and stockpiling of coal	7 days per week	24 hours per day
Rail loading of coal	7 days per week	7 am to 10 pm
Maintenance of mobile and fixed plant	7 days per week	24 hours per day
Blasting, not involving closure of John Renshaw Drive	Monday to Saturday	7 am to 5 pm
Blasting, involving closure of John Renshaw Drive	Monday to Saturday	10 am to 2 pm
Notes: Restrictions on Public Holidays are the same as Sundays		

2. *The Applicant shall submit a report to the Director-General's satisfaction demonstrating the noise limits in Condition 15 can be met while rail loading of coal is occurring during the period from 6 pm to 10 pm. If that report does not demonstrate that the noise limits can be met to the Director-General's satisfaction, then the hours of operation for rail loading of coal shall be restricted to 7 am to 6 pm."*
15. *Unless subject to a negotiated agreement in accordance with Condition 23, the Applicant shall ensure that the noise emission from construction or mining operations, when measured or computed at the boundary of any dwelling not owned by the applicant (or within 30 metres of the dwelling, if the boundary is more than 30 metres from the dwelling), shall not exceed the following noise limits:*

Location	LA10(15minute) Noise Limits (dBA)	
	Daytime	Night-time
Beresfield area (residential)	45	35
Steggles Poultry Farm	50	40
Ebenezer Park Area	46	41
Black Hill Area	40	38
Buchanan and Louth Park Area	38	36
Ashtonfield Area	41	35
Thornton Area	48	40
Notes: Daytime is 7 am to 10 pm Monday-Saturday, and 8 am to 10 pm Sundays and Public Holidays. Night-time is 10 pm to 7 am Monday-Saturday, and 10 pm to 8 am Sundays and Public Holidays.		

The noise limits apply for prevailing meteorological conditions (winds up to 3 m/s), except under conditions of temperature inversions."

Other Conditions of Consent relevant to noise are as follows:



18. *The applicant shall survey and investigate noise reduction measures from plant and equipment and set targets for noise reduction in each Annual Environmental Management Report (AEMR), taking into consideration valid noise complaints received in the previous year. The Report shall also include remedial measures.*
19. *The Applicant shall revise the Noise Management Plan as necessary and provide an updated Plan five years after commencement of mining to the Director-General, the independent noise expert (Condition 48), EPA, Councils and the Community Consultative Committee.*

2.2 Abel Coal Mine – Project Approval

Approved Operations

The following operations are approved under the Abel Coal Mine Project Approval:

- Extraction of up to 6.1 Mtpa of Run of Mine (ROM) coal from the Abel Underground Coal Mine.
- Transport coal to the existing Bloomfield Coal Handling and Preparation Plant (CHPP) by private haul roads, or by coal conveyor, or by a combination of both methods.
- Operate the CHPP to process coal extracted from the Abel Coal Mine and the Bloomfield and Donaldson Coal Mines.
- Transportation of product coal from the Bloomfield site by rail via the Bloomfield rail loading facility.

The Project Approval was modified in June 2010 (05_0136 MOD 1) allowing construction and operation of a downcast ventilation fan. In May 2011 the Project Approval was modified again (05_0136 MOD 2) to allow the construction and operation of an upcast ventilation fan (and associated facilities). In December 2013 the Project Approval was further modified (05_0136 MOD3) to account for the increase in coal extracted including the upgrade of the Bloomfield CHPP.

Consent Conditions

The relevant conditions relating to noise from the Abel Coal Mine approval are reproduced below.

Schedule 4

NOISE

Operational Noise Criteria

1. *The Proponent shall ensure that the noise generated by the Project does not exceed the criteria in Table 4 at any residence on privately-owned land.*

Table 4: Operational Noise Criteria dB(A)

Location	Receiver Area	Day	Evening	Night	
		LAeq(15minute)	LAeq(15minute)	LAeq(15minute)	LA1(1minute)
Location I	Lord Howe Drive, Ashtonfield	36	36	36	45



Location	Receiver Area	Day	Evening	Night	
		LAeq(15minute)	LAeq(15minute)	LAeq(15minute)	LA1(1minute)
Location K	Catholic Diocese Land	37	37	37	45
Location L	Kilshanny Avenue, Ashtonfield	40	40	40	47
All other Locations	All other privately owned Residences	35	35	35	45

*Notes: To interpret the locations referred to in Table 4, see plan in Appendix 3.
Noise generated by the project is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy. Appendix 4 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.*

These noise criteria do not apply if the Proponent has an Agreement with the relevant landowner to generate higher noise levels, and the proponent has advised the Department in writing of the terms of this agreement.

Construction Noise Criteria

1. The proponent shall ensure that the noise generated during the construction of the downcast ventilation shaft as described in EA (MOD3) does not exceed the criteria in Table 5.

Table 5: Construction Noise Criteria dB(A)

Location	Receiver	Day
		LAeq(15minute)
Location R	281 Lings Road, Buttai	50
Location S	189 Lings Road, Buttai	43

*Notes: The criteria in Table 5 apply only whilst the downcast ventilation shaft is being constructed, and for a maximum of 12 weeks from the commencement of construction.
To interpret the locations referred to in Table 5, see plan in Appendix 3 (attached to this report as Appendix A).
Noise generated by the project is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy.*

However, these noise criteria do not apply if the Proponent has an Agreement with the relevant landowner to generate higher noise levels, and the proponent has advised the Department in writing of the terms of this agreement.

Rail Noise Criteria

1. The proponent shall ensure that the noise from rail movements on the Bloomfield Rail Spur does not exceed the limits in Table 6 at any residence on privately owned land.

Table 6: Rail Spur noise criteria dB (A)

Table Heading	Day	Evening	Night
	LAeq(period)		
All privately owned land	55	45	40



Cumulative Noise Criteria

1. *The proponent shall implement all reasonable and feasible measures to ensure that the noise generated by the project combined with noise generated by other mines does not exceed the criteria in Table 7 at any residence on privately-owned land.*

Table 7: Cumulative noise criteria dB (A)

Table Heading	Day	Evening	Night
	LAeq(period)		
All privately owned land	55	45	40
Notes: Cumulative noise is to be measured in accordance with the relevant requirements, and exemptions (including meteorological conditions), of the NSW Industrial Noise Policy. Appendix 4 sets out the metrological conditions under which these criteria apply and the requirements for evaluating compliance with these criteria.			

Operating Conditions

1. *The proponent shall:*
 - a. *Implement best management practise to minimise the construction, operational, road and rail noise of the project;*
 - b. *Operate an on-site noise management system to ensure compliance with the relevant conditions of this approval;*
 - c. *Minimise the noise impacts of the project during meteorological conditions under which the noise limits in this consent do not apply (see Appendix 4);*
 - d. *Only receive and/or dispatch locomotives and rolling stock either on or from the site that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL (No. 3142);*
 - e. *Carry out regular monitoring to determine whether the project is complying with the noise criteria and other relevant conditions of approval, to the satisfaction of the Director-General.*

Noise Management Plan

2. *The proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Director-General. This plan must:*
 - a. *Be prepared in consultation with the EPA, and be submitted to the Director-General for approval within 6 months of the date of approval of MOD 3;*
 - b. *Describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this approval; Describe the proposed noise management system in detail; and*
 - c. *Include a monitoring program that:*
 - *Uses attended monitoring to evaluate the compliance of the project against the noise criteria in this approval;*
 - *Evaluates and reports on:*
 - *The effectiveness of the on-site noise management system; and*
 - *Compliance against the noise operating conditions; and*



- *Defines what constitutes a noise incident, and includes protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents. Appendix 4*

Noise Compliance Assessment

Applicable Meteorological Conditions

1. *The noise criteria in Tables 4 and 7 are to apply under all metrological conditions except the following:*
 - 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 measured at 10m above ground level; or*
 - d. *Temperature inversion conditions greater than 3°C/100m.*

Determination of Meteorological Conditions

2. *Except for wind speed at microphone height, the data to be used for determining metrological conditions shall be that recorded by the meteorological station located on the site.*

Compliance Monitoring

3. *Attended monitoring is to be used to evaluate compliance with the relevant conditions of this approval.*
4. *Unless otherwise agreed with the director-general, this monitoring is to be carried out in accordance with the relevant requirements 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. *Metrological conditions during which collection of noise data is not appropriate;*
 - c. *Equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and*
 - d. *Modification to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.*

Appendix 5

Statement of Commitments

3. Noise

3.1 Construction Activities

The following noise control measures will be implemented prior to commencement of construction of the Abel Underground Mine or the upgrade of the Bloomfield CHPP.

1. *Maintain all machinery and equipment in working order;*



- a. *No construction activities at the Abel pit top will take place on Sundays or Public Holidays;*
- b. *Where possible locate noisy site equipment behind structures that act as barriers or at the greatest distance from noise sensitive areas; and*
- c. *Orientate equipment so that noise emissions are directed away from noise sensitive areas.*

3.2 Noise Control Measures

- a. *The following noise control measures will be implemented prior to the mining of coal from the Abel underground Mine:*
 - i. *Orientation of the ventilation fans away from residential receivers and angle the output parallel to the ground.*
 - ii. *The sound power level of the front end loader to be used near the portal should not exceed 113 dBA and will be fitted with a noise sensitive reversing alarm.*
- b. *The following noise control measures will be implemented prior to the Bloomfield CHPP receiving any ROM coal from Able Underground Mine;*
 - i. *Noise mitigation works including partial enclosure and noise screening of drives and conveyors of the Bloomfield CHPP to screen residences to the north of the site.*

3.2 Monitoring

The Company will implement a Noise Monitoring Program for the Abel Underground Mine and the Bloomfield CHPP, to the satisfaction of the Director-General. The Noise Monitoring Program shall include a combination of real-time and supplementary attended monitoring measures, and a noise monitoring protocol for evaluating compliance with the noise environmental assessment. This plan will be integrated with the monitoring plans for the Tasman, Donaldson and Bloomfield Mines to provide a single integrated Noise Monitoring Program for all 4 mines.

3.4 Continuous Improvement

The Company shall:

- a. *Report on these investigations and implementation of any new noise mitigation measures on site in the AEMR, to the satisfaction of the Director General.*

The operator of the Bloomfield CHPP shall:

- b. *Investigate ways to reduce the noise generated by the Bloomfield CHPP, including maximum noise levels which may result in sleep disturbance;*
- c. *Implement all reasonable and feasible best practice noise mitigation measures on the site; and*



- d. Report on these investigations and the implementation of any new noise mitigation measures on site in the AEMR, to the satisfaction of the Director-General

3.0 Noise Monitoring Methodology

3.1 General Requirements

The operational noise monitoring program was conducted with reference to Development Consent N97/00147 (Donaldson Coal Mine), Project Approval 05_0136 (Abel Coal Mine), the NMP and AS 1055-2018 *Acoustics - Description and Measurement of Environmental Noise*.

All acoustic instrumentation employed throughout the monitoring program has been designed to comply with the requirements of AS IEC 61672.1 – 2019 *Electroacoustics—Sound level meters*, AS IEC 60942 2017 *Electroacoustics – Sound calibrators* and carried current NATA or manufacturer calibration certificates. Certificates for acoustic instrumentation used during the December 2023 half is provided in **Appendix B**.

Instrument calibration was conducted before and after each measurement, with the variation in calibrated levels not exceeding ± 1.0 dBA.

3.2 Monitoring Locations

Baseline and preceding operational half-yearly surveys have been conducted at 11 locations surrounding the Donaldson Mine and Abel Coal Mine sites. With the experience of these previous surveys, it was decided to concentrate noise monitoring at six focus locations that represent the potentially most noise affected areas from Donaldson Mine and Abel Coal Mine. The details of the monitoring locations are contained within **Table 1**.

It is relevant to note that Donaldson Open Cut Mine has ceased production and all major earthworks on the site have been finalised. Furthermore, Abel mine was placed in Care & Maintenance on 28th April 2016 and there were no operations onsite during the December 2023 noise monitoring period.

Table 1 Monitoring Locations

Noise Monitoring Location	Description
D	Black Hill School, Black Hill
F	Lot 684 Black Hill Road, Black Hill
G	156 Buchannan Road, Buchannan
I	Magnetic Drive, Ashtonfield
J	Parish Drive, Thornton
L	65 Tipperary Dr, Ashtonfield

A map giving the approximate location of the noise monitoring sites is contained within **Appendix C**.



3.3 Unattended Noise Monitoring

An environmental noise logger was deployed for a minimum of a seven day period between Thursday 30 November 2023 and Friday 5 January 2024 at each of the six (6) nominated locations given in **Table 1**.

All unattended monitoring equipment was programmed to continuously record statistical noise level indices in 15 minute intervals including the L_{Amax} , $LA1$, $LA10$, $LA90$, $LA99$, L_{Amin} and L_{Aeq} . The statistical noise exceedance levels (L_{AN}) are the levels exceeded for N% of the 15 minute interval. The $LA90$ represents the level exceeded for 90% of the interval period and is referred to as the average minimum or background noise level. The $LA10$ is the level exceeded for 10% of the time and is usually referred to as the average maximum noise level. The L_{Aeq} is the equivalent continuous sound pressure level and represents the steady sound level which is equal in energy to the fluctuating level over the interval period. The L_{Amax} is the maximum noise level recorded over the interval.

3.4 Operator Attended Noise Monitoring

Operator attended surveys were conducted at each of the six monitoring locations during the daytime, evening and night-time periods, to verify the unattended logging results and to determine the character and contribution of ambient noise sources.

4.0 Operator Attended Noise Monitoring

4.1 Results of Operator Attended Noise Monitoring

Operator attended noise measurements were conducted commencing during the daytime on 30 November 2023 then again on the evening of 21 December 2023 and finished during the daytime period on 22 December 2023. Operator attended noise surveys were conducted using a Brüel & Kjær Type 2250L (serial number 3003389) sound level meter.

Ambient noise levels given in the tables include all noise sources such as traffic, insects, birds, and mine operations as well as any other industrial operations.

The tables provide the following information:

- Monitoring location.
- Date and start time.
- Wind velocity (m/s) and Temperature ($^{\circ}C$) at the measurement location.
- Typical maximum (L_{Amax}) and contributed noise levels.

Mine contributions listed in the tables are from the Abel Coal Mine and are stated only when a contribution could be quantified.



Table 2 Location D, Black Hill Public School, Black Hill

Period	Date/ Start time/Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission, Typical Maximum Noise Levels (L _{Amax} – dBA)
		L _{Amax}	LA1	LA10	LA90	L _{Aeq}	
Day	30/11/2023 11:45 27°C 4.5 m/s NW	79	68	58	47	57	Birdsong 52-62 Wind in trees 45-50 Road traffic -56-79 Excavator (not site related) 50 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					
Evening	21/12/2023 18:13 19°C 3.4 m/s S	75	61	53	41	52	Birdsong/frogs 51-65 Road traffic 38-75 Wind in trees 36-44 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					
Night	21/12/2023 22:37 19°C 4.5 m/s SSW	56	51	48	42	46	Distant traffic 35-41 wind in trees 36-48 Insects/frogs/bats 44-56 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					

Table 3 Location F, Lot 684 Black Hill Road, Black Hill

Period	Date/ Start time/Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission, Typical Maximum Noise Levels (L _{Amax} – dBA)
		L _{Amax}	LA1	LA10	LA90	L _{Aeq}	
Day	22/12/2023 15:39 22°C 4.2 m/s SSE	77	71	57	53	57	Insects 42 Birdsong 48-69 Road traffic 52-77 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					
Evening	21/12/2023 18:33 19°C 3.4 m/s S	78	68	56	41	55	Birdsong/frogs 48-64 Road traffic 45-78 Farm machinery 35-44 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					
Night	21/12/2023 23:00 19°C 3.2 m/s SSW	74	60	48	38	49	Insects 37-42 Road traffic 45-74 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					

Table 4 Location G, Buchanan Road, Buchanan

Period	Date/ Start time/Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission, Typical Maximum Noise Levels (L _{Amax} – dBA)
		L _{Amax}	LA1	LA10	LA90	L _{Aeq}	
Day	22/12/2023 14:12 23°C 4.0 m/s SSE	73	66	61	55	59	Insects 53-63 Aeroplane 73 Road traffic 44-50
		Estimated Abel Mine Noise Contribution Inaudible					



Period	Date/ Start time/Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission, Typical Maximum Noise Levels (L _{Amax} – dBA)
		L _{Amax}	LA1	LA10	LA90	L _{Aeq}	
							Abel Mine Inaudible
Evening	21/12/2023 19:50 19°C 4.6 m/s SSW	75	74	73	43	67	Birdsong 46 Road traffic 38-50 Insects 42-75 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					
Night	22/12/2023 00:06 18°C 2.7 m/s WNW	53	48	42	32	39	Insects/bats 36-51 Road traffic 42-53 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					

Table 5 Location I, Magnetic Drive, Ashtonfield

Period	Date/ Start time/Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission, Typical Maximum Noise Levels (L _{Amax} – dBA)
		L _{Amax}	LA1	LA10	LA90	L _{Aeq}	
Day	22/12/2023 13:22 24°C 3.0 m/s SE	79	67	46	37	53	Birdsong 45-54 Road traffic 52-79 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					
Evening	21/12/2023 20:38 19°C 5.1 m/s SSW	66	57	45	41	46	Road traffic 55-66 Frogs/insects 42-49 Abel Mine Audible CHPP 33-35
		Estimated Abel Mine Noise Contribution 33 dBA L _{Aeq} (15minute)					
Night	22/12/2023 00:55 18°C 2.7 m/s SSW	52	40	38	35	37	Insects/frogs 34-42 Bats 52 Distant traffic 30-36 Abel Mine Barely Audible CHPP (dozer) <30
		Estimated Abel Mine Noise Contribution <30 dBA L _{Aeq} (15minute) <30 LA1(1minute)					

Table 6 Location J, Parish Drive, Thornton

Period	Date/ Start time/Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission, Typical Maximum Noise Levels (L _{Amax} – dBA)
		L _{Amax}	LA1	LA10	LA90	L _{Aeq}	
Day	22/12/2023 13:00 24°C 3.1 m/s SE	59	51	45	40	43	Birdsong 43-59 Wind in trees 42-46 Road traffic 40-44 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					



Period	Date/ Start time/Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission, Typical Maximum Noise Levels (L _{Amax} – dBA)
		L _{Amax}	LA1	LA10	LA90	L _{Aeq}	
Evening	21/12/2023 21:01 19°C 5.1 m/s SSW	55	50	48	40	45	Road traffic 38-43 Wind 40-45 Insects 49-52 Birdsong 55 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					
Night	21/12/2023 22:03 19°C 4.5 m/s SSW	54	49	48	39	45	Road traffic 34-40 Insects 47-51 Birdsong 54 Abel Mine Inaudible
		Estimated Abel Mine Noise Contribution Inaudible					

Table 7 Location L, 65 Tipperary Drive, Ashtonfield

Period	Date/ Start time/Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission, Typical Maximum Noise Levels (L _{Amax} – dBA)
		L _{Amax}	LA1	LA10	LA90	L _{Aeq}	
Day	22/12/2023 13:43 24°C 3.1 m/s SE	70	62	47	38	49	Birdsong 45-53 Wind in trees 41-48 Road traffic 46-70 Abel Mine Occasionally Audible CHPP 32-35
		Estimated Abel Mine Noise Contribution <30 dBA L _{Aeq} (15minute)					
Evening	21/12/2023 20:17 19°C 5.1 m/s SSW	73	64	55	46	48	Insects 50-55 Road traffic 64-73 Abel Mine Audible CHPP (dozer on stockpile) 33-42
		Estimated Abel Mine Noise Contribution 37 dBA L _{Aeq} (15minute)					
Night	21/12/2023 00:34 18°C 2.7 m/s SW	49	46	43	35	39	Insects 25-28 Wind in trees 40-47 Abel Mine Audible CHPP (dozer on stockpile) 32-49
		Estimated Abel Mine Noise Contribution 36 dBA L _{Aeq} (15minute) 42 LA1(1minute)					

4.2 Operator Attended Noise Monitoring Summary

4.2.1 Donaldson Mine

Donaldson Open Cut Mine has ceased production and all major earthworks on the site have been finalised. There were no operations onsite during the December 2023 noise monitoring period.



4.2.2 Abel Coal Mine

Abel mine was placed in Care & Maintenance on 28th April 2016 and there were no operations onsite, excluding that from the Bloomfield CHPP which operates under the Abel Coal Mine project consent conditions.

The Bloomfield CHPP and Abel noise emissions were inaudible during all operator attended noise surveys with the exception of Location L and Location I where the operation of the stockpile dozer associated with the Bloomfield CHPP was audible. Compliance with the Abel Mine *Project Approval* was achieved at all locations.

Noise generated by local and distant traffic was a significant contributor to ambient noise levels at all monitored locations as well as neighbourhood noise and ‘natural’ noises such as birds, insects and wind related noise.

4.3 Compliance Assessment and Discussion of Results

4.3.1 Operations

Results of the operational compliance assessment are given in **Table 8**.

Table 8 Compliance Noise Assessment - Operations

Location	Estimated Abel LAeq(15minute)– Contribution dBA			Consent Conditions LAeq(15minute) dBA			Compliance		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
D – Black Hill School, Black Hill	Inaudible	Inaudible	Inaudible	35	35	35	Yes	Yes	Yes
F – Black Hill Road, Black Hill	Inaudible	Inaudible	Inaudible	35	35	35	Yes	Yes	Yes
G – Buchanan Road, Buchanan	Inaudible	Inaudible	Inaudible	35	35	35	Yes	Yes	Yes
I – Magnetic Drive, Ashtonfield	Inaudible	33	<30	36	36	36	Yes	Yes	Yes
J – Parish Drive, Thornton	Inaudible	Inaudible	Inaudible	35	35	35	Yes	Yes	Yes
L – 65 Tipperary Dr, Ashtonfield	<30	37	36	40	40	40	Yes	Yes	Yes

Results presented in **Table 8** indicate that compliance with the relevant consent conditions was achieved at all noise monitoring locations during all periods.

4.3.2 Sleep Disturbance

Results of the sleep disturbance compliance assessment are given in **Table 9**.



Table 9 Compliance Noise Assessment – Sleep Disturbance

Location	Estimated Abel LA1(1minute) Contribution dBA	Consent Conditions LA1(1minute) dBA	Compliance
D – Black Hill School, Black Hill	Inaudible	45	Yes
F – Black Hill Road, Black Hill	Inaudible	45	Yes
G – Buchanan Road, Buchanan	Inaudible	45	Yes
I – Magnetic Drive, Ashtonfield	<30	45	Yes
J – Parish Drive, Thornton	Inaudible	45	Yes
L – 65 Tipperary Dr, Ashtonfield	42	47	Yes

Results presented in **Table 9** indicate that compliance with the sleep disturbance consent conditions was achieved at all noise monitoring locations during the night-time noise surveys.

5.0 Unattended Continuous Noise Monitoring

5.1 Results of Unattended Continuous Noise Monitoring

Unattended continuous noise monitoring was conducted between Thursday 30 November 2023 to Friday 5 January 2024 at each of the six monitoring locations given in **Table 10**.

Table 10 Noise Logger and Noise Monitoring Locations

Location	Noise Logger Serial Number	Date of Logging
D – Black Hill School, Black Hill	SVAN 957 20644	22/12/2023 to 1/1/2024
F – Black Hill Road, Black Hill	SVAN 977 98466	30/11/2023 to 7/12/2023
G – Buchanan Road, Buchanan	SVAN 977 98465	30/11/2023 to 7/12/2023
I – Magnetic Drive, Ashtonfield	-	.1
J – Parish Drive, Thornton	ARL EL-316 16-203-526	30/11/2023 to 7/12/2023
L – 65 Tipperary Dr, Ashtonfield	SVAN 977 98466	22/12/2023 to 5/1/2024

Notes: 1. No noise logging conducted due to access constraints

The unattended ambient noise logger data from each monitoring location are presented graphically on a daily basis and are attached as **Appendix C**. A summary of the results of the unattended continuous noise monitoring is given in **Table 11**.

The ambient noise level data quantifies the overall noise level at a given location independent of its source or character.



The measured ambient noise levels were divided into three periods representing day, evening and night as designated in the NSW Noise Policy for Industry (NPfI).

Precautions were taken to minimise influences from extraneous noise sources (eg optimum placement of the loggers away from creeks, trees, houses, etc), however, not all these sources or their effects can be eliminated. This is particularly the case during the warmer times of year when noise from insects, frogs, birds and other animals can become quite prevalent.

Weather data for the subject area during the noise monitoring period was provided by Bloomfield Colliery. Noise data during periods of any rainfall and/or wind speeds in excess of 5 m/s were discarded in accordance with NPfI weather affected data exclusion methodology.

Table 11 Unattended Continuous Noise Monitoring Ambient Noise Levels (dBA)

Location	Period	LA1	LA10	LA90	LAeq
D – Black Hill School, Black Hill	Day	69	63	40	63
	Evening	65	56	39	68
	Night	54	51	36	57
F – Black Hill Road, Black Hill	Day	57	50	39	49
	Evening	53	45	36	47
	Night	49	44	32	44
G – Buchanan Road, Buchanan	Day	55	50	41	50
	Evening	51	47	36	49
	Night	46	42	30	45
J – Parish Drive, Thornton	Day	51	47	39	47
	Evening	51	46	39	47
	Night	46	42	31	43
L – 65 Tipperary Dr, Ashtonfield	Day	61	51	35	59
	Evening	59	51	34	52
	Night	45	38	29	45

5.2 Long term Unattended Continuous Monitoring Summary for Donaldson Mine and Abel Coal Mine

5.2.1 Ambient LA90 Noise Levels

The long term ambient LA90 noise levels collected from each monitoring location are presented graphically in **Figure 1**, **Figure 2** and **Figure 3** for the daytime, evening and night-time periods respectively.



Figure 1 Long Term Daytime LA90 Noise Levels

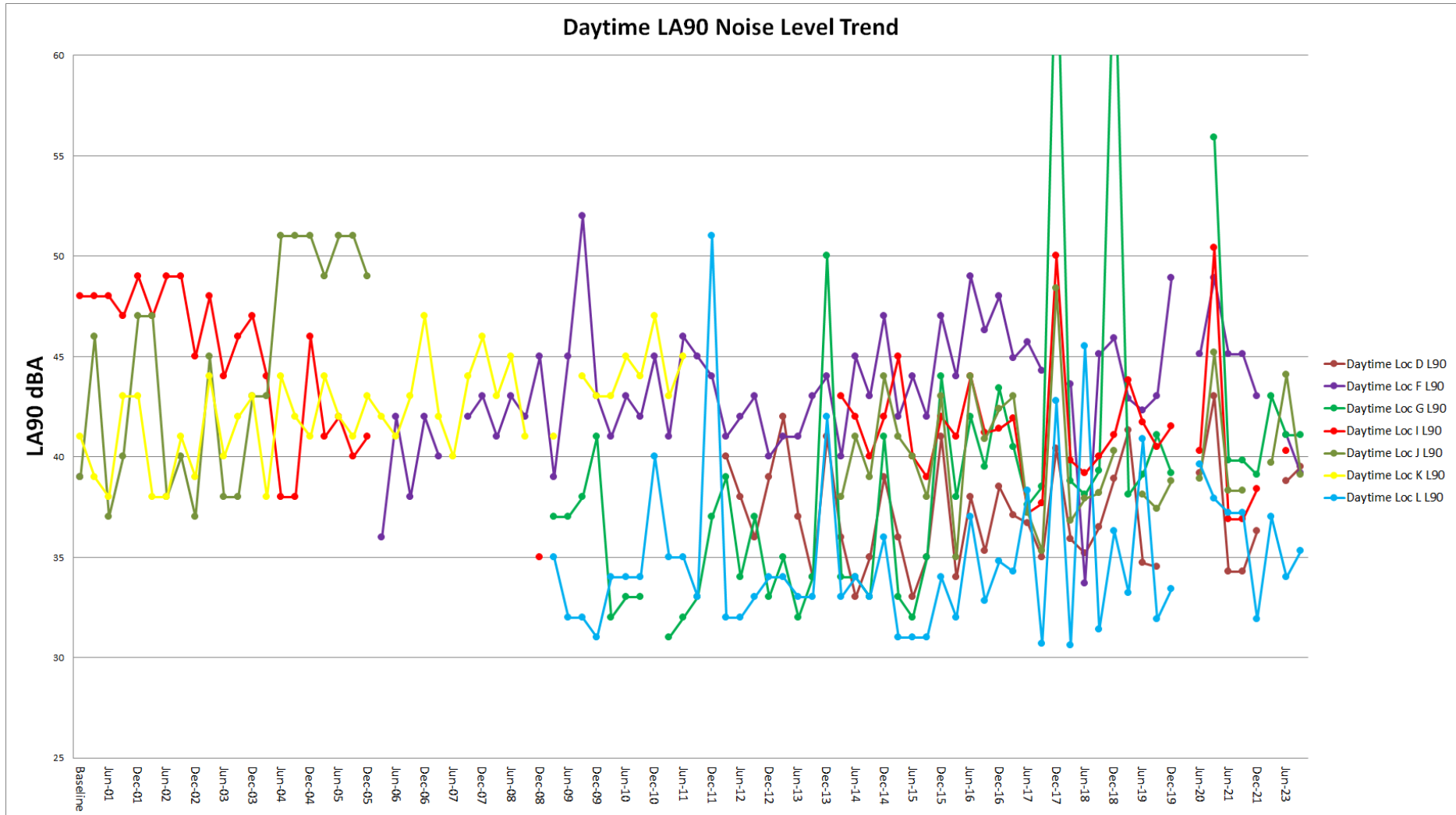


Figure 2 Long Term Evening LA90 Noise Levels

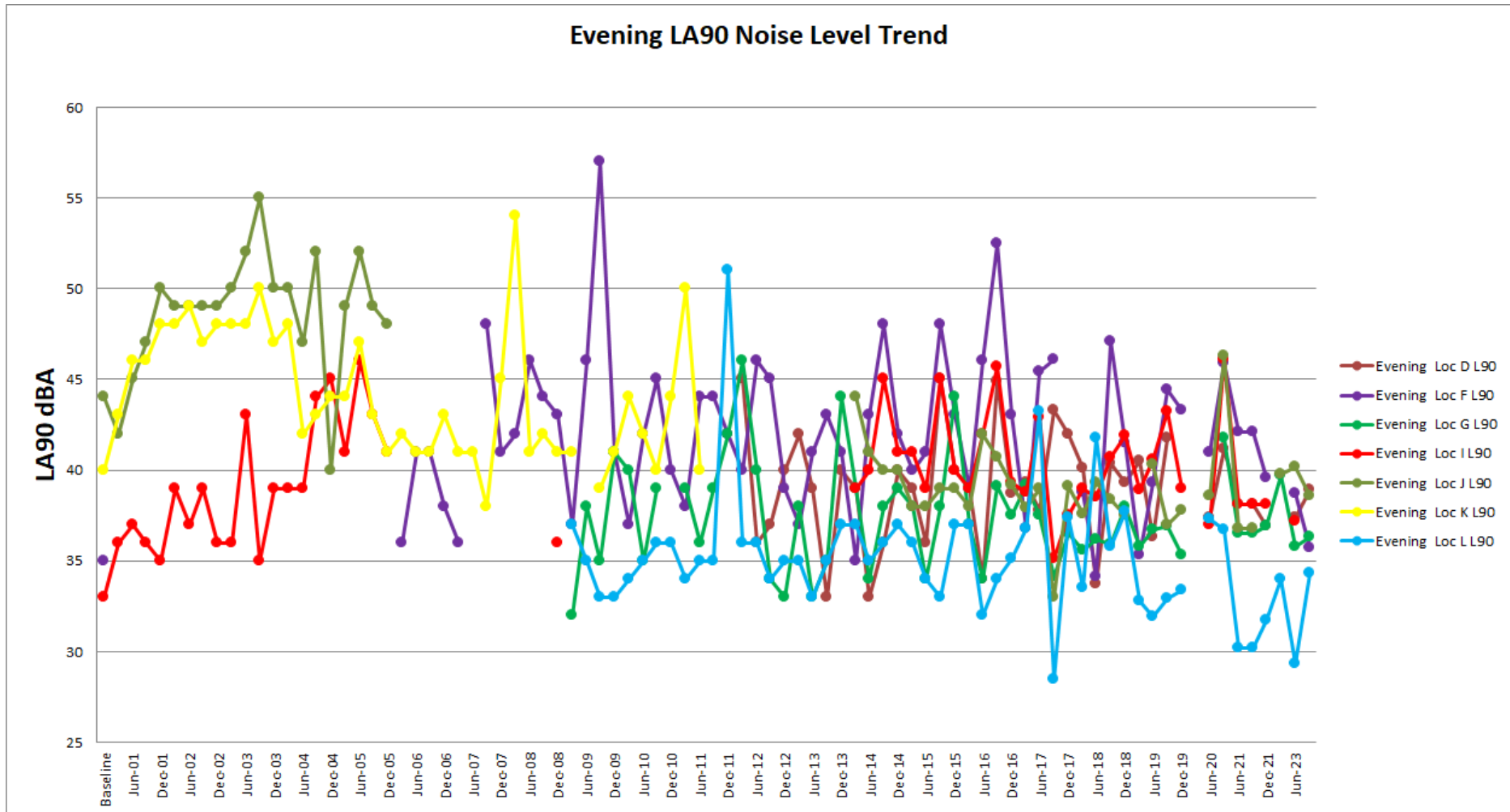
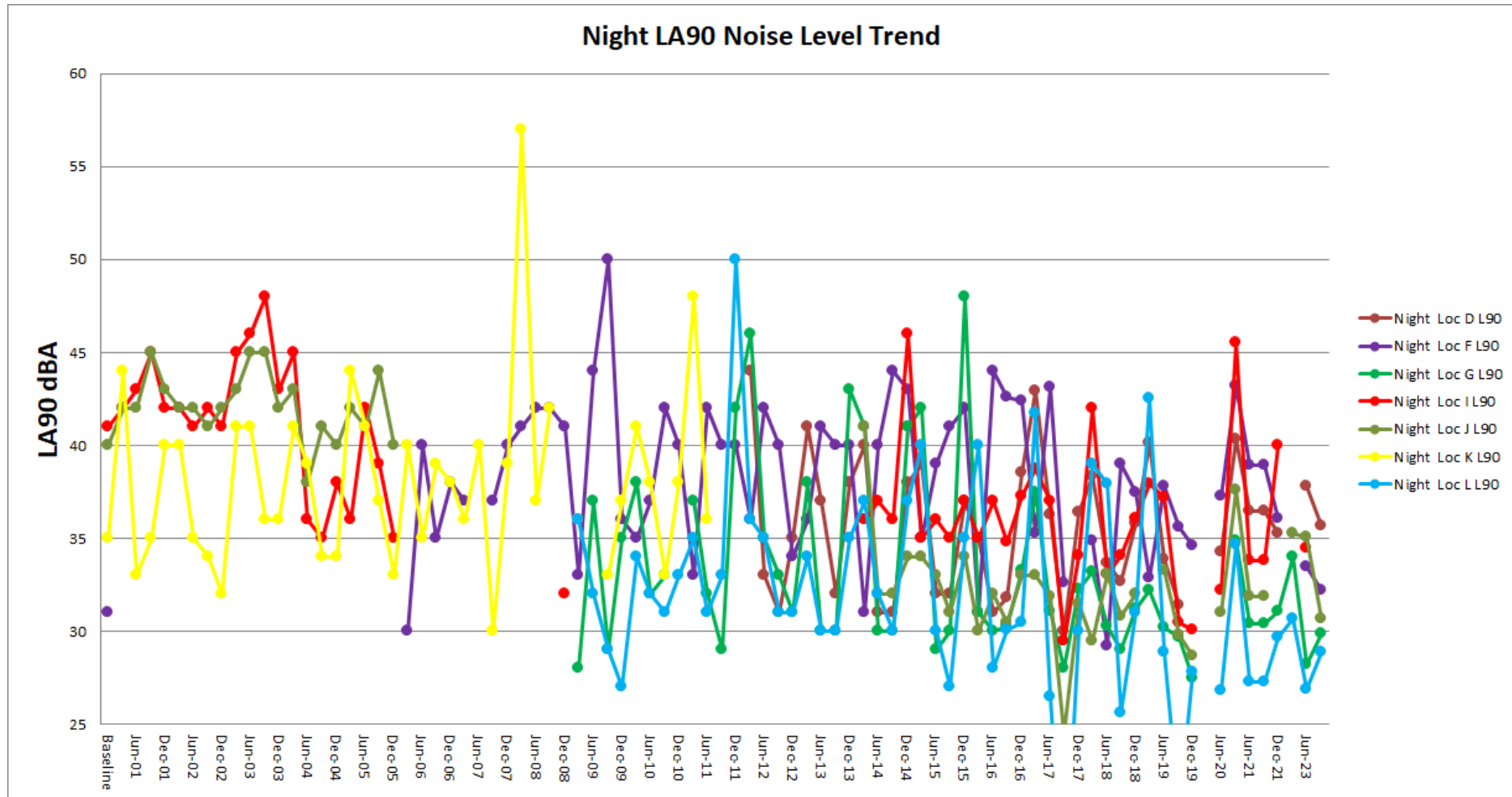


Figure 3 Long Term Night-time LA90 Noise Levels



5.2.1.1 Baseline

The summary of results in **Table 12** shows the ambient LA90 noise levels recorded for the current monitoring period compared to the levels recorded during the baseline monitoring process (ie. prior to commencement of mining operation at Donaldson).

Table 12 LA90 Results Comparison - Baseline

Monitoring Location	Period ¹	Long term Night-time LA90 Noise Levels		Difference dB ³
		Baseline	December 2023	
D – Black Hill School, Black Hill	Day	N/A ²	40	N/A ²
	Evening	N/A ²	39	N/A ²
	Night	N/A ²	36	N/A ²
F – Black Hill Road, Black Hill	Day	39	39	0
	Evening	35	36	1
	Night	31	32	1
G – Buchanan Road, Buchanan	Day	N/A ²	41	N/A ²
	Evening	N/A ²	36	N/A ²
	Night	N/A ²	30	N/A ²
L – 65 Tipperary Dr, Ashtonfield	Day	N/A ²	35	N/A ²
	Evening	N/A ²	34	N/A ²
	Night	N/A ²	29	N/A ²
J – Parish Drive, Thornton	Day	39	39	0
	Evening	44	39	-5
	Night	40	31	-9
<p>Note 1: Periods are as detailed the NPfl and are Daytime - 7.00 am to 6.00 pm Monday to Saturday, 8.00 am to 6.00 pm Sunday; Evening - 6.00 pm 10.00 pm; Night - 10.00 pm to 7.00 am pm Monday to Saturday, 10.00 pm to 8.00 am Sunday.</p> <p>Note 2: No data was available during baseline measurements, no comparisons can be made.</p> <p>Note 3: Rounded to the nearest whole dB.</p>				

5.2.1.2 Previous Half-year

Table 13 presents the ambient LA90 noise levels recorded for the current monitoring period compared to those measured during the previous monitoring period.

Table 13 LA90 Results Comparison – Previous Half-year

Monitoring Location	Period ¹	Long term Night-time LA90 Noise Levels		Difference dB ²
		June/July 2023	December 2023	
	Day	39	40	1



Monitoring Location	Period ¹	Long term Night-time LA90 Noise Levels		Difference dB ²
		June/July 2023	December 2023	
D – Black Hill School, Black Hill	Evening	37	39	2
	Night	38	36	-2
F – Black Hill Road, Black Hill	Day	41	39	-2
	Evening	39	36	-3
	Night	34	32	-1
G – Buchanan Road, Buchanan	Day	41	41	0
	Evening	36	36	1
	Night	28	30	2
L – 65 Tipperary Dr, Ashtonfield	Day	34	35	1
	Evening	29	34	5
	Night	27	29	2
J – Parish Drive, Thornton	Day	44	39	-5
	Evening	40	39	-2
	Night	35	31	-4
Note 1: Periods are as detailed the NPfl and are Daytime - 7.00 am to 6.00 pm Monday to Saturday, 8.00 am to 6.00 pm Sunday; Evening - 6.00 pm 10.00 pm; Night - 10.00 pm to 7.00 am pm Monday to Saturday, 10.00 pm to 8.00 am Sunday. Note 2: Rounded to the nearest whole dB.				

5.2.1.3 Coinciding Period last Year

Table 14 presents the ambient LA90 noise levels recorded for the current monitoring period compared to those measured during the coinciding monitoring period last year.

Table 14 LA90 Results Comparison – Coinciding Period Last Year

Monitoring Location	Period ¹	Long term Night-time LA90 Noise Levels		Difference dB ³
		June 2022	June/July 2023	
D – Black Hill School, Black Hill	Day	-2	40	-2
	Evening	-2	39	-2
	Night	-2	36	-2
F – Black Hill Road, Black Hill	Day	-2	39	-2
	Evening	-2	36	-2
	Night	-2	32	-2
G – Buchanan Road, Buchanan	Day	43	41	-2
	Evening	40	36	-3
	Night	34	30	-4



Monitoring Location	Period ¹	Long term Night-time LA90 Noise Levels		Difference dB ³
		June 2022	June/July 2023	
L – 65 Tipperary Dr, Ashtonfield	Day	37	35	-2
	Evening	34	34	0
	Night	31	29	-2
J – Parish Drive, Thornton	Day	40	39	-1
	Evening	40	39	-1
	Night	35	31	-5
<p>Note 1: Periods are as detailed the NPfl and are Daytime - 7.00 am to 6.00 pm Monday to Saturday, 8.00 am to 6.00 pm Sunday; Evening - 6.00 pm 10.00 pm; Night - 10.00 pm to 7.00 am pm Monday to Saturday, 10.00 pm to 8.00 am Sunday.</p> <p>Note 2: No data was available during the monitoring period no comparisons can be made.</p> <p>Note 3: Rounded to the nearest whole dB.</p>				

5.2.2 Ambient LA10 Noise Comparison

The long term ambient LA10 noise levels collected from each monitoring location are presented graphically in **Figure 4**, **Figure 5** and **Figure 6** for the daytime, evening and night-time respectively.



Figure 4 Long Term Daytime LA10 Noise Levels

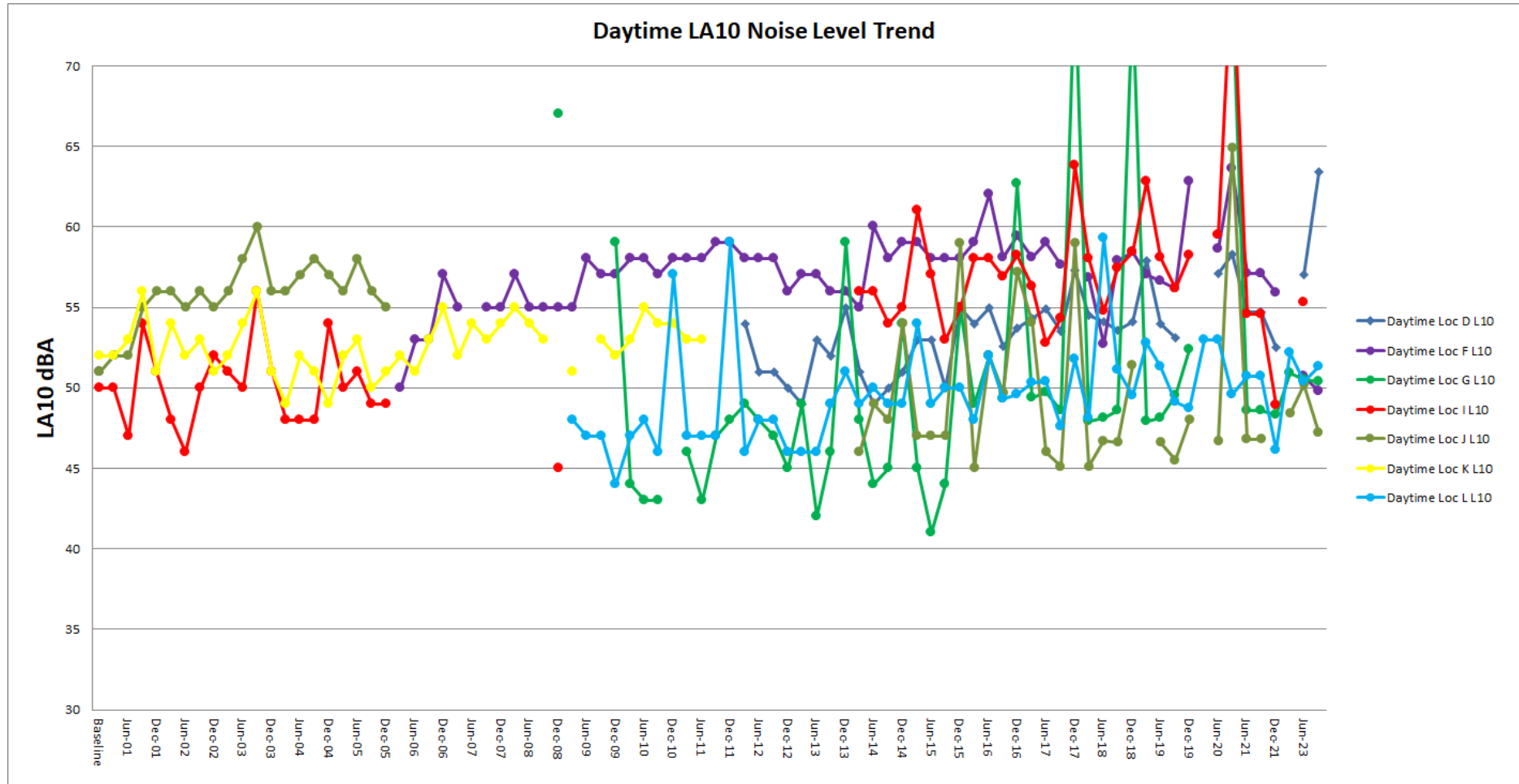


Figure 5 Long term Evening LA10 Noise Levels

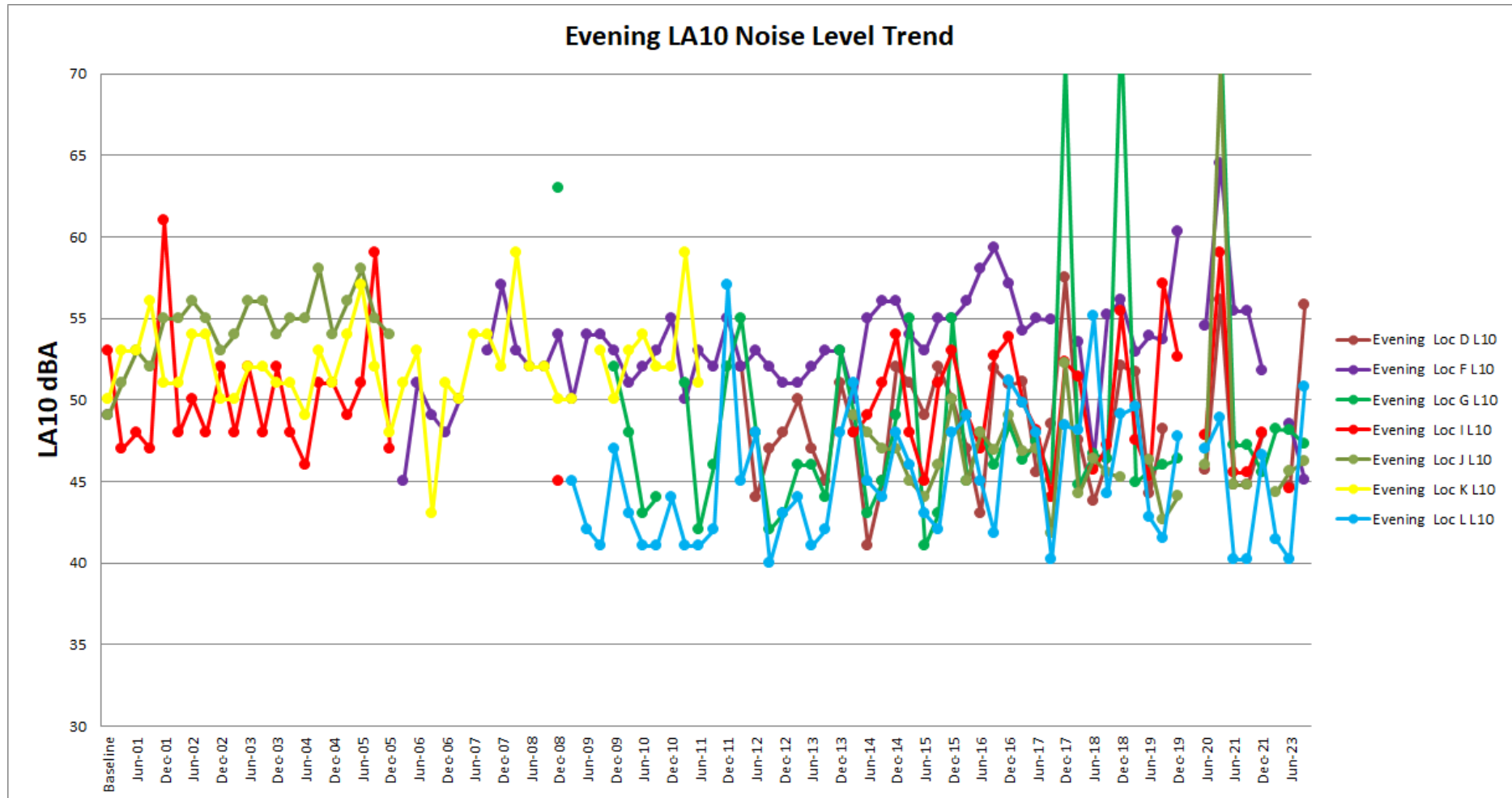
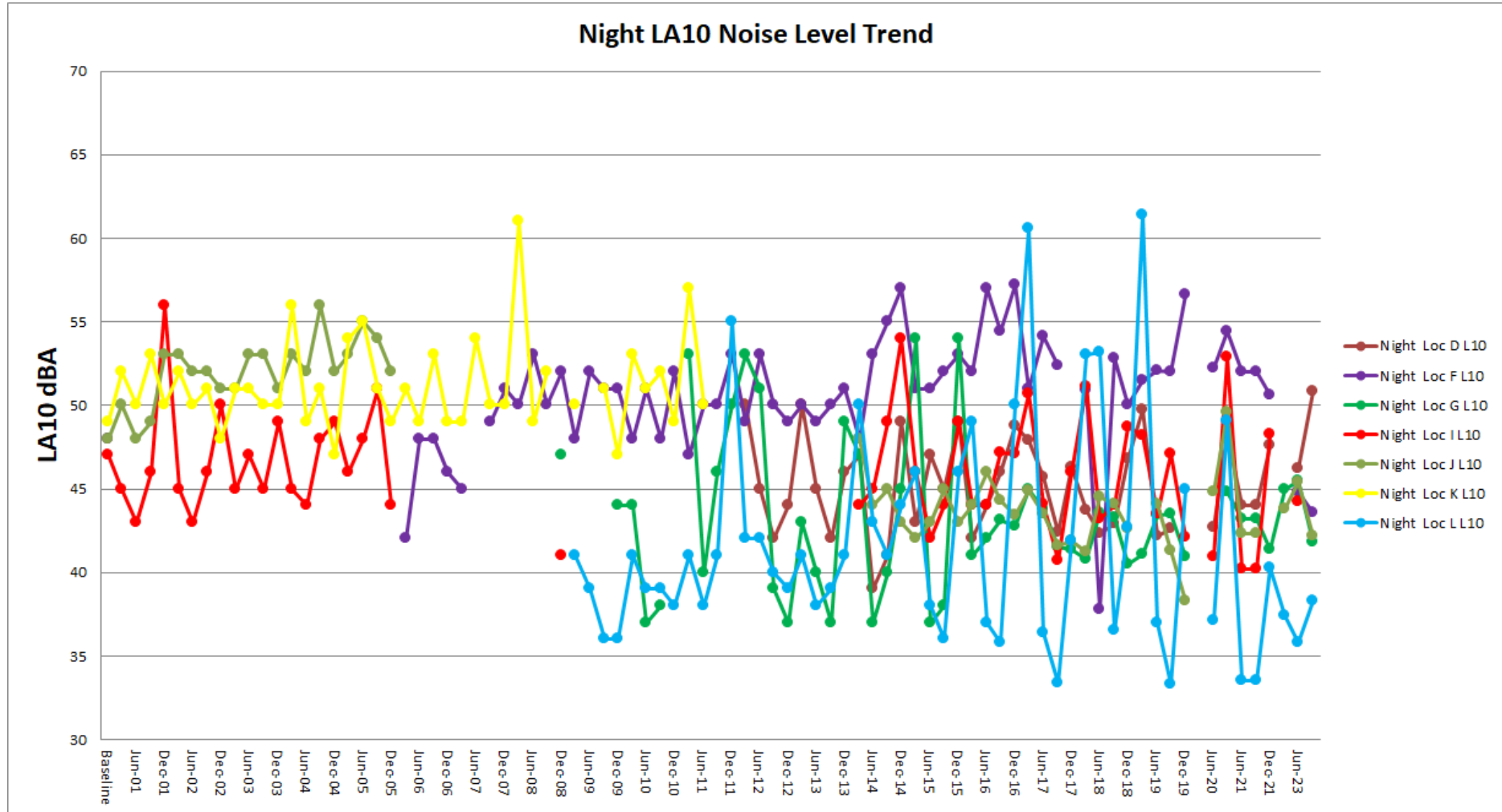


Figure 6 Long term Night LA10 Noise Levels



5.2.2.1 Baseline

Table 15 presents the ambient LA10 noise levels recorded for the current monitoring period compared to the levels recorded during the baseline monitoring period.

Table 15 LA10 Results Comparison – Baseline

Monitoring Location	Period ¹	Long term Night-time LA10 Noise Levels		Difference dB ³
		Baseline	December 2023	
D – Black Hill School, Black Hill	Day	N/A ²	63	N/A ²
	Evening	N/A ²	56	N/A ²
	Night	N/A ²	51	N/A ²
F – Black Hill Road, Black Hill	Day	51	50	-1
	Evening	49	45	-1
	Night	48	44	-4
G – Buchanan Road, Buchanan	Day	N/A ²	50	N/A ²
	Evening	N/A ²	47	N/A ²
	Night	N/A ²	46	N/A ²
L – 65 Tipperary Dr, Ashtonfield	Day	N/A ²	51	N/A ²
	Evening	N/A ²	51	N/A ²
	Night	N/A ²	38	N/A ²
J – Parish Drive, Thornton	Day	51	47	-4
	Evening	49	46	-3
	Night	48	42	-6
<p>Note 1: Periods are as detailed the NPfl and are Daytime - 7.00 am to 6.00 pm Monday to Saturday, 8.00 am to 6.00 pm Sunday; Evening - 6.00 pm 10.00 pm; Night - 10.00 pm to 7.00 am pm Monday to Saturday, 10.00 pm to 8.00 am Sunday.</p> <p>Note 2: No data was available during baseline measurements, no comparisons can be made.</p> <p>Note 3: Rounded to the nearest whole dB.</p>				

5.2.2.2 Previous Half-year

Table 16 presents the ambient LA10 noise levels recorded for the current monitoring period compared to those measured during the previous monitoring period.

Table 16 LA10 Results Comparison – Previous Half-year

Monitoring Location	Period ¹	Long term Night-time LA10 Noise Levels		Difference dB ²
		June/July 2023	December 2023	
D – Black Hill School, Black Hill	Day	57	63	6
	Evening	45	56	11



Monitoring Location	Period ¹	Long term Night-time LA10 Noise Levels		Difference dB ²
		June/July 2023	December 2023	
	Night	46	51	5
F – Black Hill Road, Black Hill	Day	51	50	-1
	Evening	49	45	-3
	Night	45	44	-1
G – Buchanan Road, Buchanan	Day	51	50	0
	Evening	48	47	-1
	Night	46	42	-4
L – 65 Tipperary Dr, Ashtonfield	Day	50	51	1
	Evening	40	51	11
	Night	36	38	3
J – Parish Drive, Thornton	Day	50	47	-3
	Evening	46	46	1
	Night	45	42	-3
Note 1: Periods are as detailed the NPfl and are Daytime - 7.00 am to 6.00 pm Monday to Saturday, 8.00 am to 6.00 pm Sunday; Evening - 6.00 pm 10.00 pm; Night - 10.00 pm to 7.00 am pm Monday to Saturday, 10.00 pm to 8.00 am Sunday. Note 2: Rounded to the nearest whole dB.				

5.2.2.3 Coinciding Period Last Year

Table 17 presents the ambient LA10 noise levels recorded for the current monitoring period compared to those measured during the coinciding monitoring period last year.

Table 17 LA10 Result Comparison – Coinciding Period Last Year

Monitoring Location	Period ¹	Long term Night-time LA10 Noise Levels		Difference dB ³
		December 2022	December 2023	
D – Black Hill School, Black Hill	Day	-2	63	-2
	Evening	-2	56	-2
	Night	-2	51	-2
F – Black Hill Road, Black Hill	Day	-2	50	-2
	Evening	-2	45	-2
	Night	-2	44	-2
G – Buchanan Road, Buchanan	Day	51	50	-1
	Evening	48	47	-1
	Night	45	42	-3
	Day	52	51	-1



Monitoring Location	Period ¹	Long term Night-time LA10 Noise Levels		Difference dB ³
		December 2022	December 2023	
L – 65 Tipperary Dr, Ashtonfield	Evening	41	51	9
	Night	37	38	1
J – Parish Drive, Thornton	Day	48	47	-1
	Evening	44	46	2
	Night	44	42	-2
<p>Note 1: Periods are as detailed the NPfl and are Daytime - 7.00 am to 6.00 pm Monday to Saturday, 8.00 am to 6.00 pm Sunday; Evening - 6.00 pm 10.00 pm; Night - 10.00 pm to 7.00 am pm Monday to Saturday, 10.00 pm to 8.00 am Sunday.</p> <p>Note 2: Rounded to the nearest whole dB. No data was available during the monitoring period no comparisons can be made.</p> <p>Note 3: Rounded to the nearest whole dB.</p>				

5.3 Rail Noise Monitoring

In order to determine compliance with the rail noise criteria, a noise logger was positioned at Location J. No rail movements were recorded over the noise monitoring period and as such the Bloomfield Rail Spur was in compliance with the Abel Mine Project Approval during the noise monitoring period.

6.0 Conclusion

SLR was engaged by Donaldson Coal Pty Ltd to conduct half-yearly noise monitoring surveys for Donaldson Coal Mine and Abel Coal Mine in accordance with the NMP, dated 3 June 2019.

Abel mine was placed in Care & Maintenance on 28th April 2016 and there were no operations onsite, excluding that from the Bloomfield CHPP which operates under the Abel Coal Mine project consent conditions.

Operator-attended and unattended noise measurements were conducted for the December 2023 half at six focus locations surrounding the mine.

Results of the attended noise monitoring have indicated that compliance with the Abel Mine *Project Approval* was achieved at all locations.

A comparison of ambient LA10 and LA90 noise levels recorded during the current monitoring period (December 2023), the baseline monitoring period, the last monitoring period (June 2023), and the coinciding monitoring period from last year (December 2022) has been conducted.

Rail noise levels from the Bloomfield Rail Spur were considered to be in compliance with the Abel Mine Project Approval during the noise monitoring period.



Appendix A Acoustic Terminology

Donaldson and Abel Coal Mines

Bi-Annual Noise Monitoring – Half-year Ending December 2023

Donaldson Coal Pty Ltd

SLR Project No.: 630.01053.20000

5 March 2024

1 Sound Level or Noise Level

The terms 'sound' and 'noise' are almost interchangeable, except that 'noise' often refers to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure. The human ear responds to changes in sound pressure over a very wide range with the loudest sound pressure to which the human ear can respond being ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or LP are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2×10^{-5} Pa.

2 'A' Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an 'A-weighting' filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4,000 Hz), and less sensitive at lower and higher frequencies. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect, whilst a 3 dB to 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels.

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as 'linear', and the units are expressed as dB(lin) or dB.

3 Sound Power Level

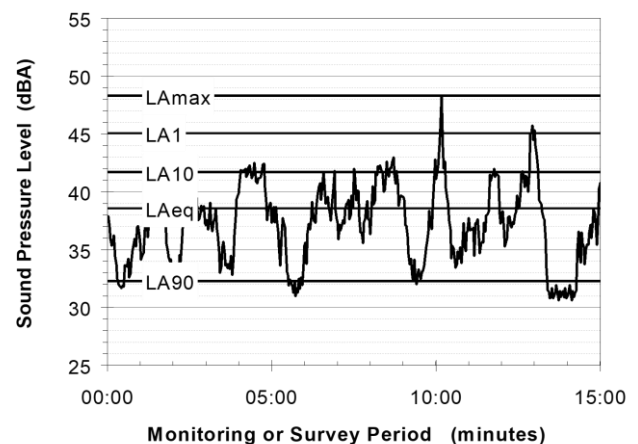
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure is similar to the effect of an electric radiator, which is characterised by a power rating but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4 Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

- LA1 The noise level exceeded for 1% of the 15 minute interval.
- LA10 The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.
- LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.
- LAeq The A-weighted equivalent noise level (basically, the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

5 Frequency Analysis

Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

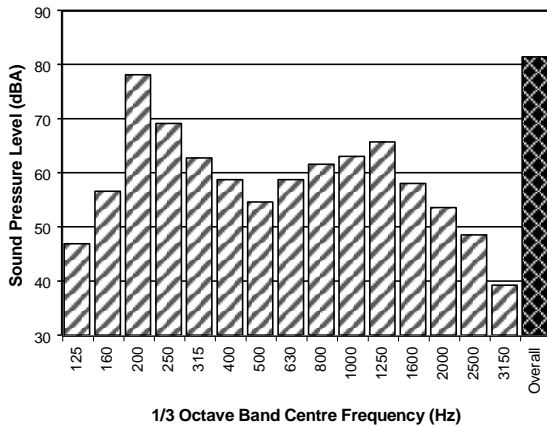
The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (three bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)



The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



6 Annoying Noise (Special Audible Characteristics)

A louder noise will generally be more annoying to nearby receivers than a quieter one. However, noise is often also found to be more annoying and result in larger impacts where the following characteristics are apparent:

- **Tonality** - tonal noise contains one or more prominent tones (ie differences in distinct frequency components between adjoining octave or 1/3 octave bands), and is normally regarded as more annoying than 'broad band' noise.
- **Impulsiveness** - an impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.
- **Intermittency** - intermittent noise varies in level with the change in level being clearly audible. An example would include mechanical plant cycling on and off.
- **Low Frequency Noise** - low frequency noise contains significant energy in the lower frequency bands, which are typically taken to be in the 10 to 160 Hz region.



Appendix B Noise Monitoring Locations

Donaldson and Abel Coal Mines

Bi-Annual Noise Monitoring – Half-year Ending December 2023

Donaldson Coal Pty Ltd

SLR Project No.: 630.01053.20000

5 March 2024

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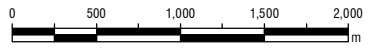


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Project No.:	630.01053.01200
Date:	11/01/2018
Drawn by:	NT
Scale:	1:45,000
Sheet Size:	A4
Projection:	GDA 1994 MGA Zone 56

LEGEND

Noise Monitoring Locations



Donaldson Coal

Noise Monitoring Locations

The content contained within this document may be based on third party data.
 SLR Consulting Australia Pty Ltd does not guarantee the accuracy of such information.

Appendix C Calibration Certificates

Donaldson and Abel Coal Mines

Bi-Annual Noise Monitoring – Half-year Ending December 2023

Donaldson Coal Pty Ltd

SLR Project No.: 630.01053.20000

5 March 2024

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM33812

EQUIPMENT TESTED: Sound Level Meter

Manufacturer: B&K

Type No: 2250-L

Serial No: 3003389

Mic. Type: 4950

Serial No: 2913816

Pre-Amp. Type: ZC0032

Serial No: 20519

Filter Type: 1/3 Octave

Test No: F033825

Owner: SLR Consulting Australia Pty Ltd
120 High Street
North Sydney, NSW 2060

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 1001 hPa ± 1 hPa

Date of Receipt : 26/09/2022

Temperature 22 $^{\circ}\text{C} \pm 1^{\circ}\text{C}$

Date of Calibration : 26/09/2022

Relative Humidity 52 % $\pm 5\%$

Date of Issue : 28/09/2022

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

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%.



WORLD RECOGNISED
ACCREDITATION

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

The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	<i>Clause</i>	<i>Result</i>
<i>Absolute Calibration</i>	10	Pass
<i>Acoustical Frequency Weighting</i>	12	Pass
<i>Self-Generated Noise</i>	11.1	Observed
<i>Electrical Noise</i>	11.2	Observed
<i>Long Term Stability</i>	15	Pass
<i>Electrical Frequency Weightings</i>	13	Pass
<i>Frequency and Time Weightings</i>	14	Pass
<i>Reference Level Linearity</i>	16	Pass
<i>Range Level Linearity</i>	17	Not Applicable
<i>Toneburst</i>	18	Pass
<i>Peak C Sound Level</i>	19	Pass
<i>Overload Indicator</i>	20	Pass
<i>High Level Stability</i>	21	Pass

Statement of Compliance: The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:-2013, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of IEC 61672-1:-2013 because evidence was not publically available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:-2013 and because the periodic tests of IEC 61672-3:-2013 cover only a limited subset of the specifications in IEC 61672-1:-2013.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 61260-3:2016 and were conducted to test the following performance characteristics:

Tests performed	<i>Clause</i>	<i>Result</i>
<i>Test of relative attenuation at filter midband frequency</i>	10	Pass
<i>Linear operating range including range control if fitted</i>	11	N/A
<i>Test of lower limit of linear operating range</i>	12	Pass
<i>Measurement of relative attenuation (filter shape)</i>	13	Pass

The filter submitted for testing successfully completed the tests listed above for the environmental conditions under which the tests were performed. If the filter type has successfully completed the pattern-evaluation tests of IEC 61260-2 then it can be stated that the filter set continues to conform to the specifications of IEC 61260-1.

A full technical report is available on request.

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: **SLM32291**

EQUIPMENT TESTED: Sound & Vibration Analyser

Manufacturer: Svantek
Type No: Svan-957
Mic. Type: 7052E
Pre-Amp. Type: SV12L
Filter Type: 1/3 Octave
Owner: SLR Consulting Australia Pty Ltd
120 High Street
North Sydney, NSW 2060

Serial No: 20664

Serial No: 46859

Serial No: 25327

Test No: F032292

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

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

CONDITIONS OF TEST:

Ambient Pressure 1002 hPa ± 1 hPa

Temperature 22 $^{\circ}\text{C} \pm 1^{\circ}\text{C}$

Relative Humidity 55 % $\pm 5\%$

Date of Receipt : 11/04/2022

Date of Calibration : 12/04/2022

Date of Issue : 26/04/2022

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

CHECKED BY:

AUTHORISED SIGNATURE:

Jack Kiett

Accredited for compliance with ISO/IEC 17025 - Calibration
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The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	<i>Clause</i>	<i>Result</i>
<i>Absolute Calibration</i>	10	Pass
<i>Acoustical Frequency Weighting</i>	12	Pass
<i>Self-Generated Noise</i>	11.1	Observed
<i>Electrical Noise</i>	11.2	Observed
<i>Long Term Stability</i>	15	Pass
<i>Electrical Frequency Weightings</i>	13	Pass
<i>Frequency and Time Weightings</i>	14	Pass
<i>Reference Level Linearity</i>	16	Pass
<i>Range Level Linearity</i>	17	Pass
<i>Toneburst</i>	18	Pass
<i>Peak C Sound Level</i>	19	Pass
<i>Overload Indicator</i>	20	Pass
<i>High Level Stability</i>	21	Pass

Statement of Compliance: The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:-2013, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of IEC 61672-1:-2013 because evidence was not publically available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:-2013 and because the periodic tests of IEC 61672-3:-2013 cover only a limited subset of the specifications in IEC 61672-1:-2013.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 61260-3:2016 and were conducted to test the following performance characteristics:

Tests performed	<i>Clause</i>	<i>Result</i>
<i>Test of relative attenuation at filter midband frequency</i>	10	Pass
<i>Linear operating range including range control if fitted</i>	11	Pass
<i>Test of lower limit of linear operating range</i>	12	Pass
<i>Measurement of relative attenuation (filter shape)</i>	13	Pass

The filter submitted for testing successfully completed the tests listed above for the environmental conditions under which the tests were performed. If the filter type has successfully completed the pattern-evaluation tests of IEC 61260-2 then it can be stated that the filter set continues to conform to the specifications of IEC 61260-1.

A full technical report is available on request.

CERTIFICATE OF CALIBRATION

CERTIFICATE No: **SLM35329**

EQUIPMENT TESTED: Sound & Vibration Analyser

Manufacturer: Svantek
Type No: SVAN-977D **Serial No:** 98465
Mic. Type: MK255 **Serial No:** 23871
Pre-Amp. Type: SV12L **Serial No:** 126906
Filter Type: 1/3 Octave **Test No:** F035331
Owner: SLR Consulting Australia Pty Ltd
120 High Street
North Sydney, NSW 2060

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	993 hPa ± 1 hPa	Date of Receipt :	01/03/2023
Temperature	23 $^{\circ}\text{C} \pm 1^{\circ}\text{C}$	Date of Calibration :	01/03/2023
Relative Humidity	48 % $\pm 5\%$	Date of Issue :	03/03/2023

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

CHECKED BY:  **AUTHORISED SIGNATURE:** 

Jack Kielt

Accredited for compliance with ISO/IEC 17025 - Calibration

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

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(02) 9680 8133
www.acu-vib.com.au

The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	Clause	Result
Absolute Calibration	10	Pass
Acoustical Frequency Weighting	12	Pass
Self-Generated Noise	11.1	Observed
Electrical Noise	11.2	Observed
Long Term Stability	15	Pass
Electrical Frequency Weightings	13	Pass
Frequency and Time Weightings	14	Pass
Reference Level Linearity	16	Pass
Range Level Linearity	17	Pass
Toneburst	18	Pass
Peak C Sound Level	19	Pass
Overload Indicator	20	Pass
High Level Stability	21	Pass

Statement of Compliance: The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:-2013, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of IEC 61672-1:-2013 because evidence was not publically available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:-2013 and because the periodic tests of IEC 61672-3:-2013 cover only a limited subset of the specifications in IEC 61672-1:-2013.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 61260-3:2016 and were conducted to test the following performance characteristics:

Tests performed	Clause	Result
Test of relative attenuation at filter midband frequency	10	Pass
Linear operating range including range control if fitted	11	Pass
Test of lower limit of linear operating range	12	Pass
Measurement of relative attenuation (filter shape)	13	Pass

The filter submitted for testing successfully completed the tests listed above for the environmental conditions under which the tests were performed. If the filter type has successfully completed the pattern-evaluation tests of IEC 61260-2 then it can be stated that the filter set continues to conform to the specifications of IEC 61260-1.

A full technical report is available on request.

CERTIFICATE OF CALIBRATION

CERTIFICATE No: **SLM35321**

EQUIPMENT TESTED: Sound & Vibration Analyser

Manufacturer: Svantek

Type No: SVAN-977D

Serial No: 98466

Mic. Type: MK255

Serial No: 23855

Pre-Amp. Type: SV12L

Serial No: 123807

Filter Type: 1/3 Octave

Test No: F035328

Owner: SLR Consulting Australia Pty Ltd
120 High Street
North Sydney, NSW 2060

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 994 hPa ± 1 hPa

Date of Receipt : 01/03/2023

Temperature 23 $^{\circ}\text{C} \pm 1^{\circ}\text{C}$

Date of Calibration : 01/03/2023

Relative Humidity 50 % $\pm 5\%$

Date of Issue : 03/03/2023

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

CHECKED BY: 

AUTHORISED SIGNATURE: 

Jack Kielt

Accredited for compliance with ISO/IEC 17025 - Calibration

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

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The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	<i>Clause</i>	<i>Result</i>
<i>Absolute Calibration</i>	10	Pass
<i>Acoustical Frequency Weighting</i>	12	Pass
<i>Self-Generated Noise</i>	11.1	Observed
<i>Electrical Noise</i>	11.2	Observed
<i>Long Term Stability</i>	15	Pass
<i>Electrical Frequency Weightings</i>	13	Pass
<i>Frequency and Time Weightings</i>	14	Pass
<i>Reference Level Linearity</i>	16	Pass
<i>Range Level Linearity</i>	17	Pass
<i>Toneburst</i>	18	Pass
<i>Peak C Sound Level</i>	19	Pass
<i>Overload Indicator</i>	20	Pass
<i>High Level Stability</i>	21	Pass

Statement of Compliance: The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:-2013, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of IEC 61672-1:-2013 because evidence was not publically available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:-2013 and because the periodic tests of IEC 61672-3:-2013 cover only a limited subset of the specifications in IEC 61672-1:-2013.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 61260-3:2016 and were conducted to test the following performance characteristics:

Tests performed	<i>Clause</i>	<i>Result</i>
<i>Test of relative attenuation at filter midband frequency</i>	10	Pass
<i>Linear operating range including range control if fitted</i>	11	Pass
<i>Test of lower limit of linear operating range</i>	12	Pass
<i>Measurement of relative attenuation (filter shape)</i>	13	Pass

The filter submitted for testing successfully completed the tests listed above for the environmental conditions under which the tests were performed. If the filter type has successfully completed the pattern-evaluation tests of IEC 61260-2 then it can be stated that the filter set continues to conform to the specifications of IEC 61260-1.

A full technical report is available on request.



Sound Level Meter AS 1259-1:1990 - AS 1259-2:1990 Calibration Certificate

Calibration Number C22130

Client Details SLR Consulting Australia Pty Ltd
Level 16, 175 Eagle Street
Brisbane QLD 4000

Equipment Tested/ Model Number : ARL EL-316
Instrument Serial Number : 16-203-526
Microphone Serial Number : 322264
Pre-amplifier Serial Number : 28144

Atmospheric Conditions

Ambient Temperature : 25.4°C
Relative Humidity : 61.4%
Barometric Pressure : 100.09kPa

Calibration Technician : Lucky Jaiswal
Calibration Date : 1 Mar 2022

Secondary Check: Rhys Gravelle
Report Issue Date : 1 Mar 2022

Approved Signatory : 

Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
10.2.2: Absolute sensitivity	Pass	10.3.4: Inherent system noise level	Pass
10.2.3: Frequency weighting	Pass	10.4.2: Time weighting characteristic F and S	Pass
10.3.2: Overload indications	Pass	10.4.3: Time weighting characteristic I	Pass
10.3.3: Accuracy of level range control	Pass	10.4.5: R.M.S performance	Pass
8.9: Detector-indicator linearity	Pass	9.3.2: Time averaging	Pass
8.10: Differential level linearity	Pass	9.3.5: Overload indication	Pass

Uncertainties of Measurement -

Acoustic Tests

31.5 Hz to 8kHz ±0.14dB
12.5kHz ±0.19dB
16kHz ±0.29dB

Electrical Tests

31.5 Hz to 20 kHz ±0.11dB

Environmental Conditions

Temperature ±0.1°C
Relative Humidity ±1.9%
Barometric Pressure ±0.014kPa

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

The sound level meter under test has been shown to conform to the type 1 requirements for periodic testing as described in AS 1259.1:1990 and AS 1259.2:1990 for the tests stated above.



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

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

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

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

Appendix D Statistical Ambient Noise Levels

Donaldson and Abel Coal Mines

Bi-Annual Noise Monitoring – Half-year Ending December 2023

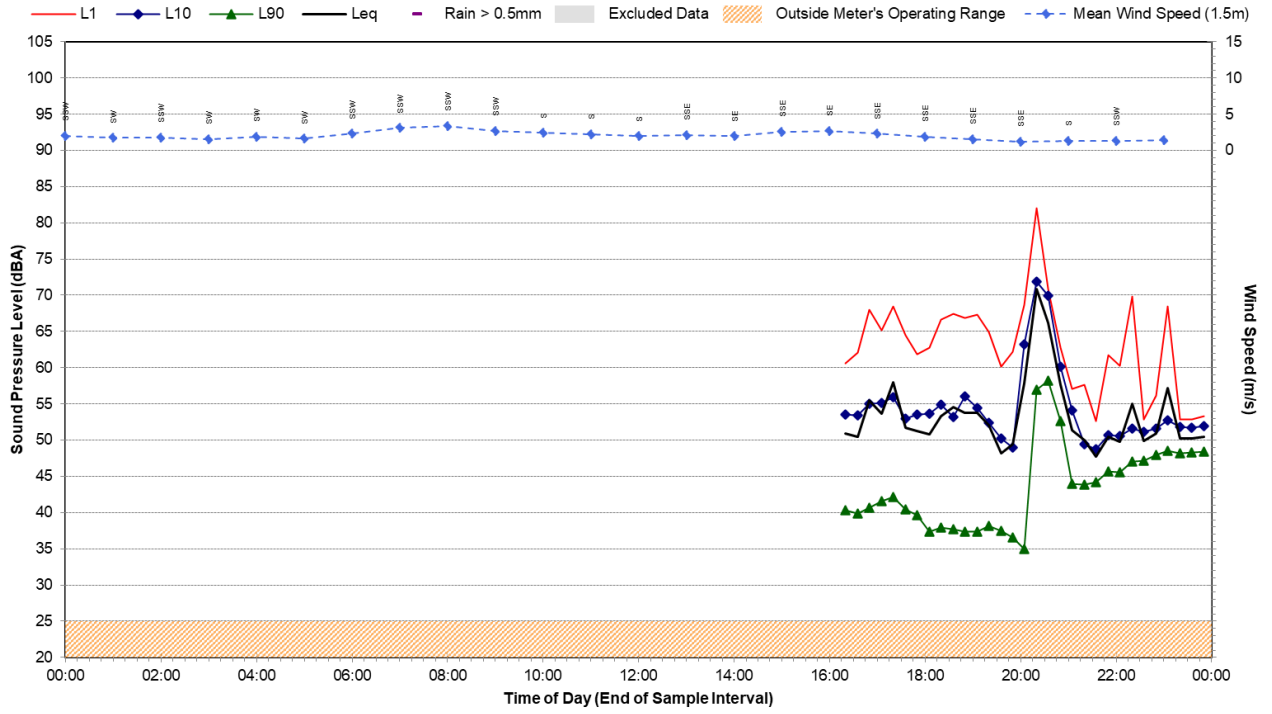
Donaldson Coal Pty Ltd

SLR Project No.: 630.01053.20000

5 March 2024

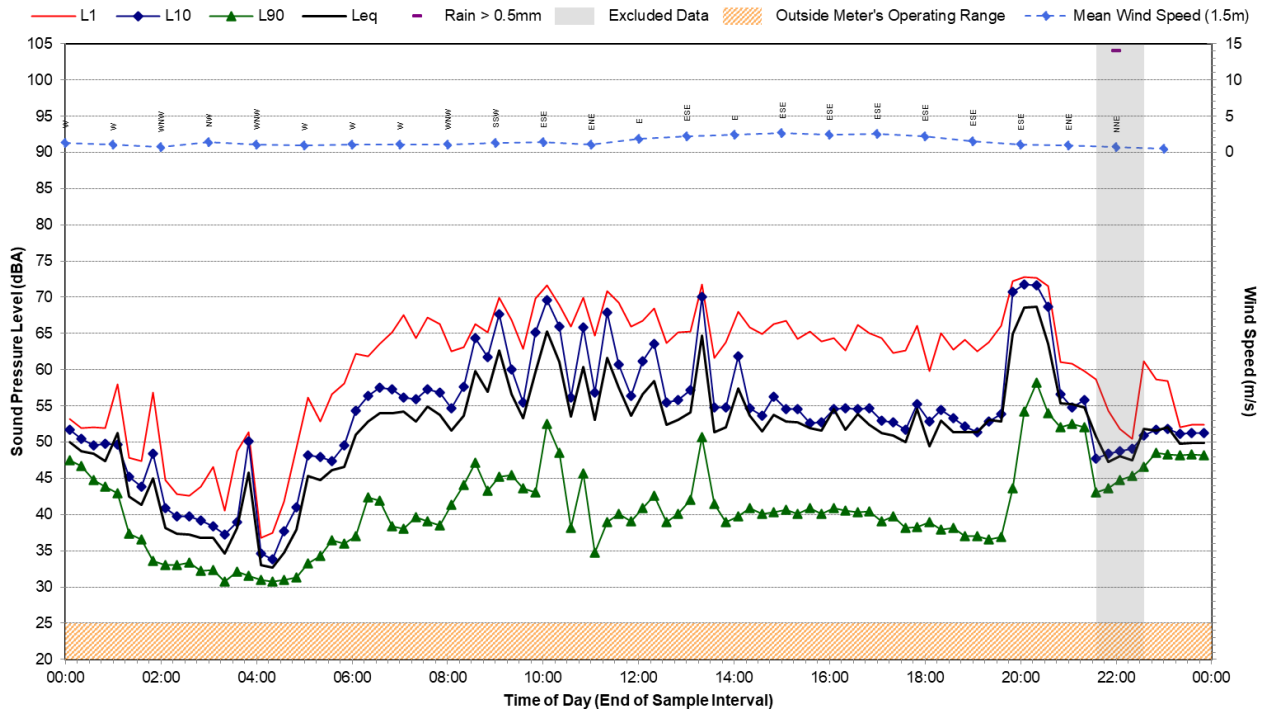
Statistical Ambient Noise Levels

Location D - Friday, 22 December 2023



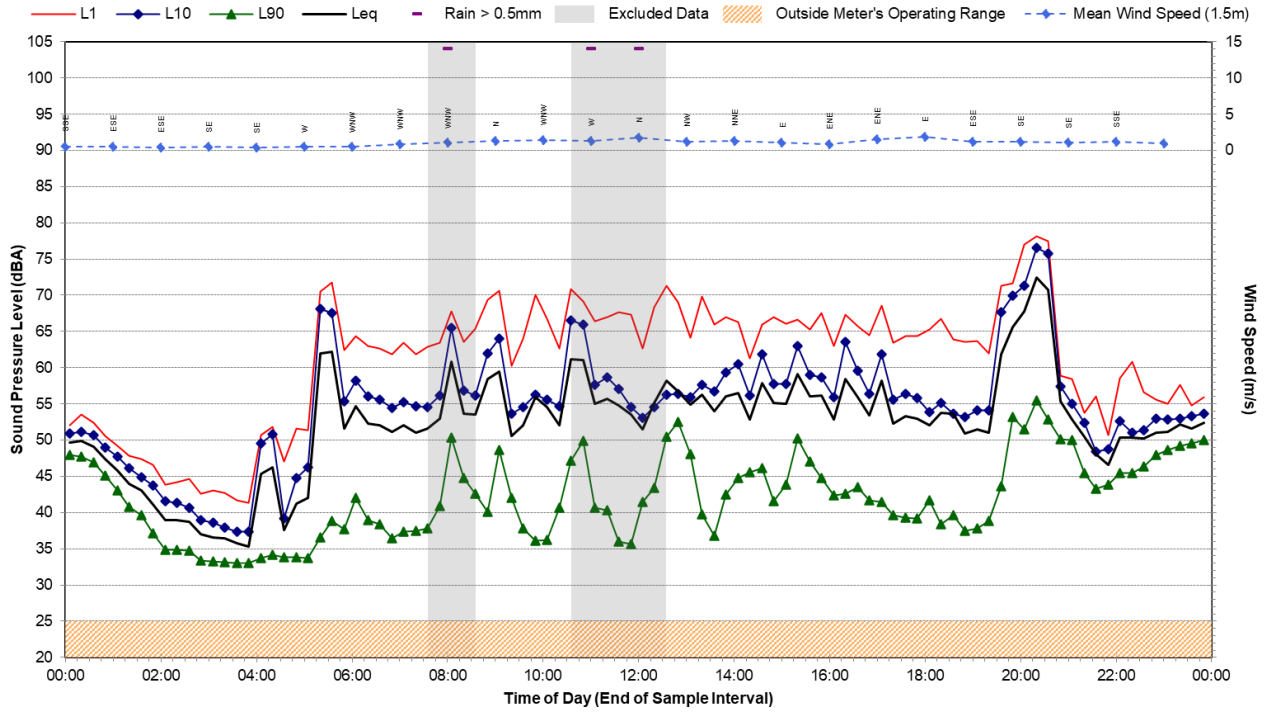
Statistical Ambient Noise Levels

Location D - Saturday, 23 December 2023



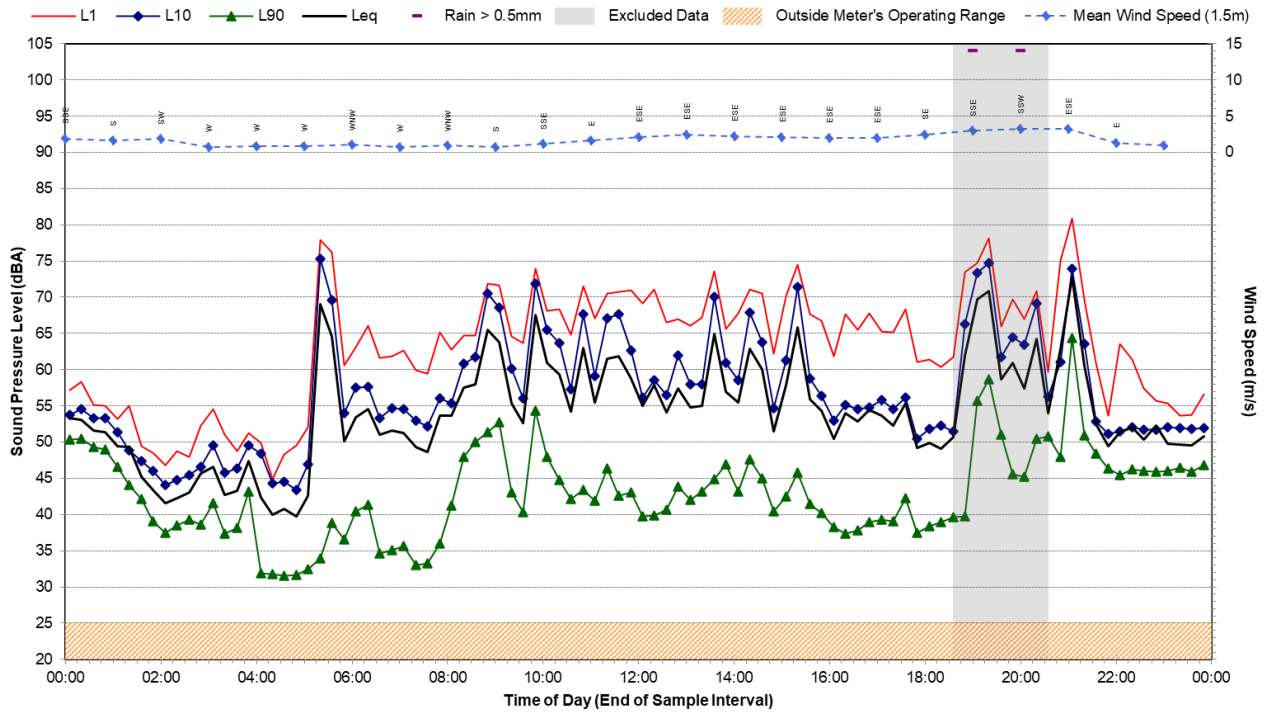
Statistical Ambient Noise Levels

Location D - Sunday, 24 December 2023



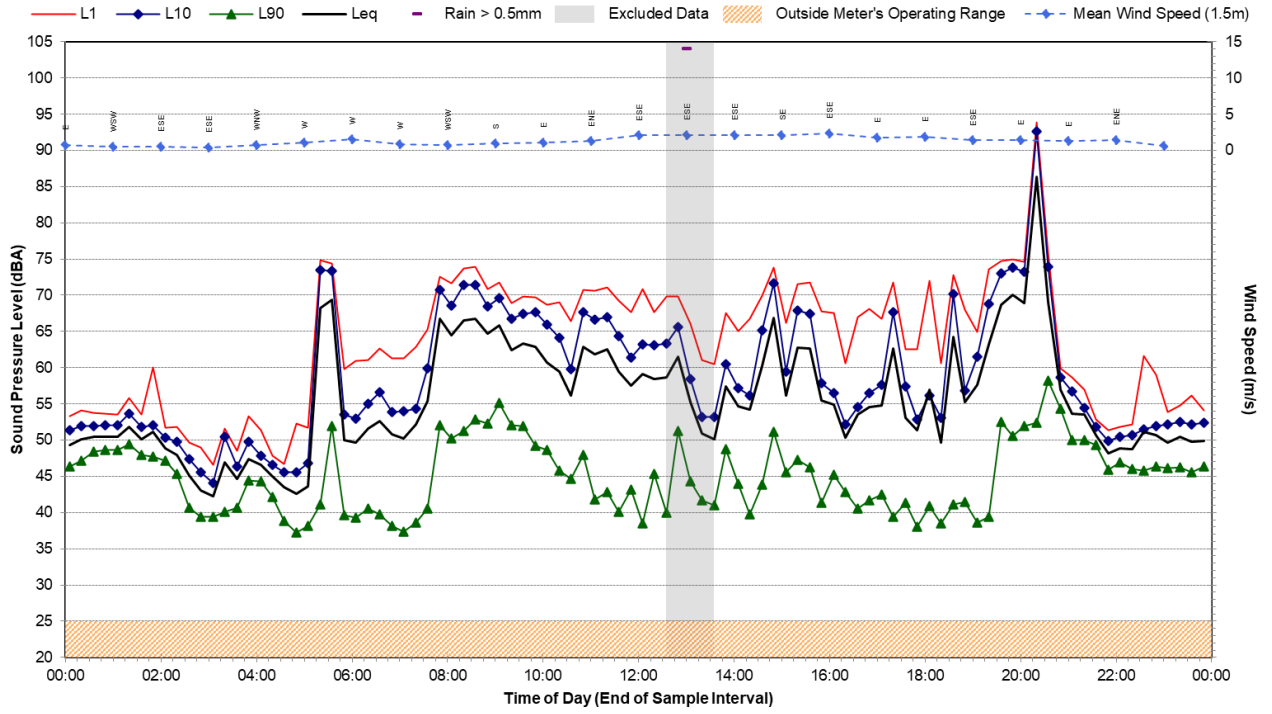
Statistical Ambient Noise Levels

Location D - Monday, 25 December 2023



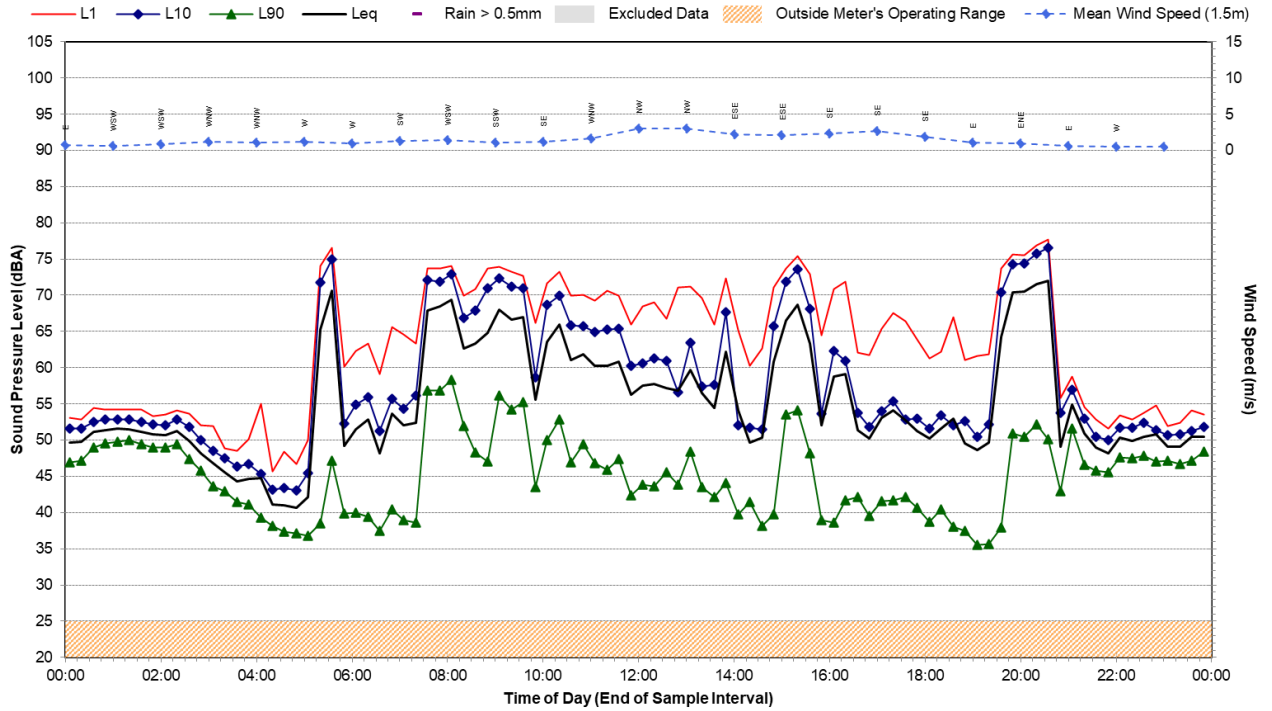
Statistical Ambient Noise Levels

Location D - Tuesday, 26 December 2023



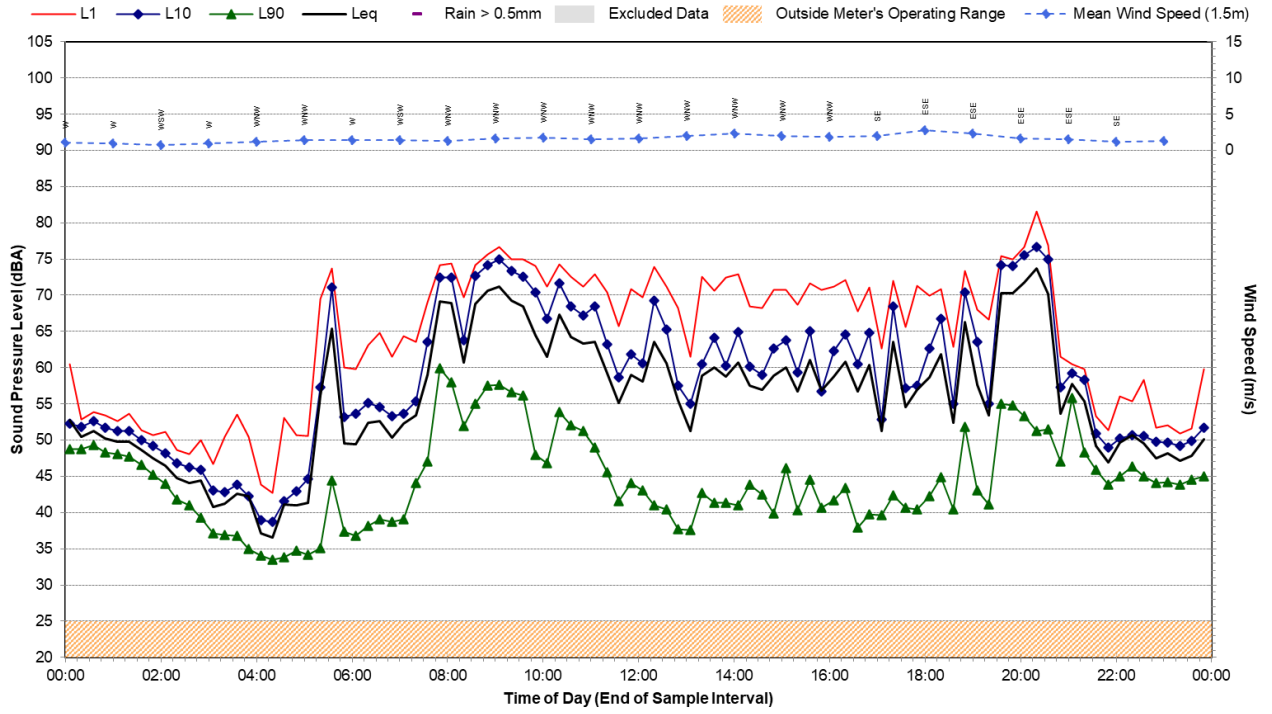
Statistical Ambient Noise Levels

Location D - Wednesday, 27 December 2023



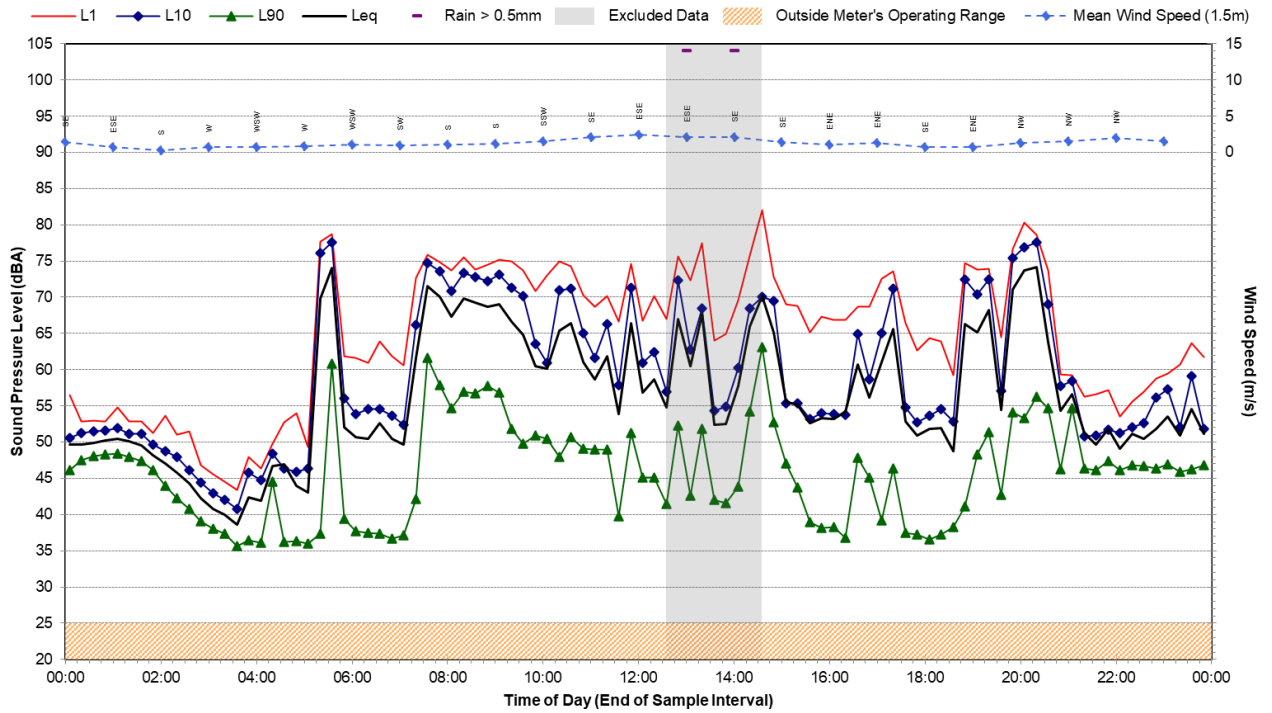
Statistical Ambient Noise Levels

Location D - Thursday, 28 December 2023



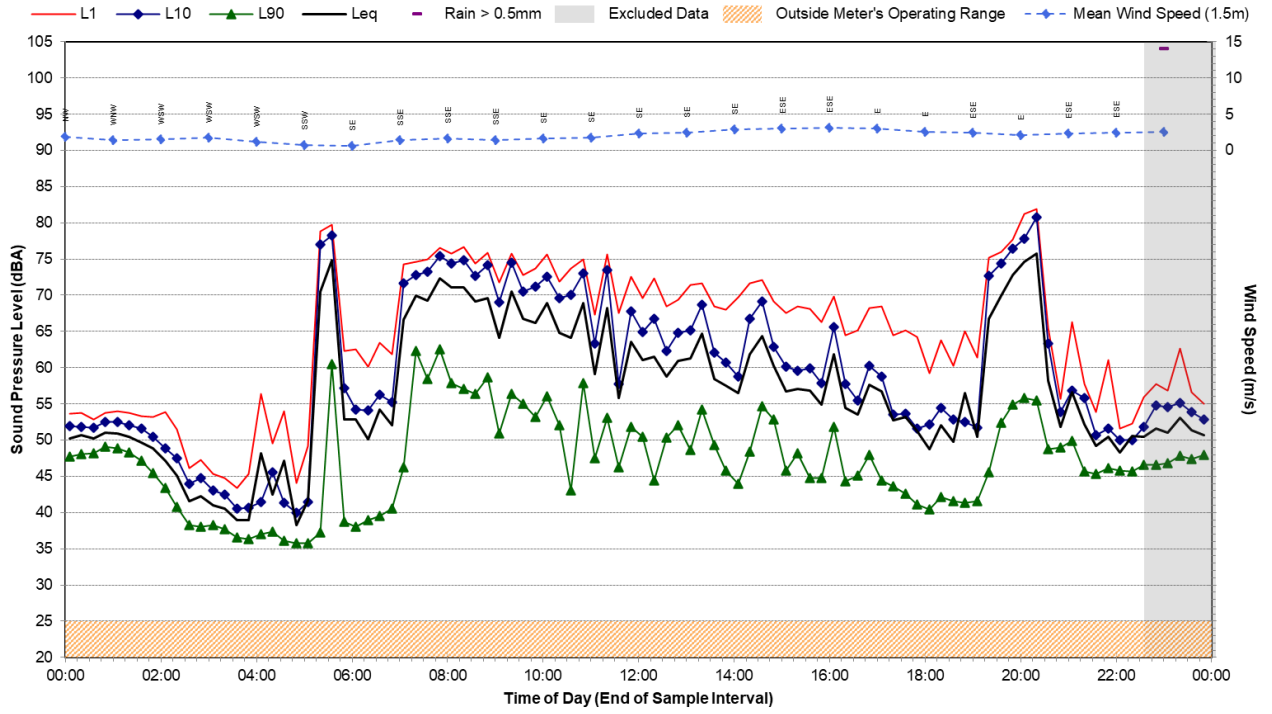
Statistical Ambient Noise Levels

Location D - Friday, 29 December 2023



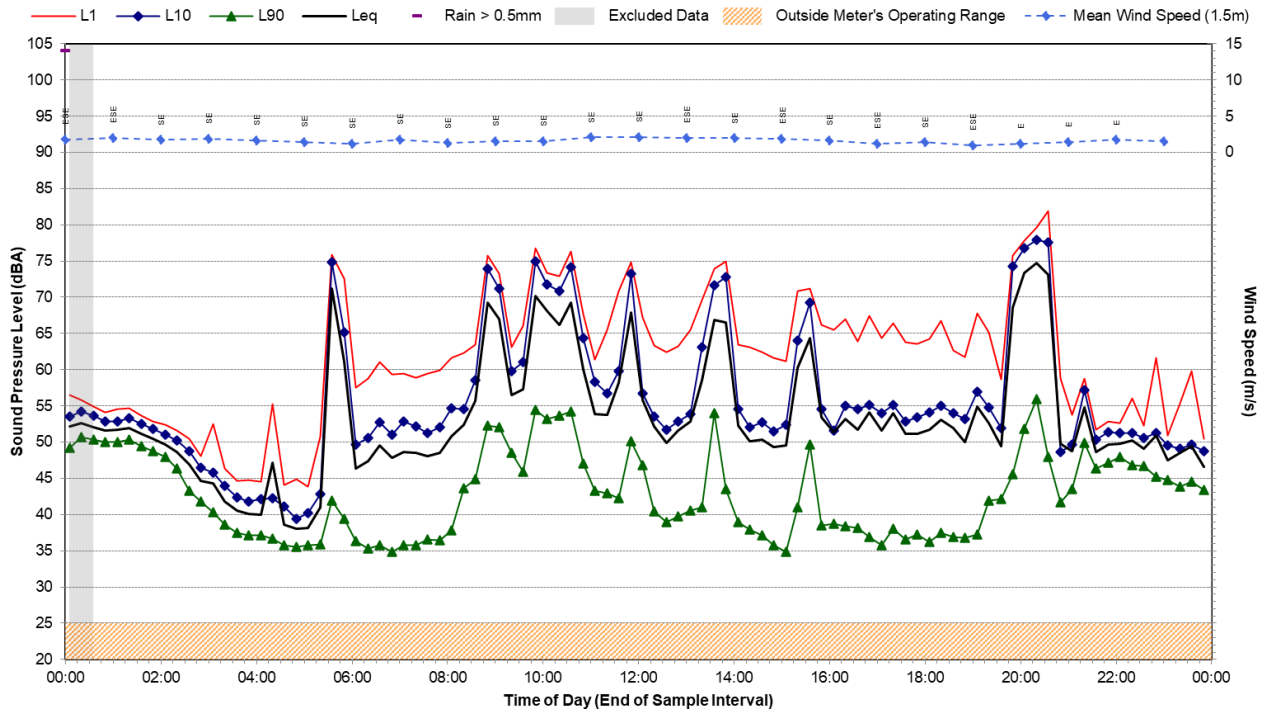
Statistical Ambient Noise Levels

Location D - Saturday, 30 December 2023



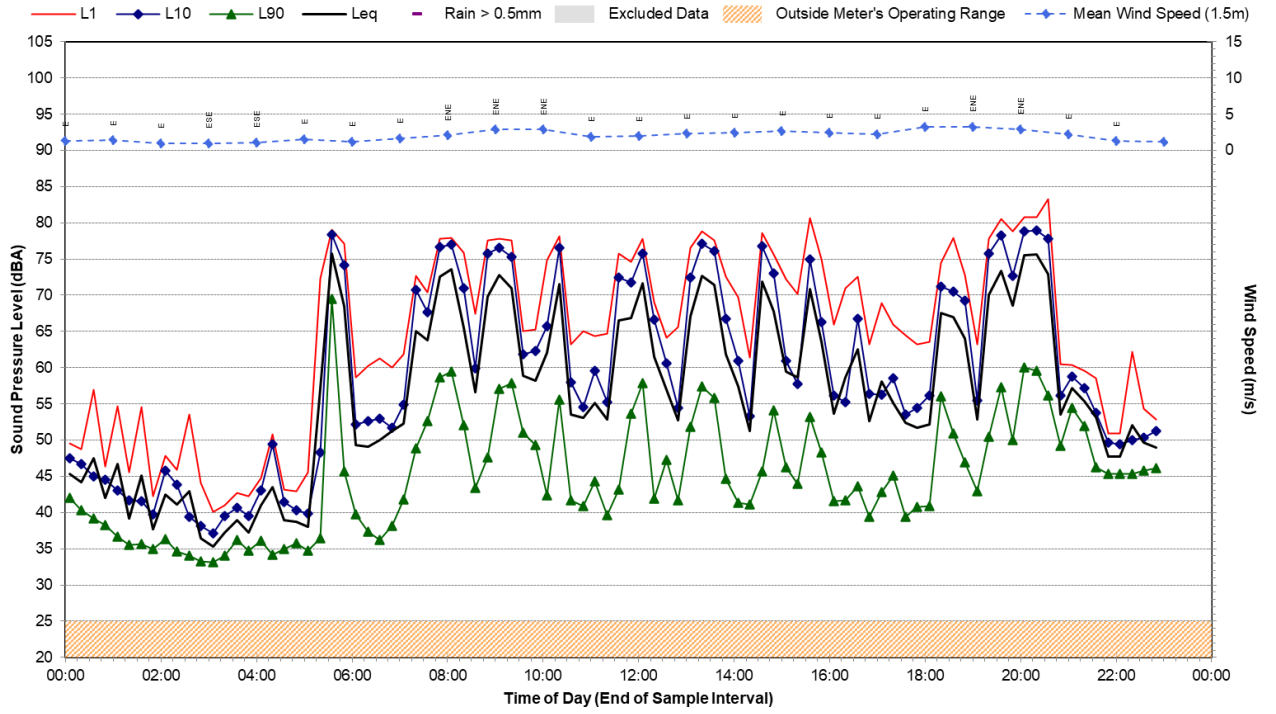
Statistical Ambient Noise Levels

Location D - Sunday, 31 December 2023



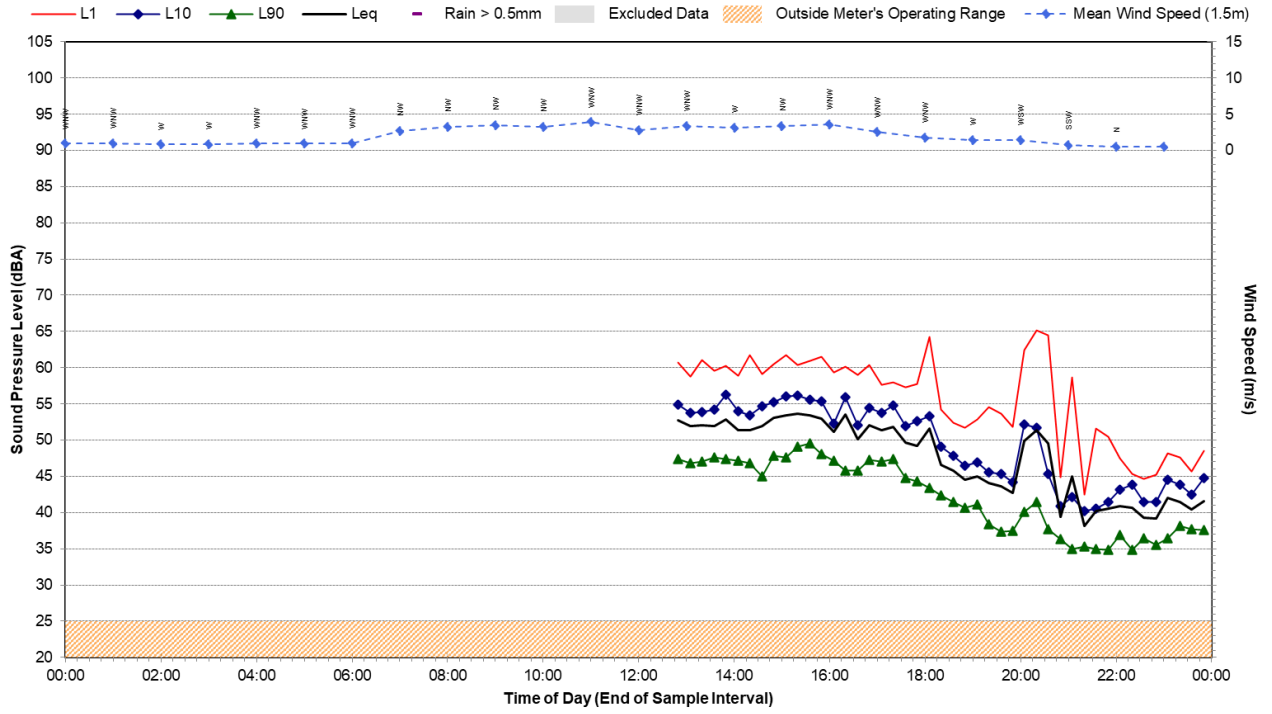
Statistical Ambient Noise Levels

Location D - Monday, 1 January 2024



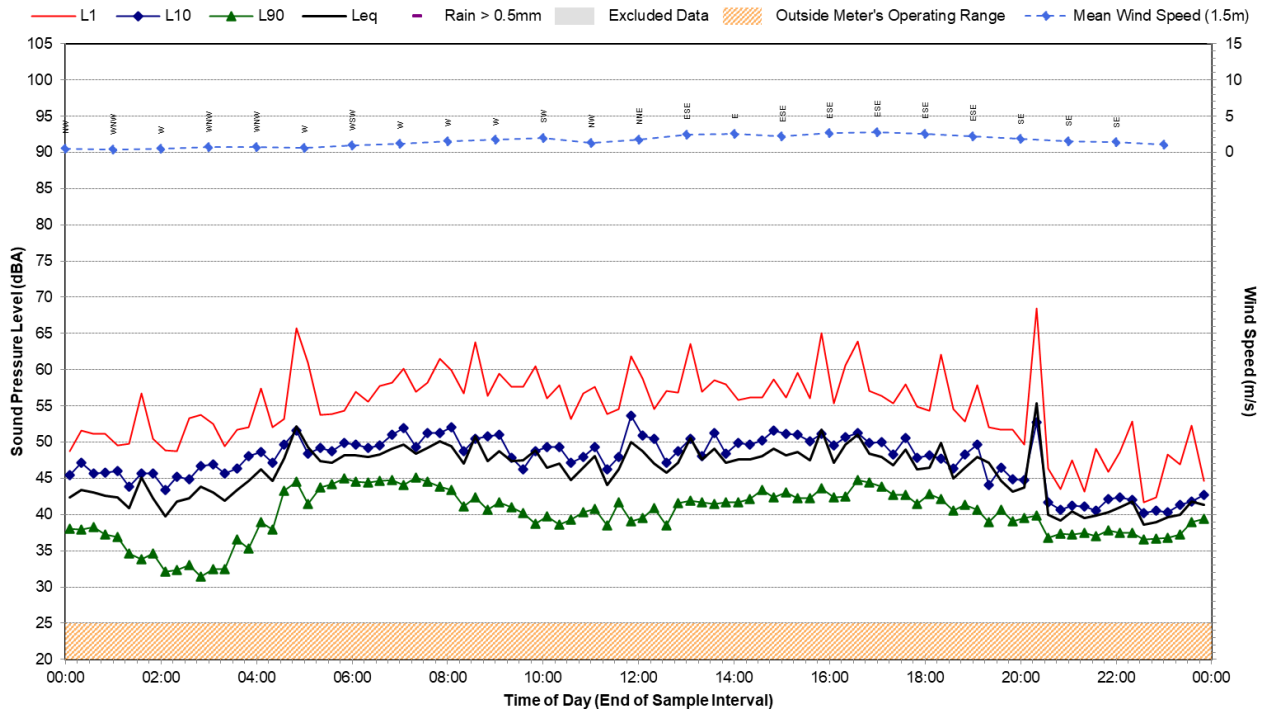
Statistical Ambient Noise Levels

Location F - Thursday, 30 November 2023



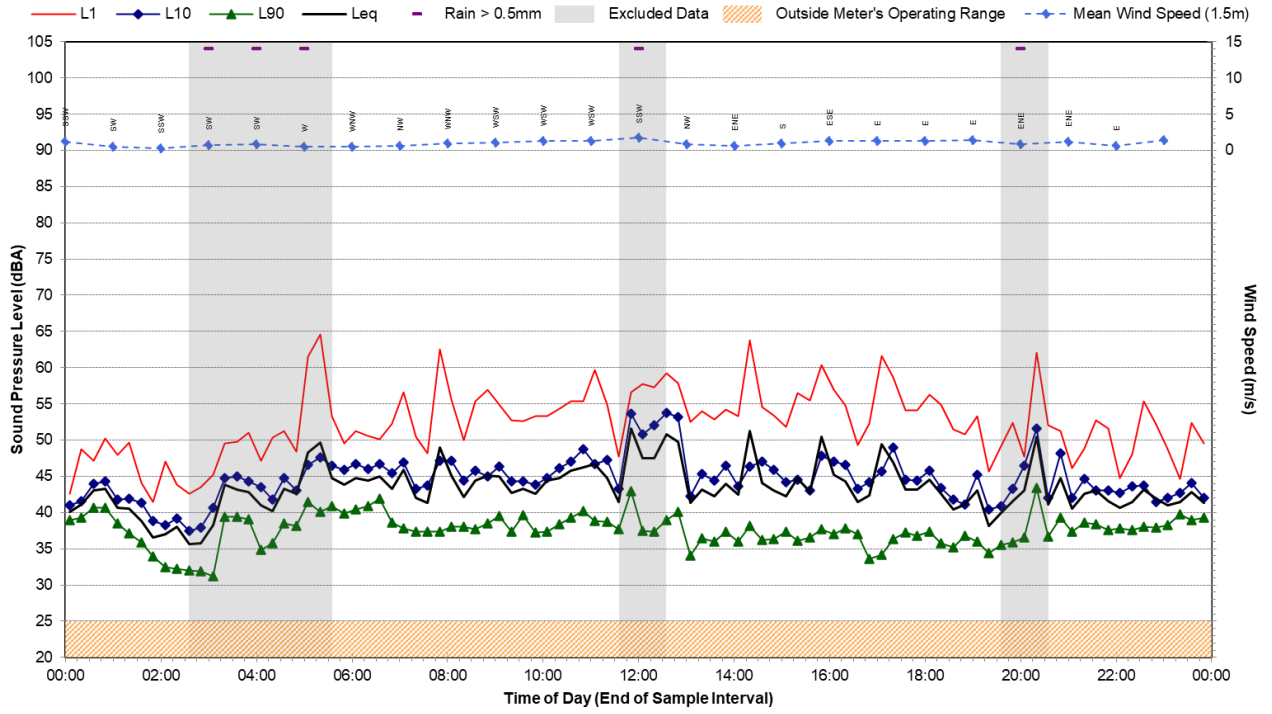
Statistical Ambient Noise Levels

Location F - Friday, 1 December 2023



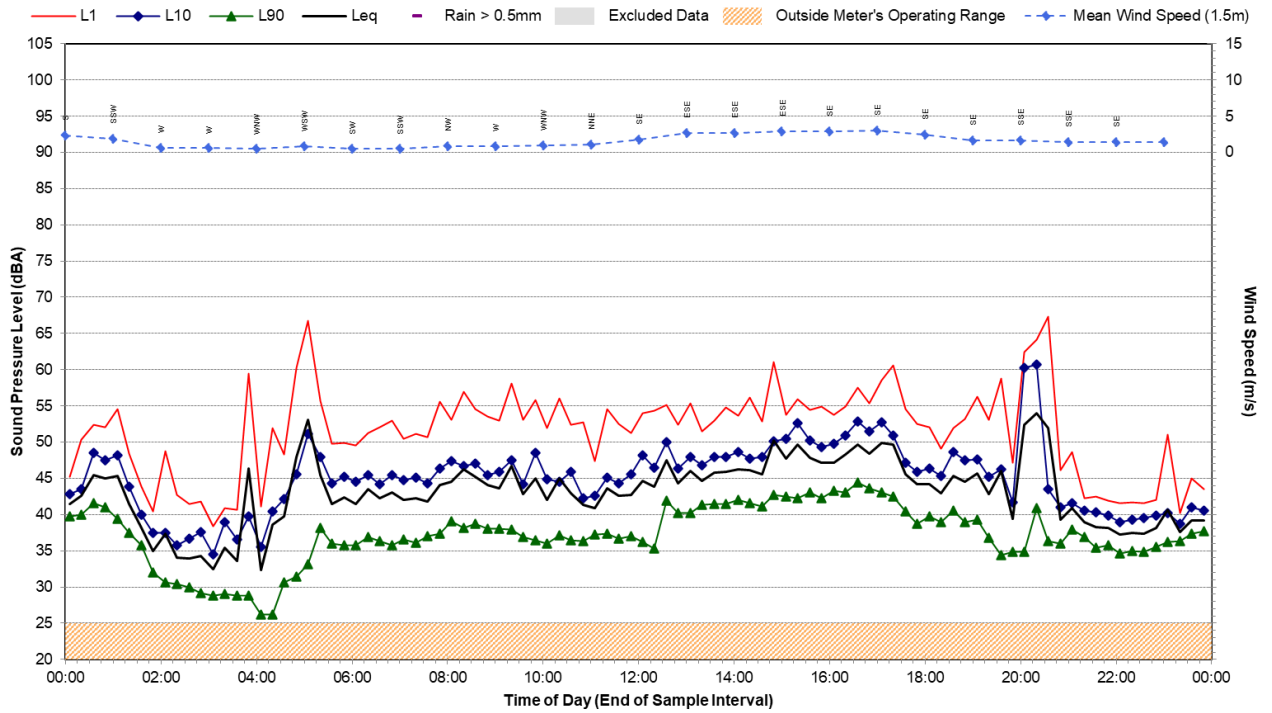
Statistical Ambient Noise Levels

Location F - Saturday, 2 December 2023



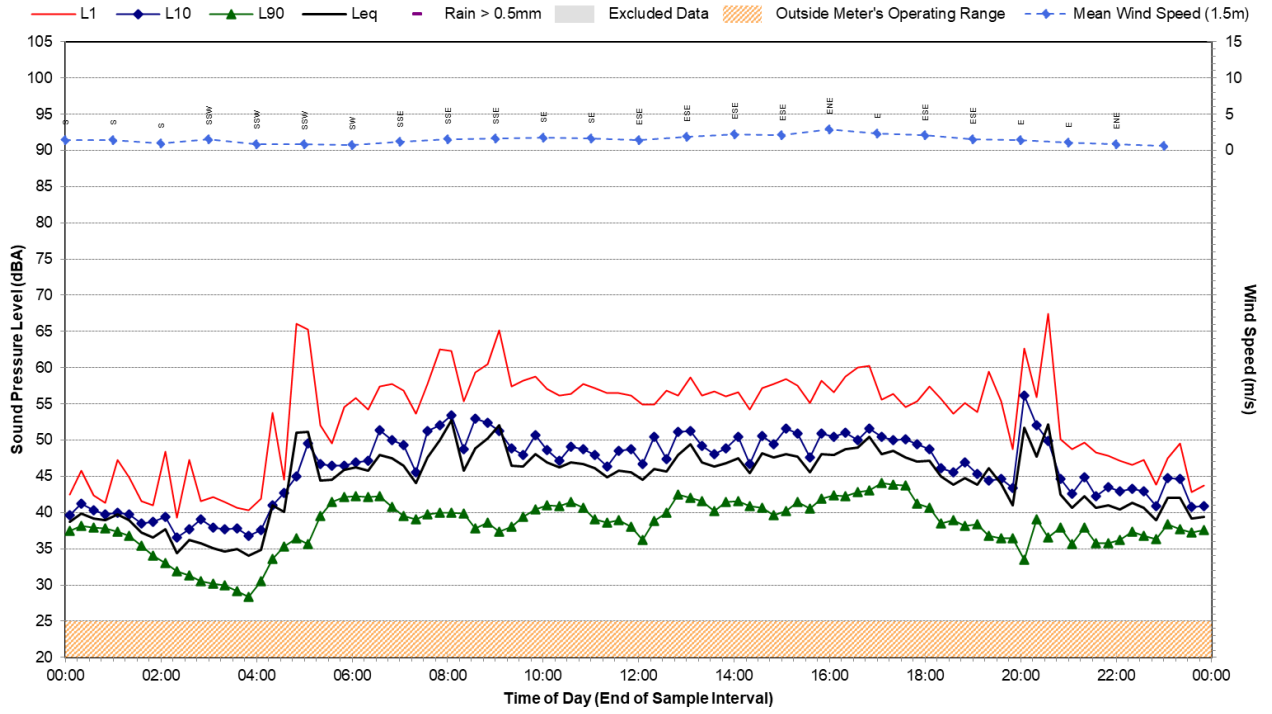
Statistical Ambient Noise Levels

Location F - Sunday, 3 December 2023



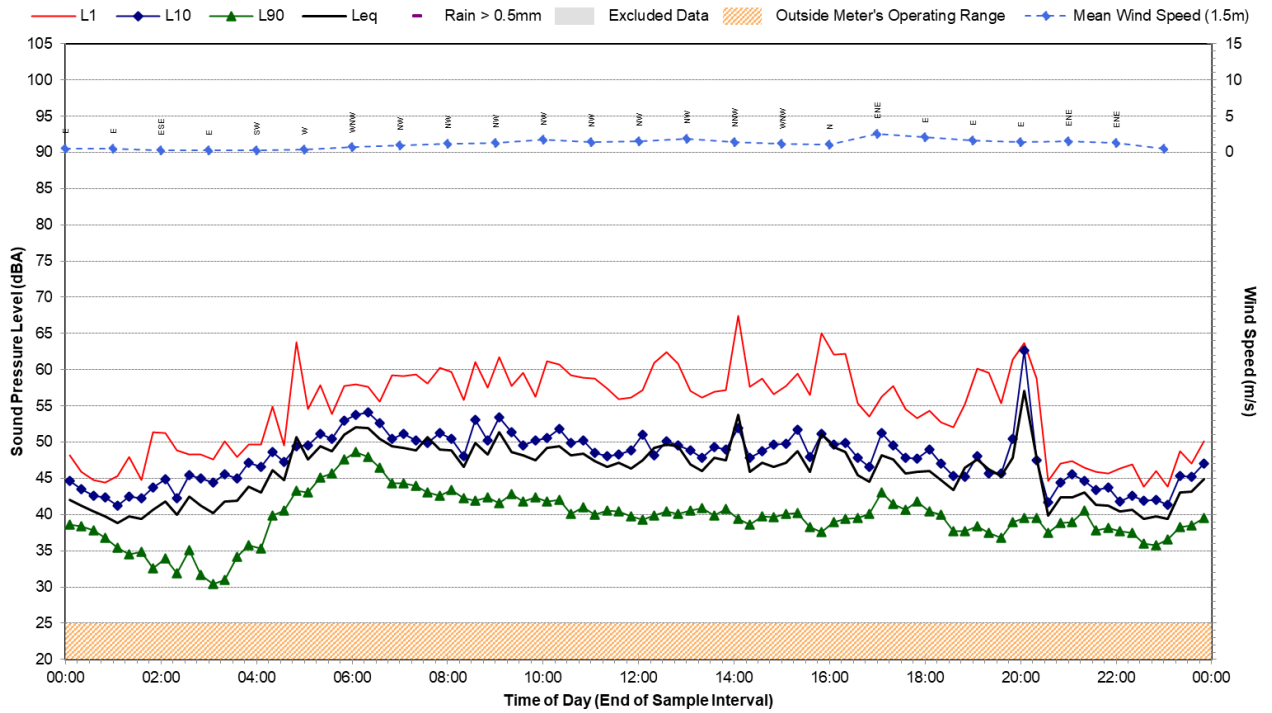
Statistical Ambient Noise Levels

Location F - Monday, 4 December 2023



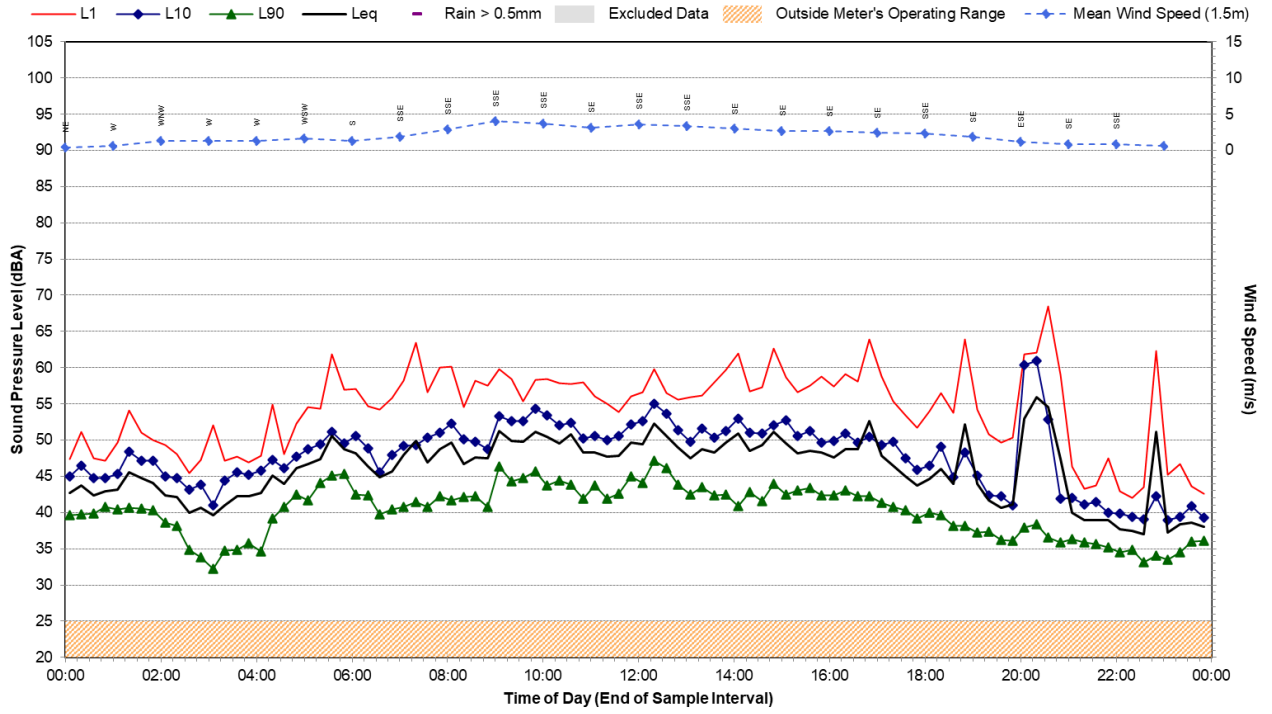
Statistical Ambient Noise Levels

Location F - Tuesday, 5 December 2023



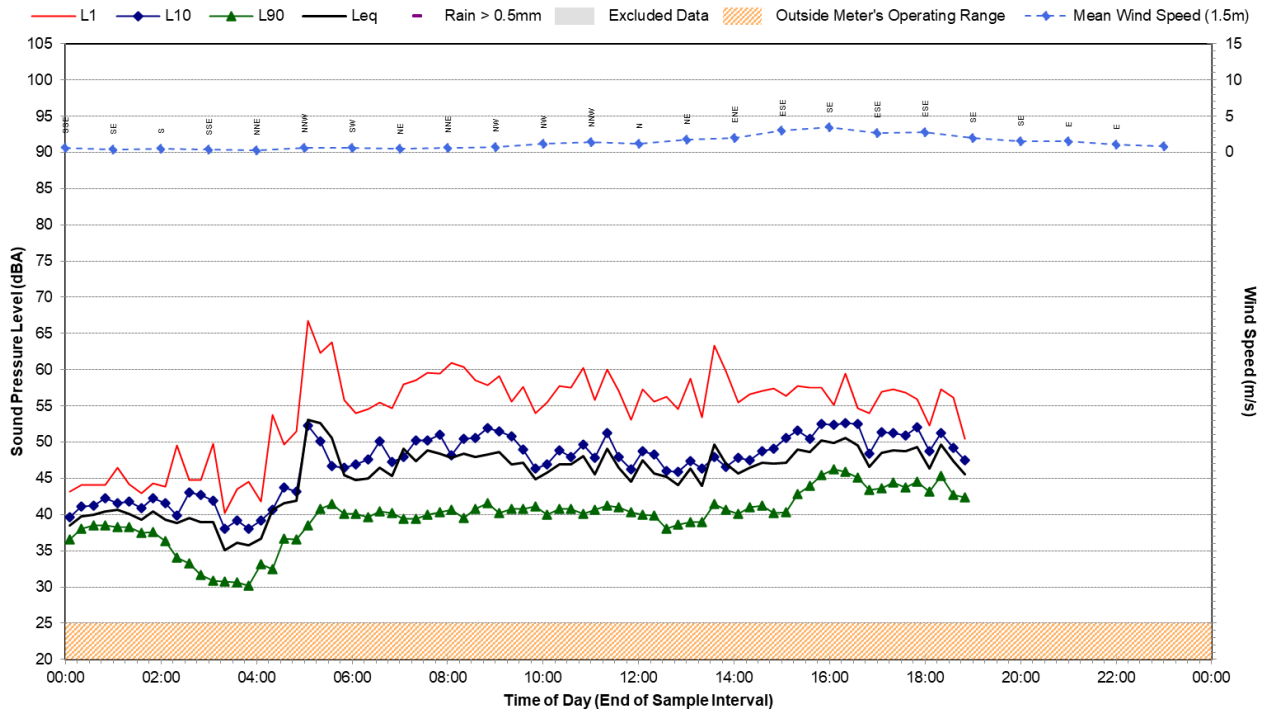
Statistical Ambient Noise Levels

Location F - Wednesday, 6 December 2023



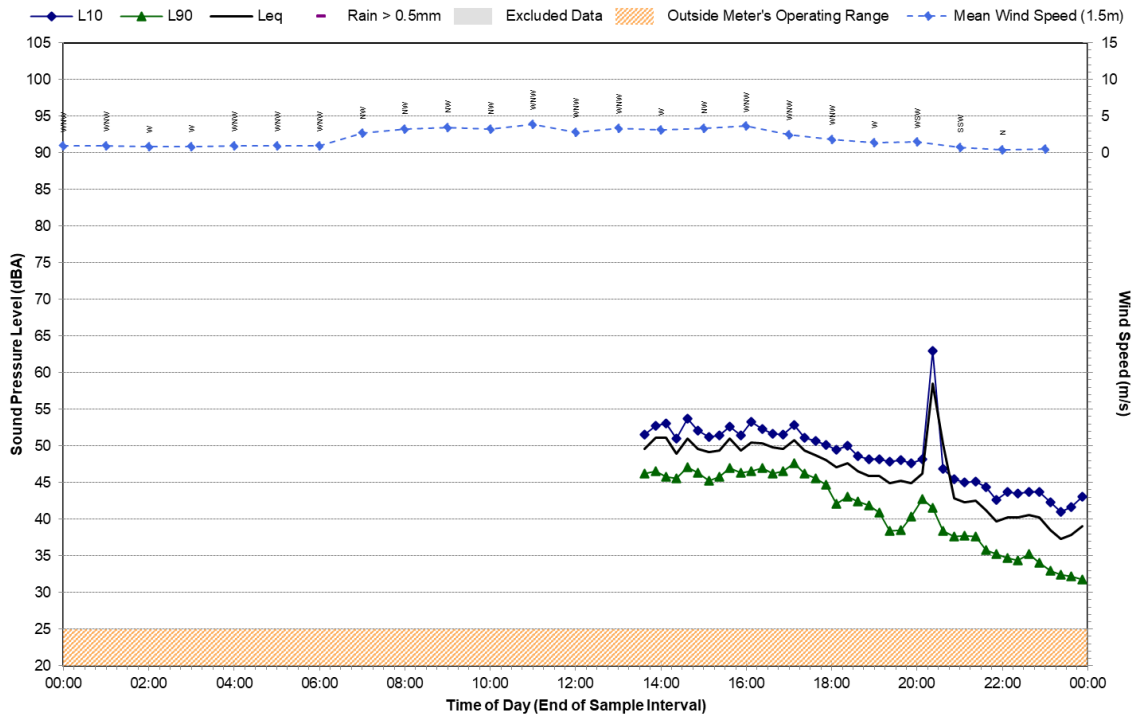
Statistical Ambient Noise Levels

Location F - Thursday, 7 December 2023



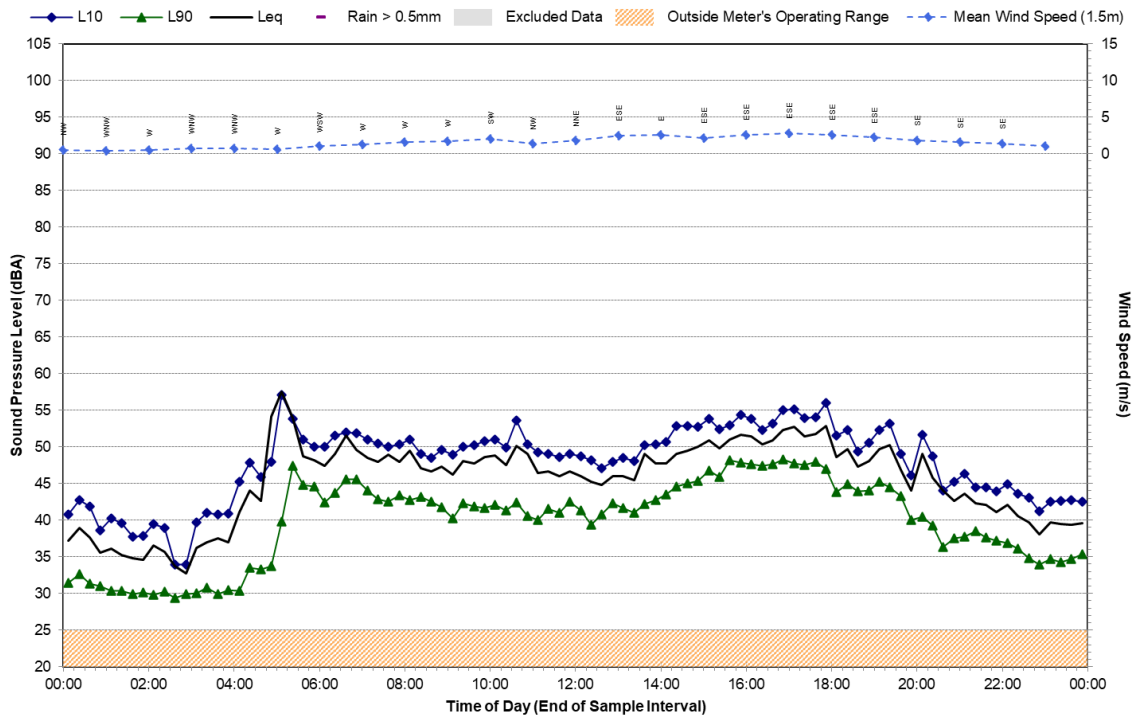
Statistical Ambient Noise Levels

Location G - Thursday, 30 November 2023



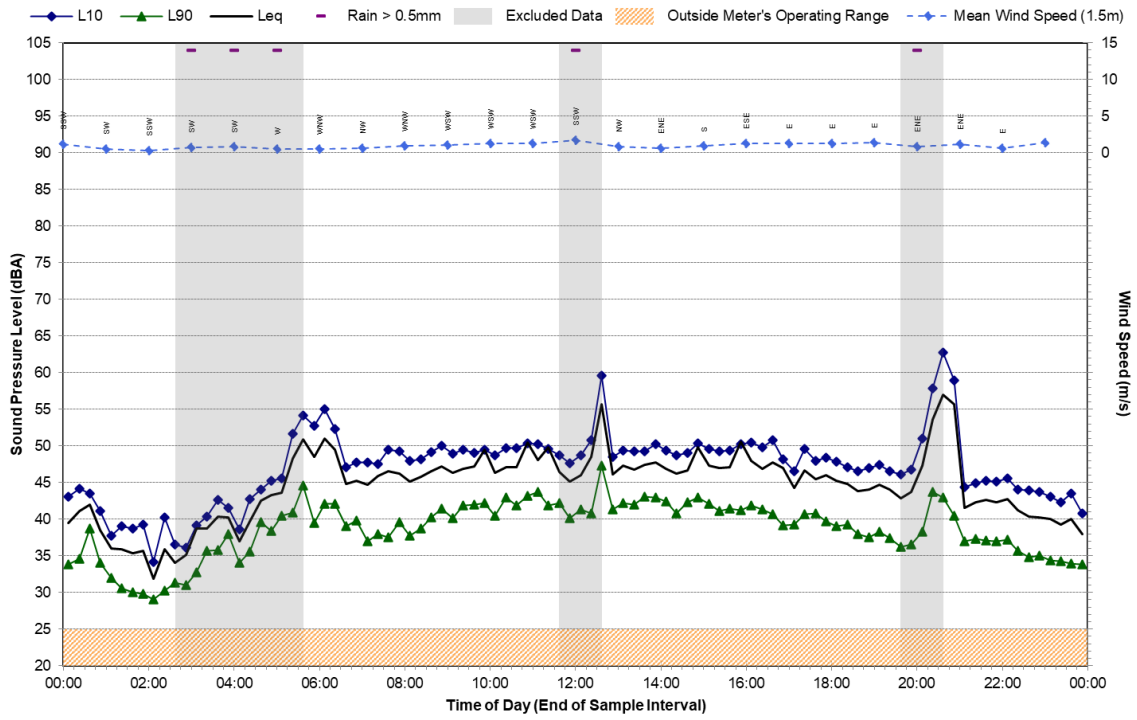
Statistical Ambient Noise Levels

Location G - Friday, 1 December 2023



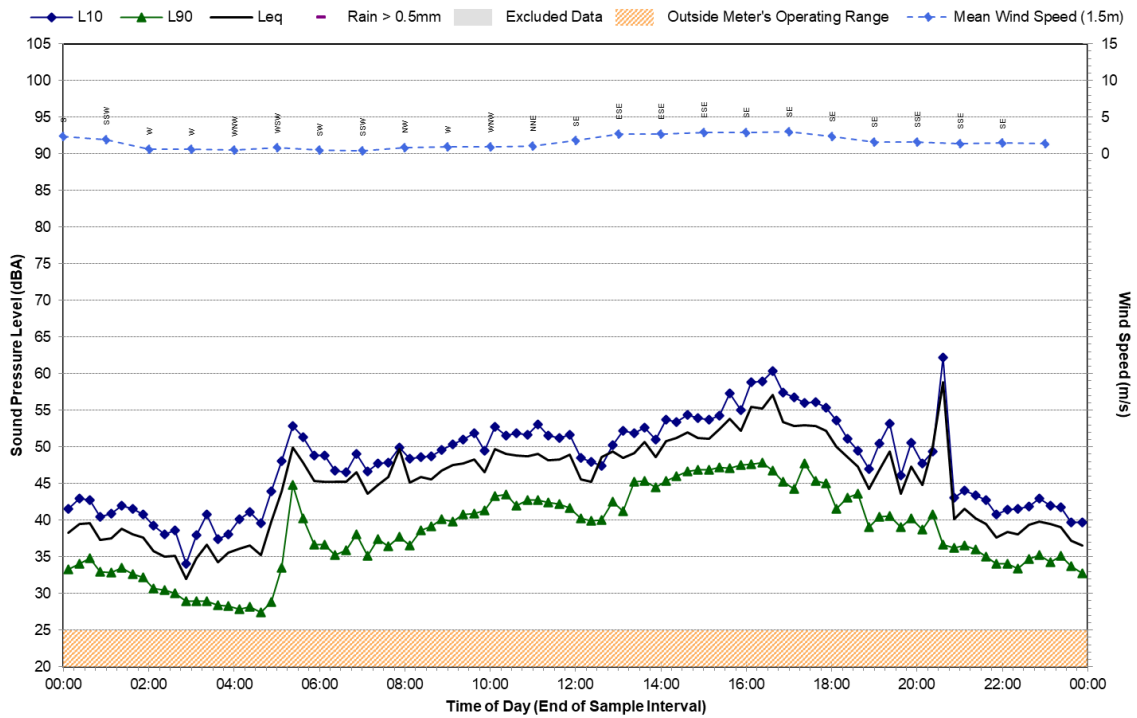
Statistical Ambient Noise Levels

Location G - Saturday, 2 December 2023



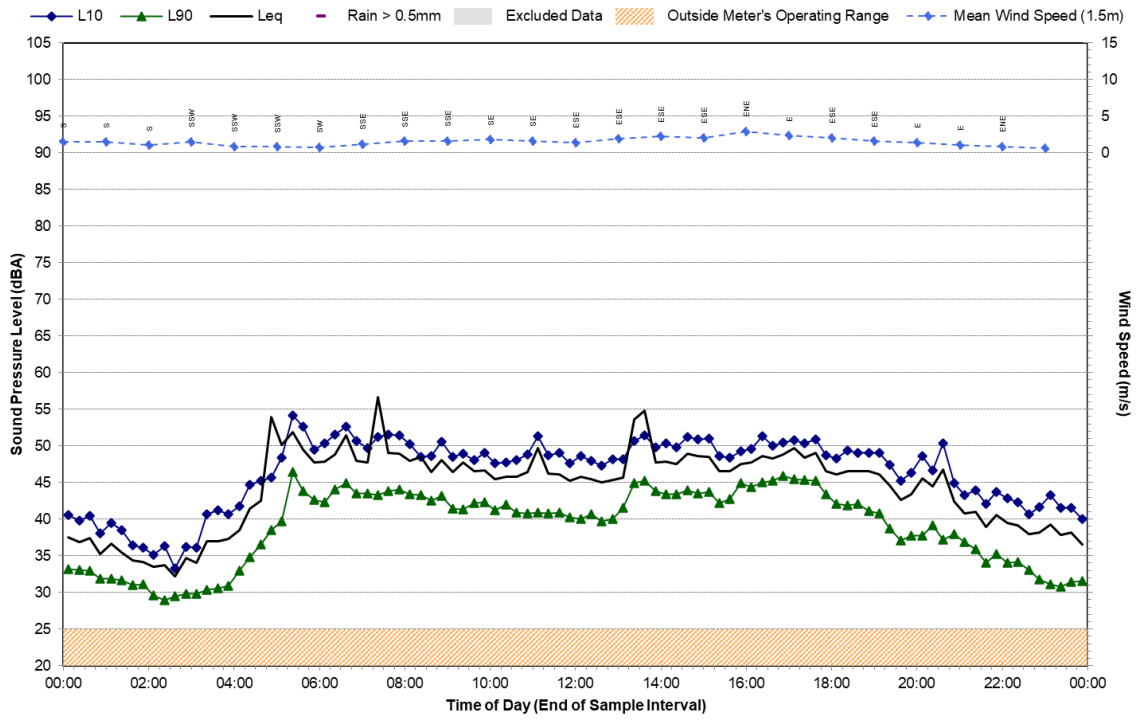
Statistical Ambient Noise Levels

Location G - Sunday, 3 December 2023



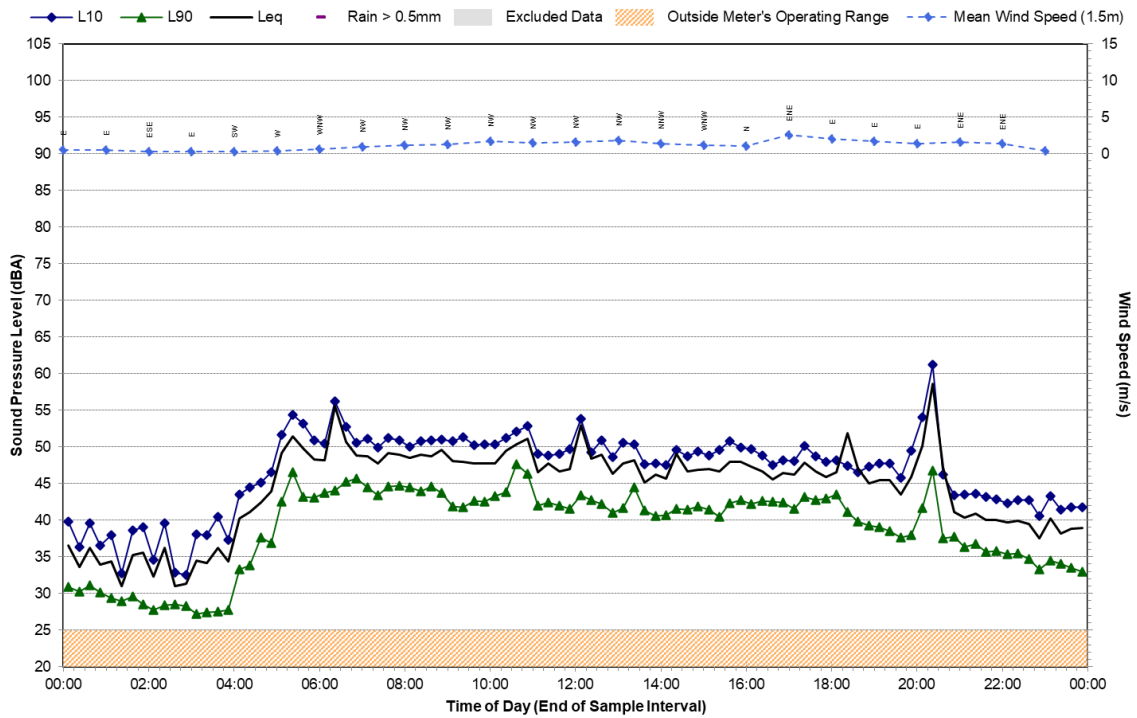
Statistical Ambient Noise Levels

Location G - Monday, 4 December 2023



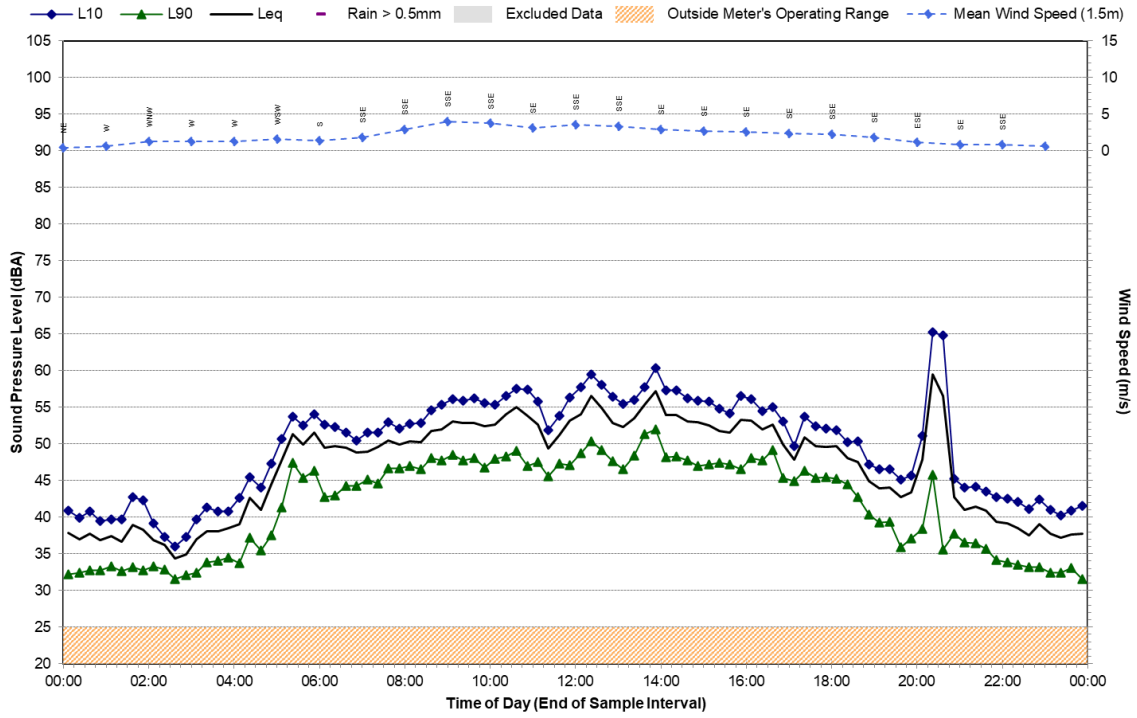
Statistical Ambient Noise Levels

Location G - Tuesday, 5 December 2023



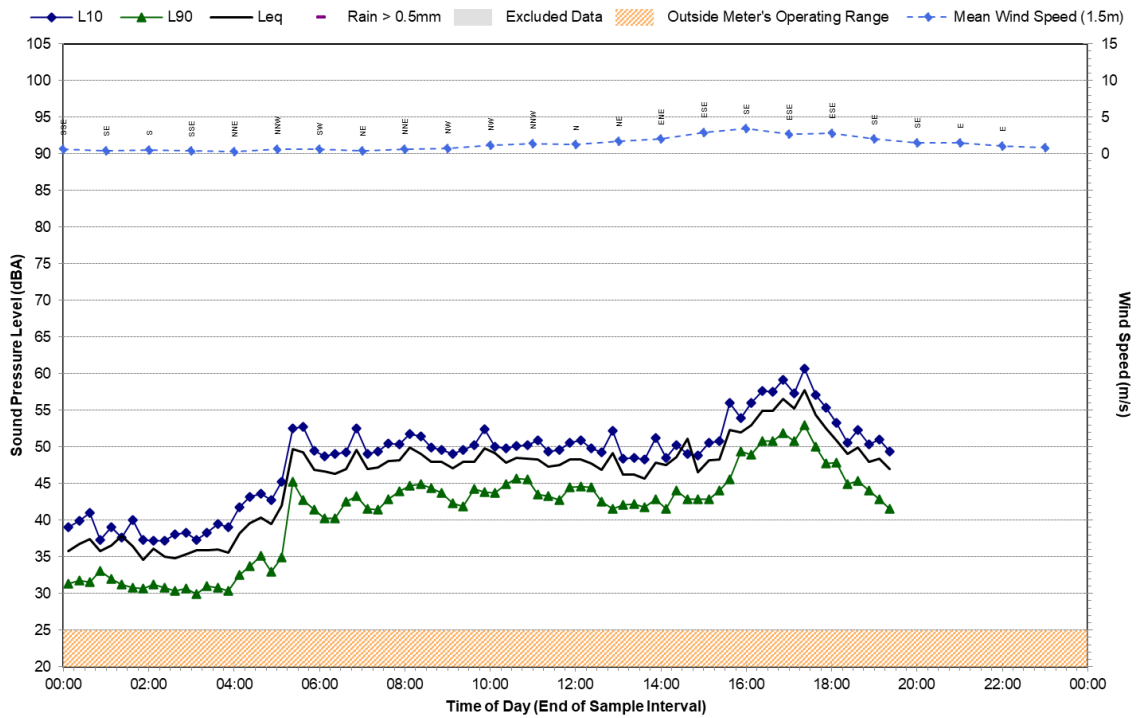
Statistical Ambient Noise Levels

Location G - Wednesday, 6 December 2023



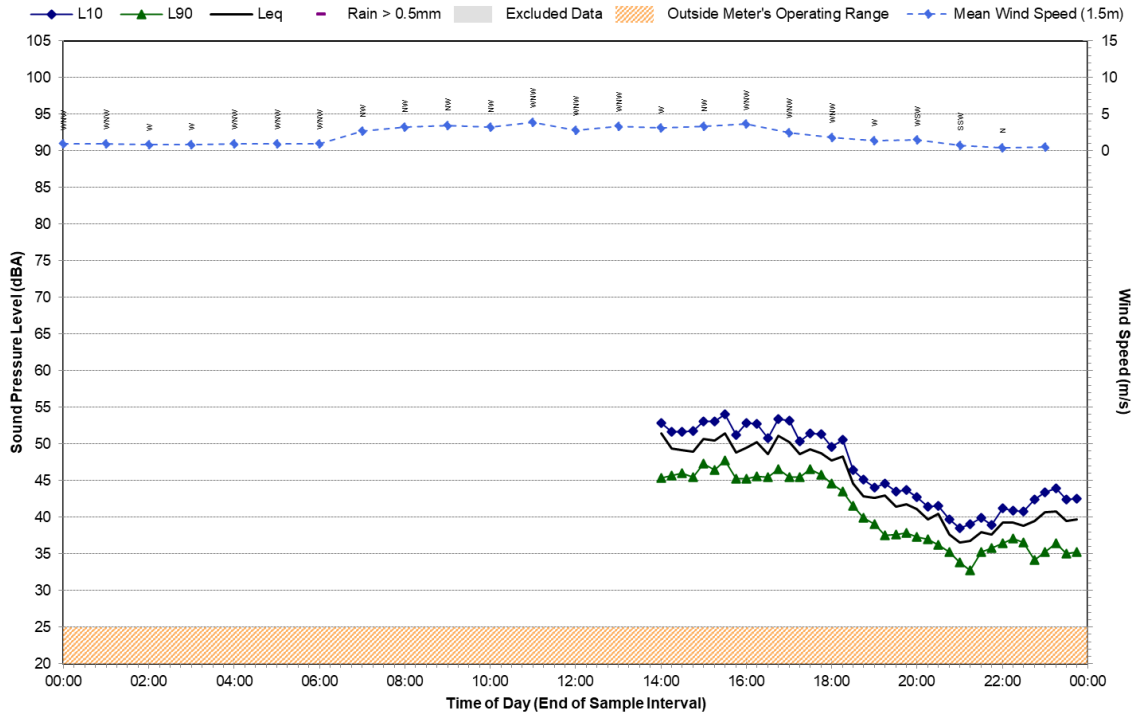
Statistical Ambient Noise Levels

Location G - Thursday, 7 December 2023



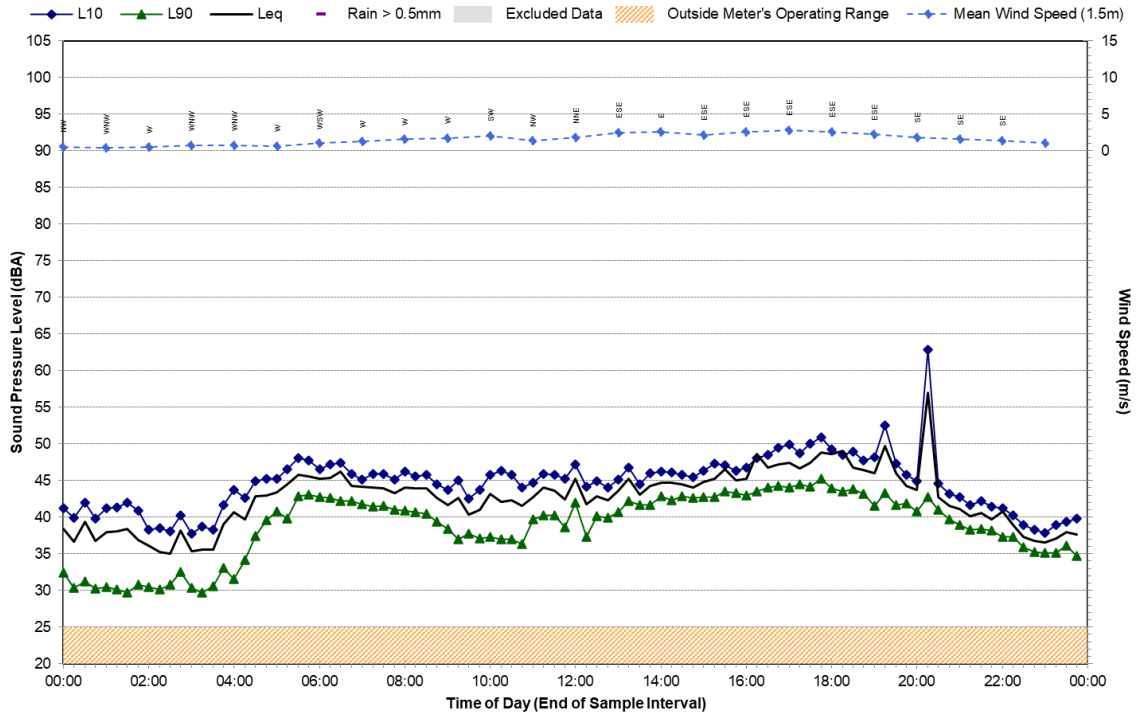
Statistical Ambient Noise Levels

Location J - Thursday, 30 November 2023



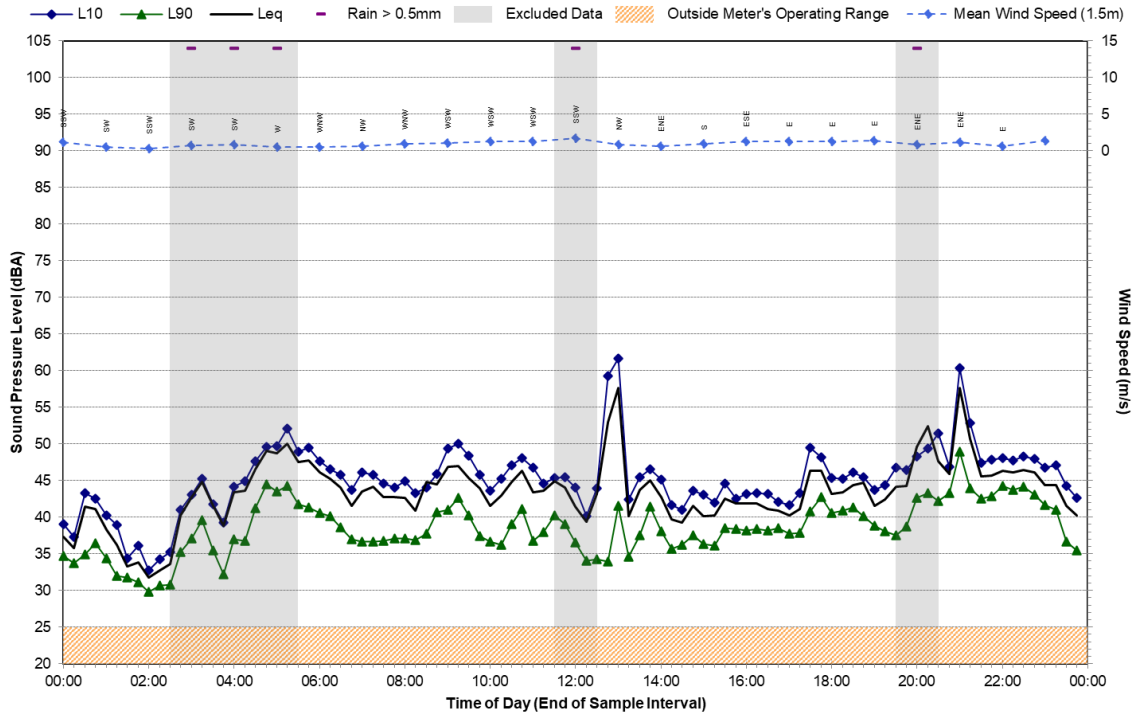
Statistical Ambient Noise Levels

Location J - Friday, 1 December 2023



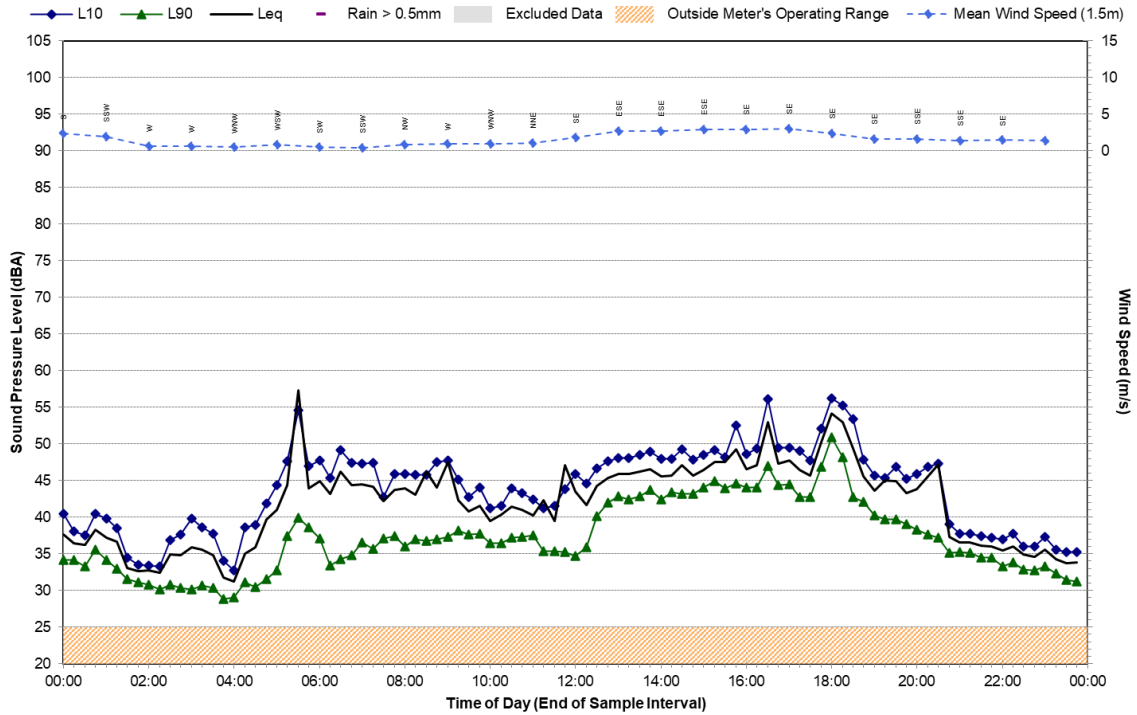
Statistical Ambient Noise Levels

Location J - Saturday, 2 December 2023



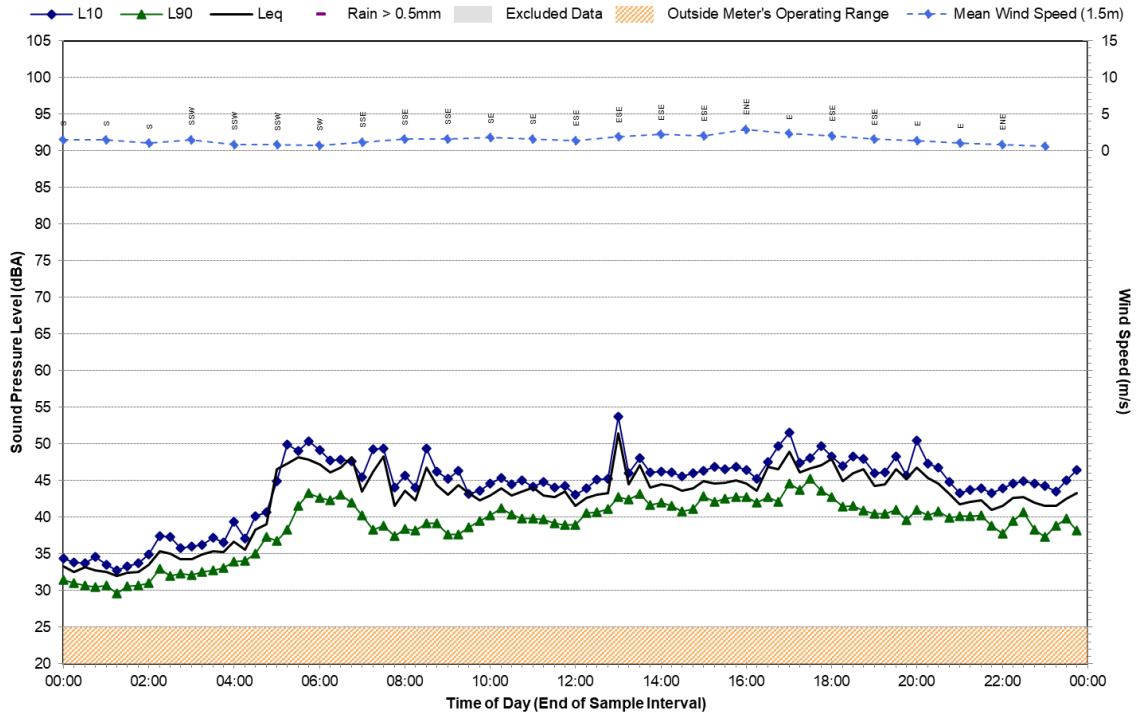
Statistical Ambient Noise Levels

Location J - Sunday, 3 December 2023



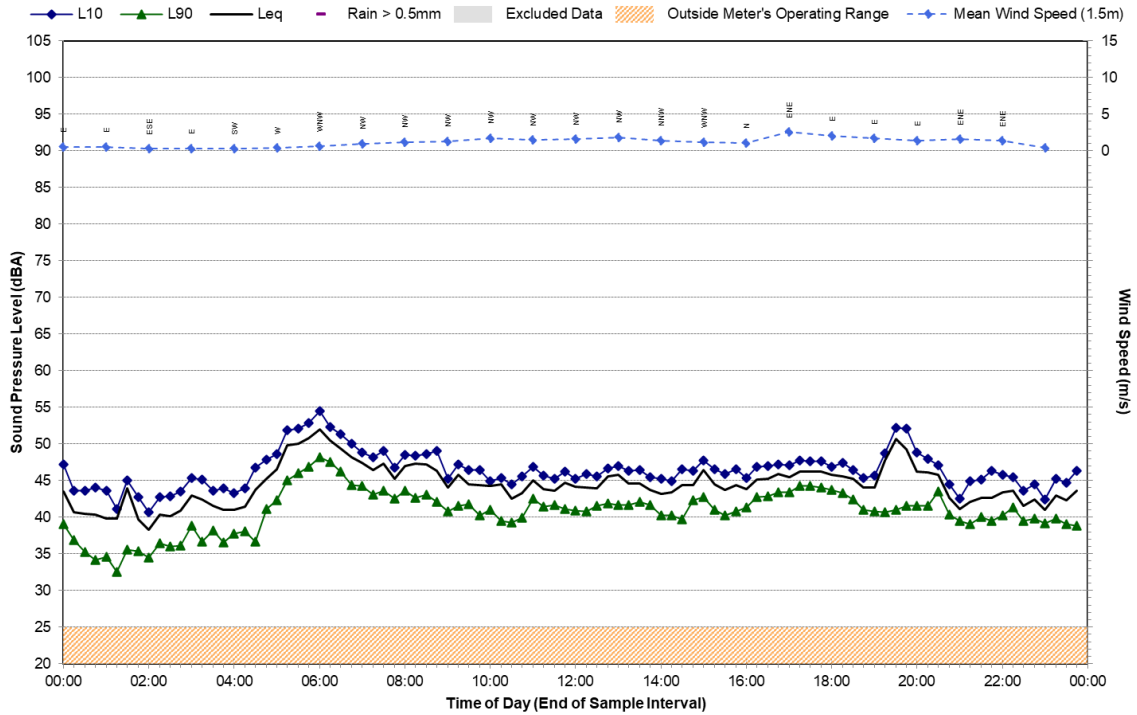
Statistical Ambient Noise Levels

Location J - Monday, 4 December 2023



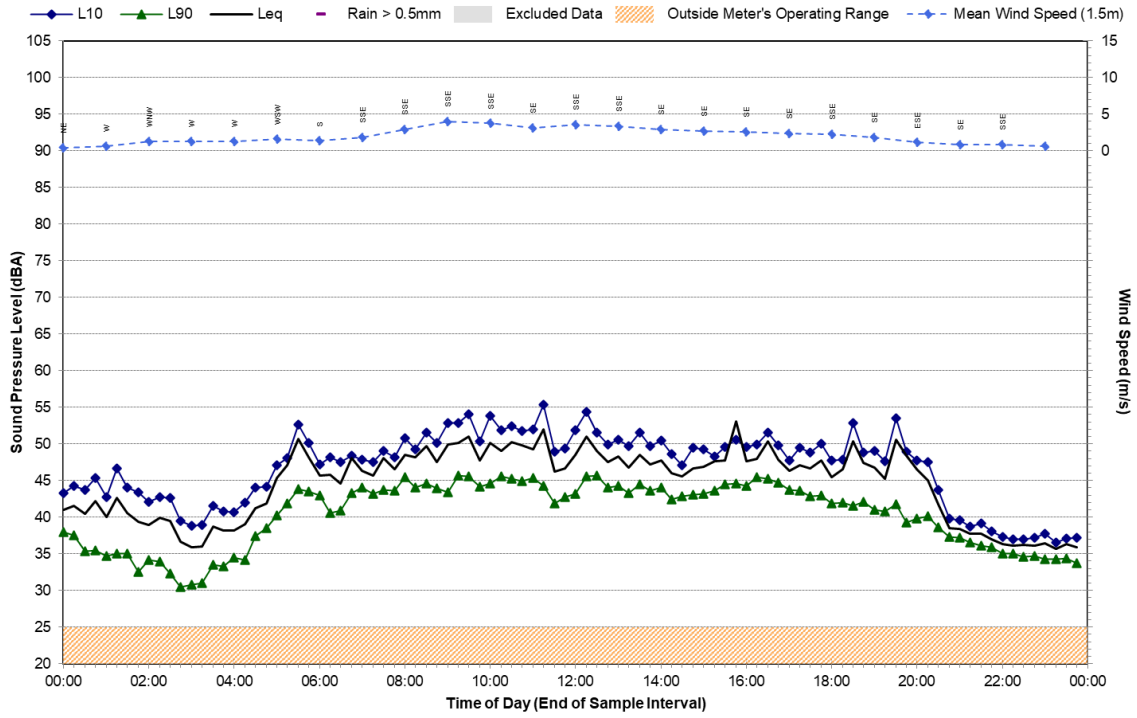
Statistical Ambient Noise Levels

Location J - Tuesday, 5 December 2023



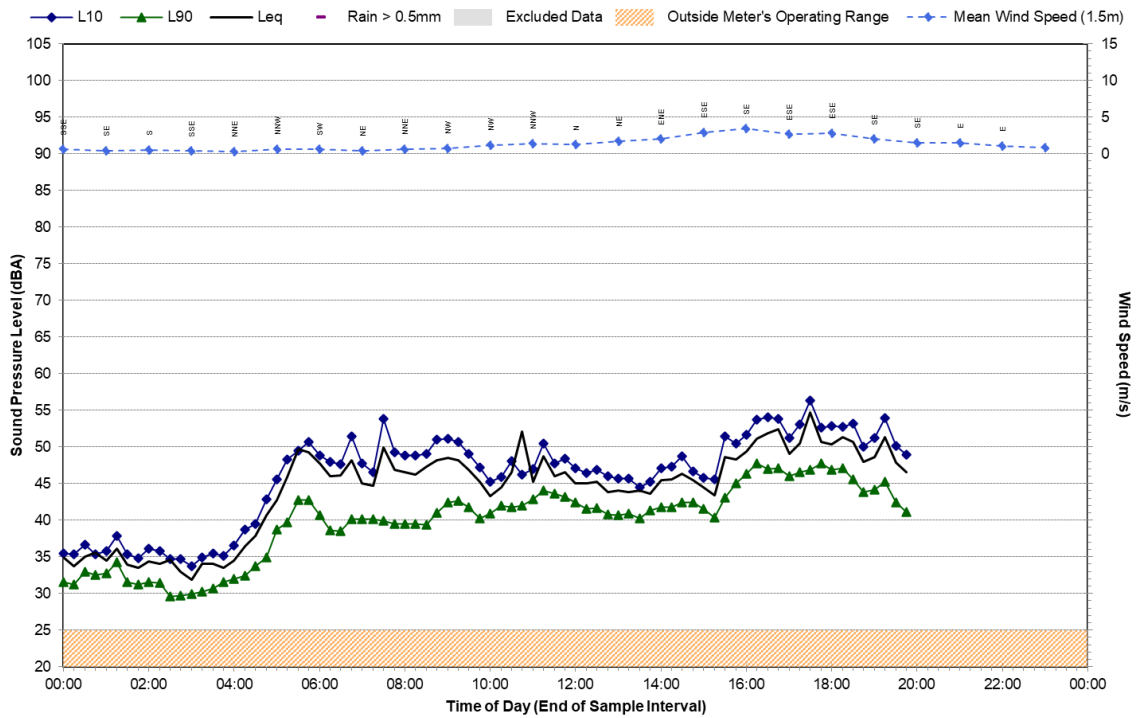
Statistical Ambient Noise Levels

Location J - Wednesday, 6 December 2023



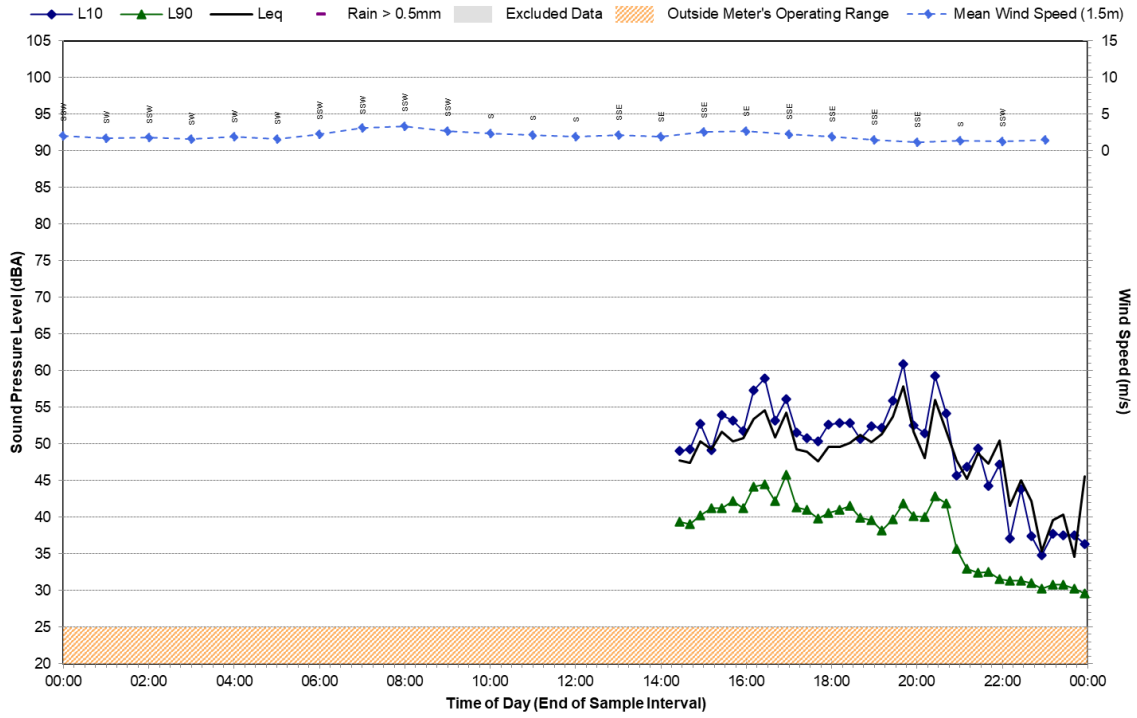
Statistical Ambient Noise Levels

Location J - Thursday, 7 December 2023



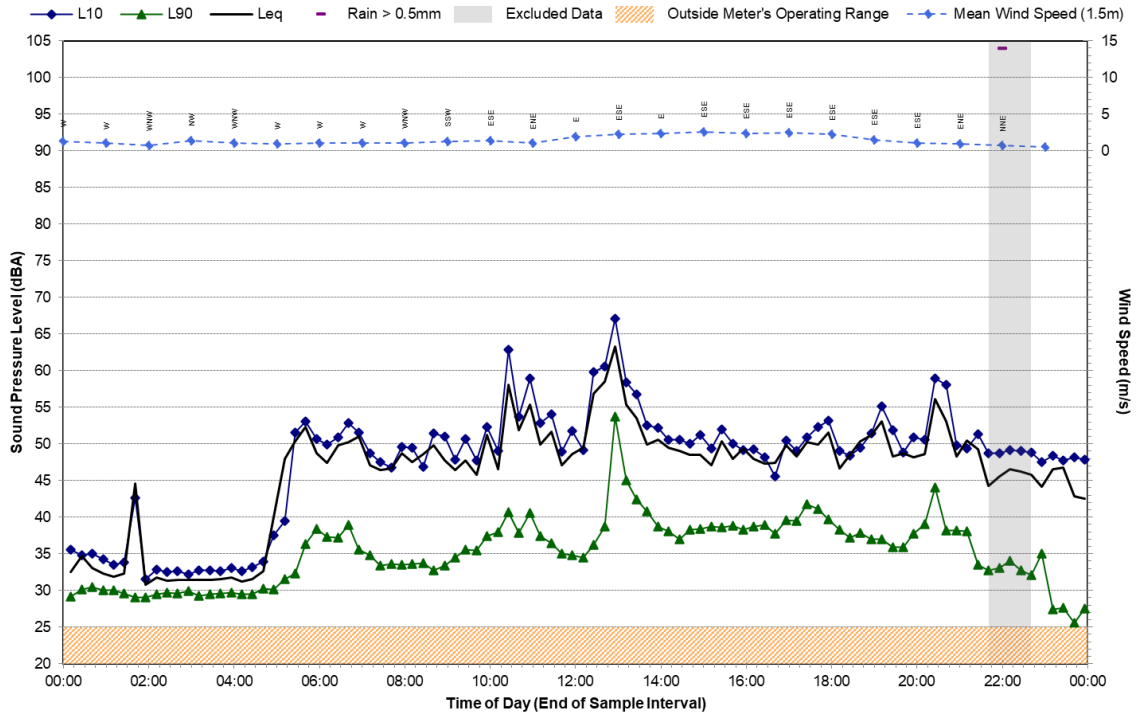
Statistical Ambient Noise Levels

Location L - Friday, 22 December 2023



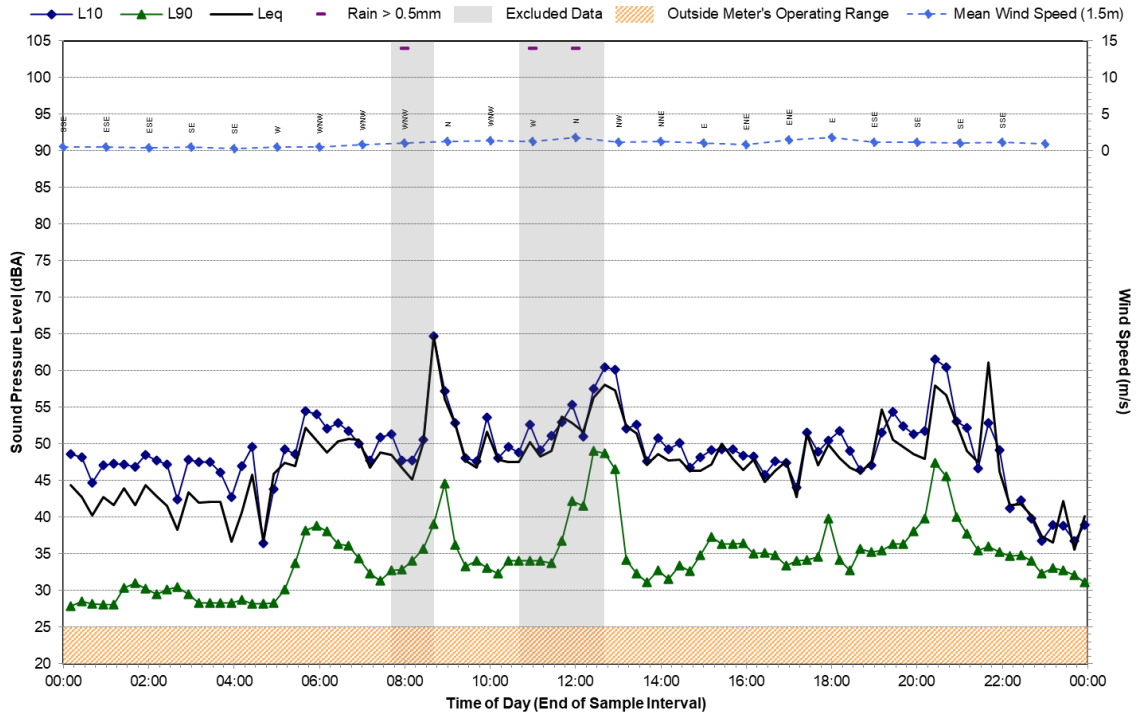
Statistical Ambient Noise Levels

Location L - Saturday, 23 December 2023



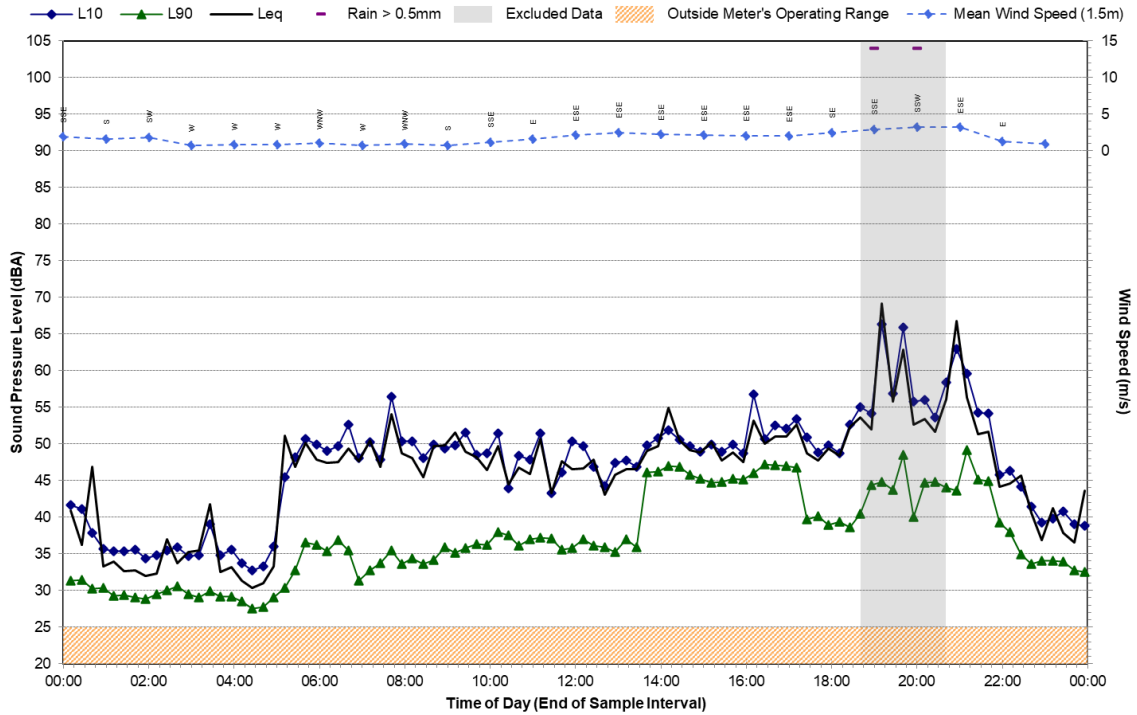
Statistical Ambient Noise Levels

Location L - Sunday, 24 December 2023



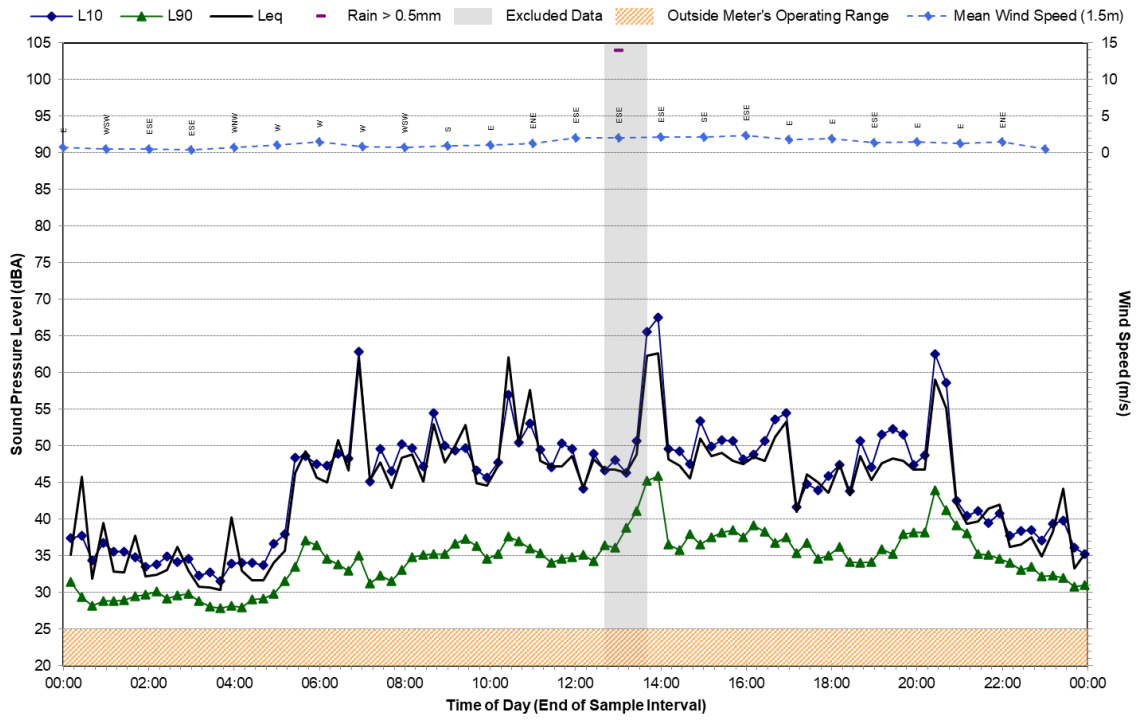
Statistical Ambient Noise Levels

Location L - Monday, 25 December 2023



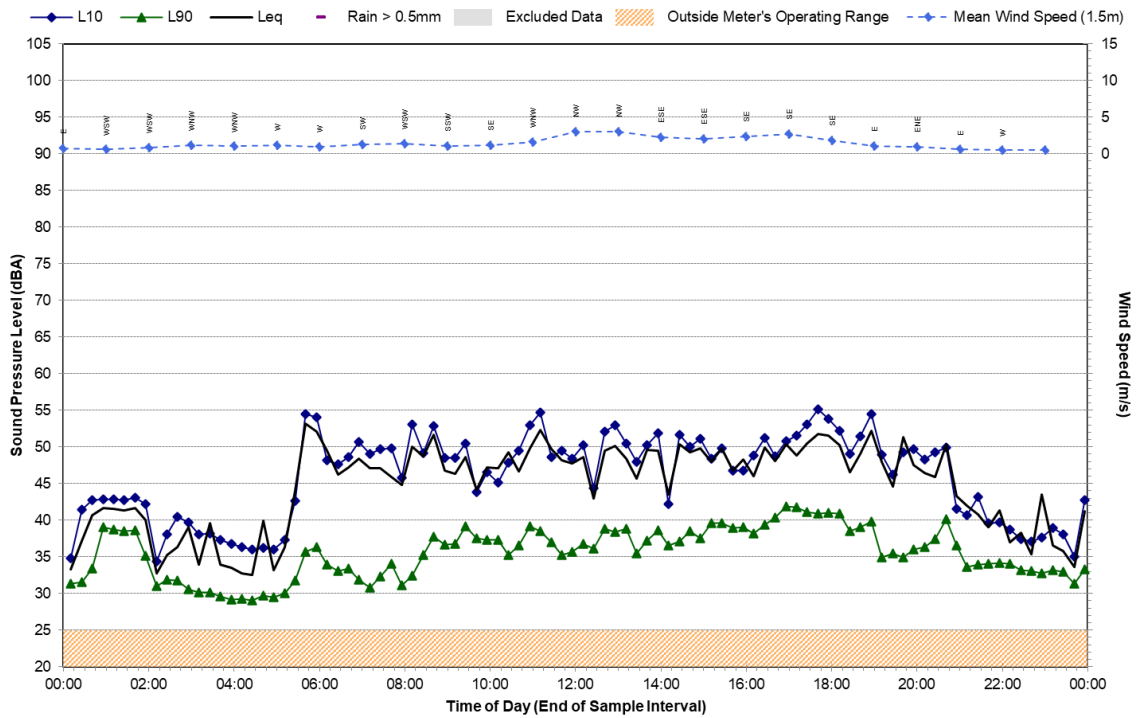
Statistical Ambient Noise Levels

Location L - Tuesday, 26 December 2023



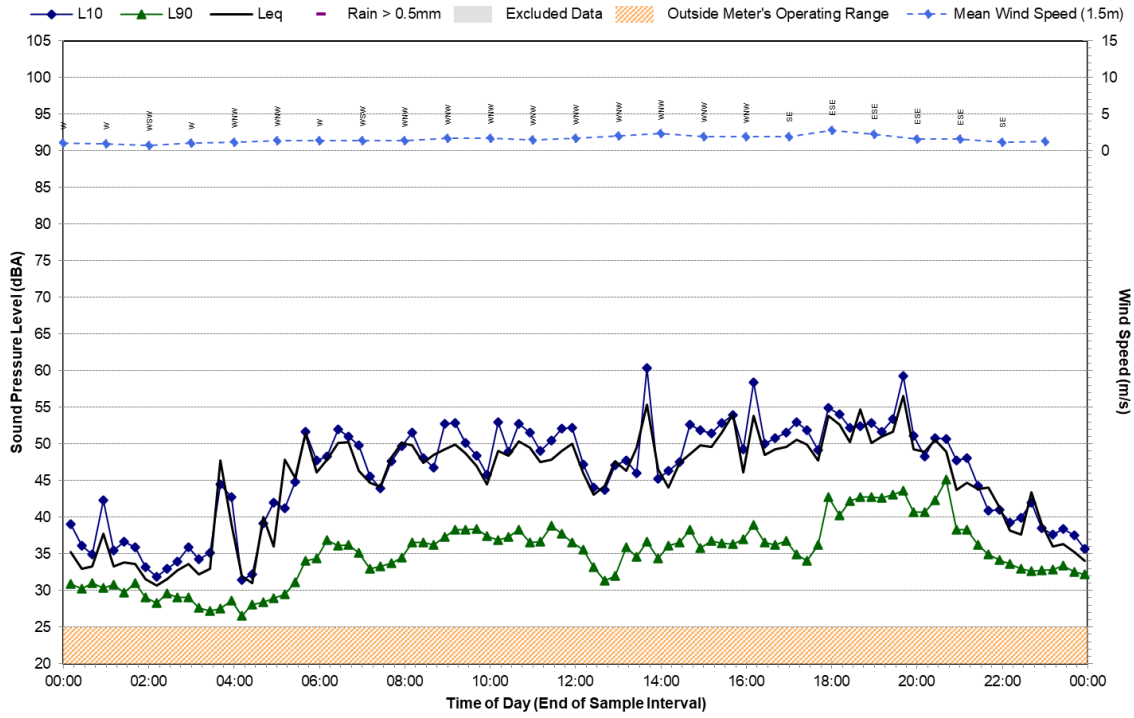
Statistical Ambient Noise Levels

Location L - Wednesday, 27 December 2023



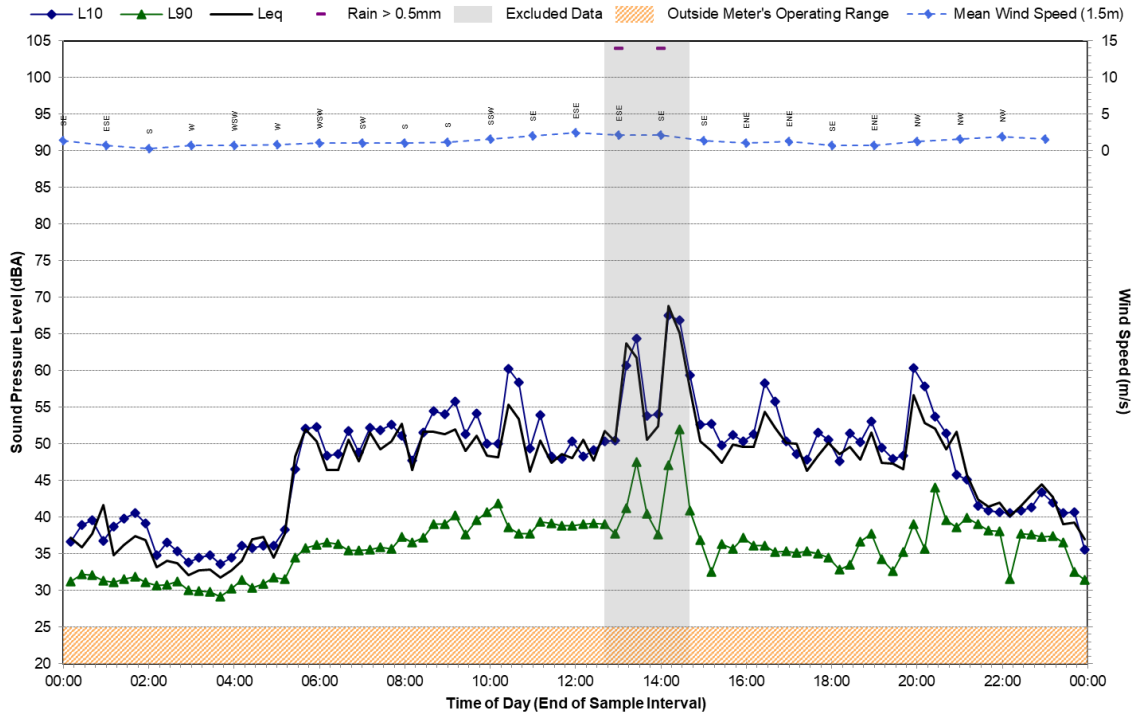
Statistical Ambient Noise Levels

Location L - Thursday, 28 December 2023



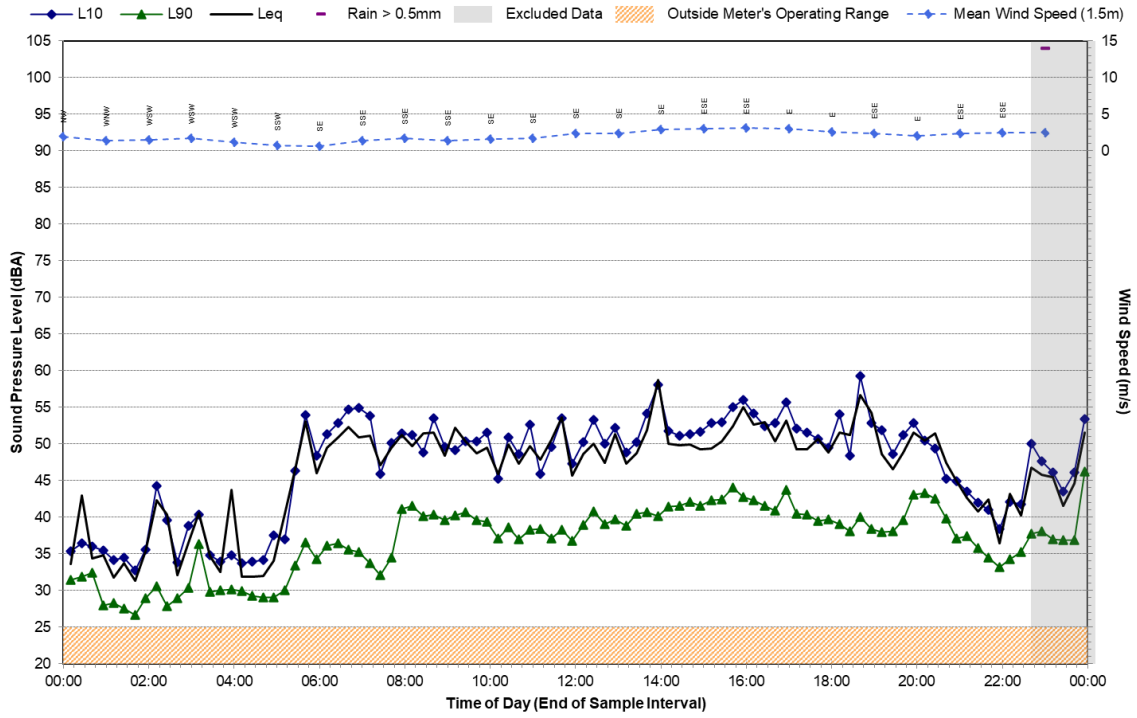
Statistical Ambient Noise Levels

Location L - Friday, 29 December 2023



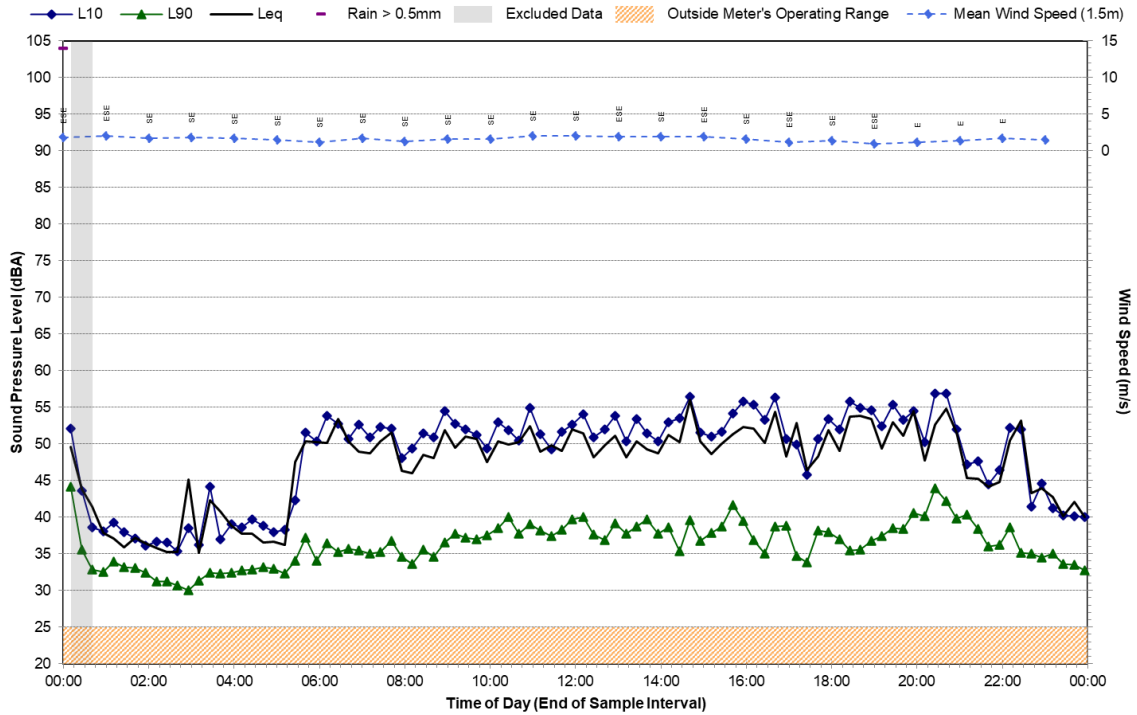
Statistical Ambient Noise Levels

Location L - Saturday, 30 December 2023



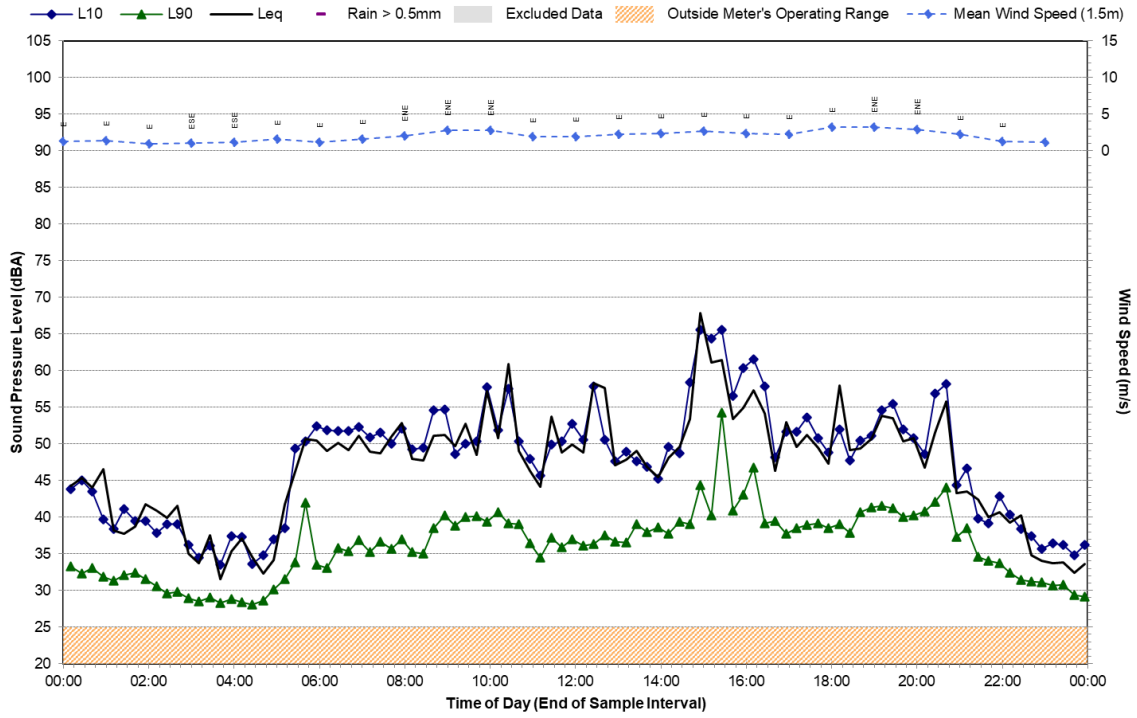
Statistical Ambient Noise Levels

Location L - Sunday, 31 December 2023



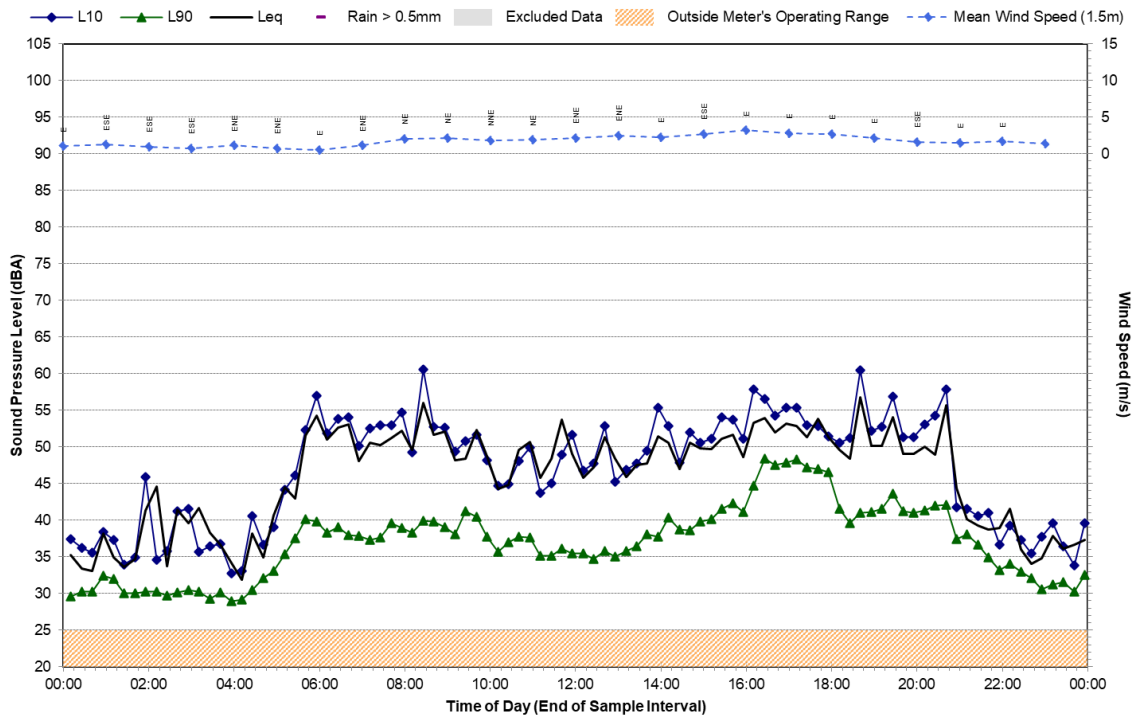
Statistical Ambient Noise Levels

Location L - Monday, 1 January 2024



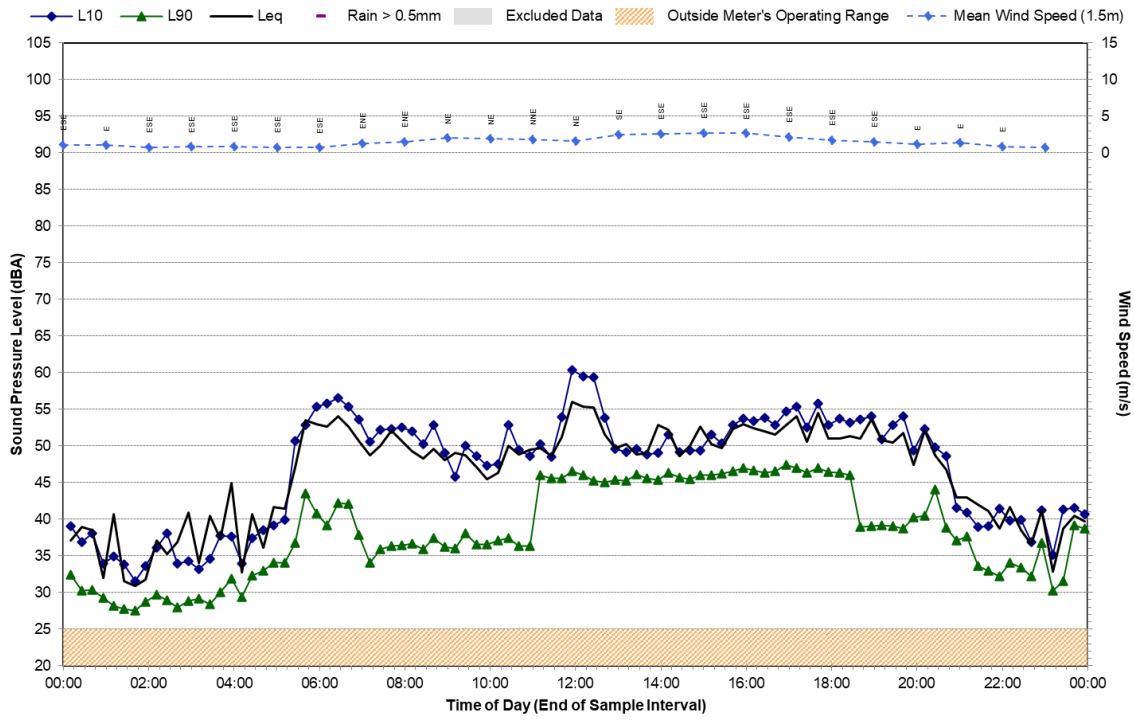
Statistical Ambient Noise Levels

Location L - Tuesday, 2 January 2024



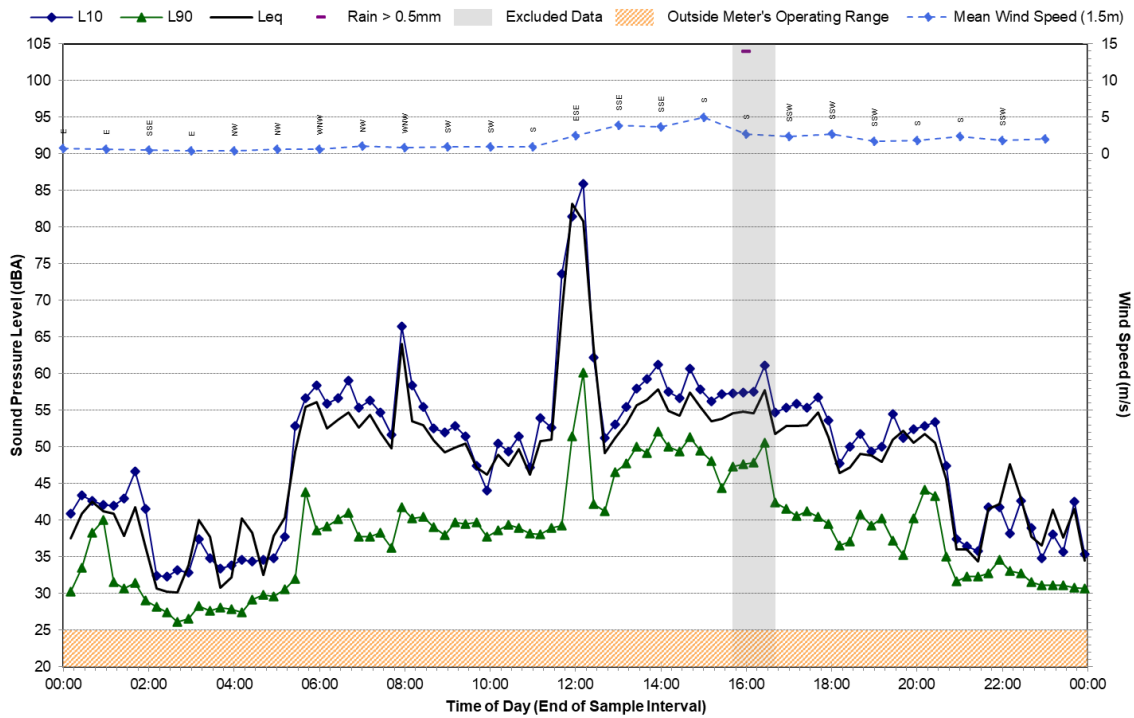
Statistical Ambient Noise Levels

Location L - Wednesday, 3 January 2024



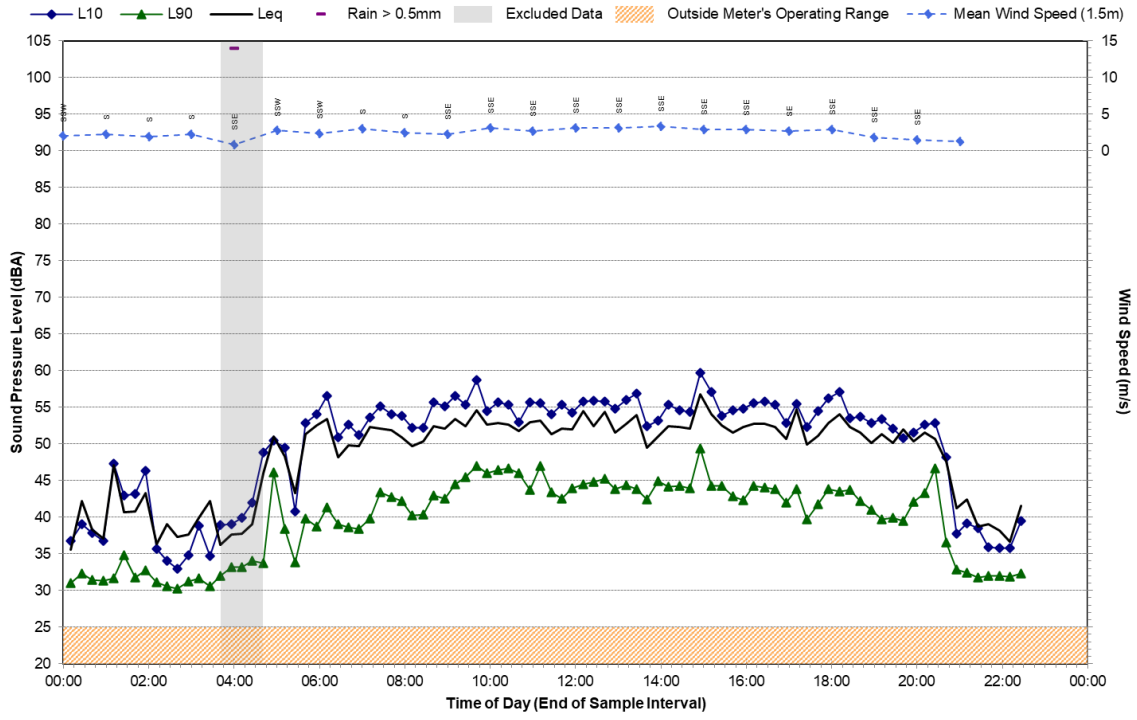
Statistical Ambient Noise Levels

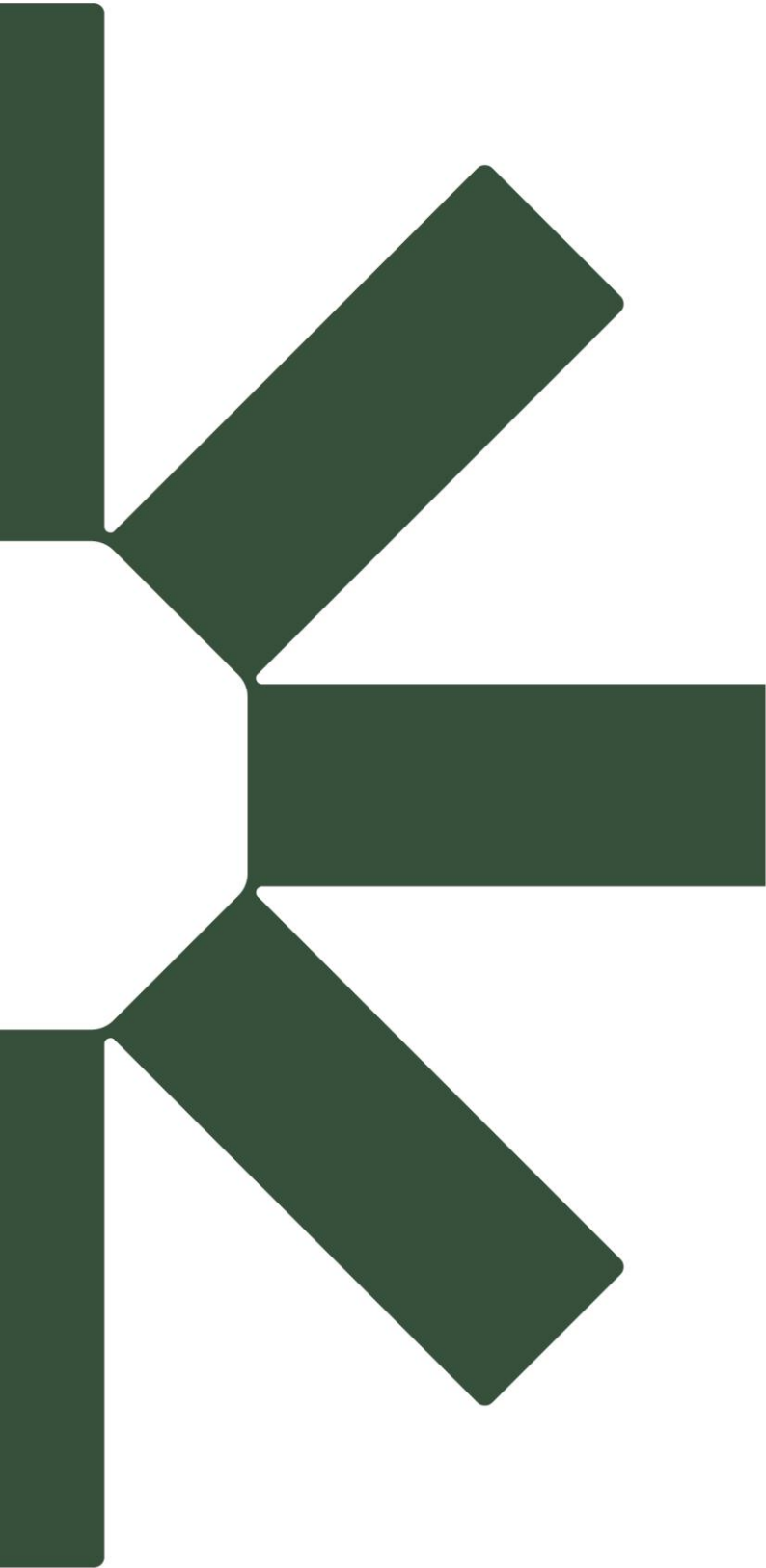
Location L - Thursday, 4 January 2024



Statistical Ambient Noise Levels

Location L - Friday, 5 January 2024





Making Sustainability Happen

Appendix 2

Water Monitoring Results

(No. of pages including blank pages = 30)

Surface Water 2008 to 2023

Surface Water Quality Monitoring Results – 2008/2009

Sample Site	Date	pH	EC (µS/cm)	TSS (mg/L)	Flow	Sample Site	Date	pH	EC (µS/cm)	TSS (mg/L)	Flow
1	Jun-08	6.6	940	2	N	1	Dec-08	7.0	1210	6	N
8	Jun-08	7.1	810	7	N	8	Dec-08	7.3	980	16	N
9	Jun-08	7.7	740	4	L	9	Dec-08	6.8	1040	2	L
10	Jun-08	7.6	1230	5	L	10	Dec-08	7.2	1390	2	N
11	Jun-08	7.1	1840	2	N	11	Dec-08	6.8	1610	15	N
FMCU	Jun-08	6.9	620	11	VL	FMCU	Dec-08	7.0	450	2	N
FMCD	Jun-08	7.2	300	6	N	FMCD	Dec-08	6.8	160	4	L
1	Jul-08	6.8	1160	6	L	1	Jan-09	6.8	1130	39	N
8	Jul-08	7.2	1100	4	L	8	Jan-09	6.8	870	22	N
9	Jul-08	7.6	1060	3	L	9	Jan-09	7.0	1180	7	L
10	Jul-08	7.3	1400	4	M	10	Jan-09	7.3	1350	7	L
11	Jul-08	6.8	2060	7	L	11	Jan-09	6.8	1330	12	N
FMCU	Jul-08	7.4	820	10	N	FMCU	Jan-09	7.0	230	9	N
FMCD	Jul-08	7.4	190	2	VL	FMCD	Jan-09	7.3	150	27	M
1	Aug-08	6.9	1220	2	N	1	Feb-09	6.8	680	7	N
8	Aug-08	7.4	1140	4	L	8	Feb-09	7.0	590	3	L
9	Aug-08	7.7	1090	7	M	9	Feb-09	7.3	540	7	L
10	Aug-08	7.5	1410	5	N	10	Feb-09	7.1	1270	3	L
11	Aug-08	7.0	2220	4	N	11	Feb-09	6.8	910	11	N
FMCU	Aug-08	8.3	730	14	N	FMCU	Feb-09	6.8	350	13	N
FMCD	Aug-08	7.8	170	3	L	FMCD	Feb-09	7.4	260	11	M
1	Sep-08	7.1	890	9	N	1	Mar-09	6.8	650	4	N
8	Sep-08	7.5	820	2	L	8	Mar-09	7.2	700	3	N
9	Sep-08	7.8	650	5	M	9	Mar-09	7.5	820	2	M
10	Sep-08	7.9	1250	8	M	10	Mar-09	7.4	1230	6	M
11	Sep-08	7.3	1330	14	N	11	Mar-09	7.3	1060	7	N
FMCU	Sep-08	7.3	460	96	L	FMCU	Mar-09	7.3	420	9	N
FMCD	Sep-08	7.3	320	11	N	FMCD	Mar-09	7.6	150	7	M
1	Oct-08	6.7	970	3	N	1	Apr-09	7.0	740	4	N
8	Oct-08	7.7	1150	2	L	8	Apr-09	7.4	500	4	N
9	Oct-08	7.5	910	2	M	9	Apr-09	7.5	1030	9	M
10	Oct-08	7.1	1200	2	N	10	Apr-09	7.3	1050	10	M
11	Oct-08	6.8	1930	2	N	11	Apr-09	7.7	1020	11	N
FMCU	Oct-08	6.8	540	15	N	FMCU	Apr-09	6.7	340	17	M
FMCD	Oct-08	7.1	200	31	M	FMCD	Apr-09	7.3	200	51	H
1	Nov-08	7.1	1130	4	N	1	May-09	7.4	810	10	N
8	Nov-08	7.7	940	15	N	8	May-09	7.5	660	44	M
9	Nov-08	7.4	1050	3	H	9	May-09	7.9	610	41	M
10	Nov-08	7.4	510	2	L	10	May-09	7.7	1070	5	M
11	Nov-08	7.2	2020	6	N	11	May-09	7.3	940	3	N
FMCU	Nov-08	7.0	570	11	N	FMCU	May-09	6.9	540	10	N
FMCD	Nov-08	7.9	160	2	M	FMCD	May-09	8.0	180	2	M

N - Nil Flow, L - Low Flow, M - Medium Flow, H - High Flow

Surface Water Quality Monitoring Results – 2009/2010

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow
1	Jun-09	6.8	510	15	N
8	Jun-09	7.4	630	<2	M
9	Jun-09	7.7	390	22	H
10	Jun-09	7.4	680	23	M
11	Jun-09	7.1	560	8	N
FMCU	Jun-09	7.6	280	12	H
FMCD	Jun-09	7.2	240	20	H
1	Jul-09	7.8	880	9	N
8	Jul-09	7.6	820	<2	L
9	Jul-09	7.9	870	19	L
10	Jul-09	7.6	1290	9	L
11	Jul-09	NS	NS	NS	-
FMCU	Jul-09	6.6	510	23	L
FMCD	Jul-09	7.5	150	69	L
1	Aug-09	7.2	990	15	L
8	Aug-09	7.3	840	11	L
9	Aug-09	7.6	1180	25	L
10	Aug-09	7.3	1640	16	L
11	Aug-09	7.3	1720	18	L
FMCU	Aug-09	7.4	700	21	N
FMCD	Aug-09	7.8	140	2	L
1	Sep-09	7.8	1050	5	N
8	Sep-09	6.4	730	10	N
9	Sep-09	7.6	1770	14	N
10	Sep-09	7.5	1820	8	L
11	Sep-09	6.2	1680	10	N
FMCU	Sep-09	NS	NS	NS	N
FMCD	Sep-09	NS	NS	NS	N
1	Oct-09	8.6	1050	10	N
8	Oct-09	NS	NS	NS	N
9	Oct-09	8.4	1500	186	L
10	Oct-09	8.5	1770	3	L
11	Oct-09	8.3	1480	7	N
FMCU	Oct-09	NS	NS	NS	N
FMCD	Oct-09	NS	NS	NS	N
1	Nov-09	8.8	1580	22	L
8	Nov-09	NS	NS	NS	N
9	Nov-09	NS	NS	NS	N
10	Nov-09	8.5	2610	10	L
11	Nov-09	8.8	2230	26	L
FMCU	Nov-09	NS	NS	NS	N
FMCD	Nov-09	NS	NS	NS	N

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow
1	Dec-09	NS	NS	NS	N
8	Dec-09	NS	NS	NS	N
9	Dec-09	NS	NS	NS	N
10	Dec-09	NS	NS	NS	N
11	Dec-09	7.4	1590	18	N
FMCU	Dec-09	NS	NS	NS	N
FMCD	Dec-09	NS	NS	NS	N
1	Jan-10	NS	NS	NS	N
8	Jan-10	NS	NS	NS	N
9	Jan-10	NS	NS	NS	N
10	Jan-10	NS	NS	NS	N
11	Jan-10	7.1	2220	37	L
FMCU	Jan-10	NS	NS	NS	N
FMCD	Jan-10	NS	NS	NS	N
1	Feb-10	NS	NS	NS	N
8	Feb-10	NS	NS	NS	N
9	Feb-10	NS	NS	NS	N
10	Feb-10	NS	NS	NS	N
11	Feb-10	7.1	1820	17	N
FMCU	Feb-10	NS	NS	NS	N
FMCD	Feb-10	NS	NS	NS	N
1	Mar-10	NS	NS	NS	N
8	Mar-10	NS	NS	NS	N
9	Mar-10	NS	NS	NS	N
10	Mar-10	NS	NS	NS	N
11	Mar-10	7.5	1500	8	L
FMCU	Mar-10	NS	NS	NS	N
FMCD	Mar-10	NS	NS	NS	N
1	Apr-10	NS	NS	NS	N
8	Apr-10	NS	NS	NS	N
9	Apr-10	NS	NS	NS	N
10	Apr-10	NS	NS	NS	N
11	Apr-10	7.2	1620	72	-
FMCU	Apr-10	NS	NS	NS	N
FMCD	Apr-10	NS	NS	NS	N
1	May-10	NS	NS	NS	N
8	May-10	NS	NS	NS	N
9	May-10	NS	NS	NS	N
10	May-10	NS	NS	NS	N
11	May-10	NS	NS	NS	N
FMCU	May-10	7.5	322.0	14.0	-
FMCD	May-10	7.9	165	360	-

D - Dry, N - Nil Flow, L - Low Flow, M - Medium Flow, H - High Flow NS - Sample Unobtainable

Surface Water Quality Monitoring Results – 2010/2011

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow
1	Jun-10	7.9	460	19	NS
8	Jun-10	NS	NS	NS	Dry
9	Jun-10	NS	NS	NS	Dry
10	Jun-10	7.3	880	8	NS
11	Jun-10	7.5	690	20	NS
FMCU	Jun-10	6.9	388	NS	NS
FMCD	Jun-10	0	0	0	0
1	Jul-10	6.22	504	18	Pond
8	Jul-10	7.16	1110	2	Pond
9	Jul-10	7.2	1300	27	Trickle
10	Jul-10	7.12	1350	8	Trickle
11	Jul-10	7.06	865	13	Pond
FMCU	Jul-10	7.9	590	8	Trickle
FMCD	Jul-10	7.99	128	1	Steady
1	Aug-10	6.55	492	12	Slow
8	Aug-10	6.75	988	1	Trickle
9	Aug-10	6.92	516	44	Trickle
10	Aug-10	6.67	1220	10	Trickle
11	Aug-10	6.89	602	13	Slow
FMCU	Aug-10	7.31	543	7	Still
FMCD	Aug-10	7.38	130	2	Steady
1	Sep-09	7.05	464	4	Still
8	Sep-10	7.14	947	3	Trickle
9	Sep-10	7.23	1410	6	Trickle
10	Sep-10	7.25	1700	2	Trickle
11	Sep-10	7	671	14	Still
FMCU	Sep-10	7.29	534	4	Pond
FMCD	Sep-10	7.44	121	1	Steady
1	Oct-10	7.19	484	5	Still
8	Oct-10	7.29	1010	2	Still
9	Oct-10	7.74	1570	7	Trickle
10	Oct-10	7.59	1840	6	Trickle
11	Oct-10	7.22	734	16	Still
FMCU	Oct-10	7.07	456	7	Still
FMCD	Oct-10	6.93	121	1	Steady
1	Nov-10	6.89	402	12	Still
8	Nov-10	7.13	461	2	Still
9	Nov-10	7.1	307	45	Trickle
10	Nov-10	7.09	751	32	Trickle
11	Nov-10	6.95	340	6	Still
FMCU	Nov-10	6.94	509	16	Trickle
FMCD	Nov-10	7.14	294	23	Steady

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow
1	Dec-10	6.7	436.0	28.0	Still
8	Dec-10	7.16	732	6	Still
9	Dec-10	7.32	1070	32	Still
10	Dec-10	7.17	1410	10	Trickle
11	Dec-10	6.85	493	36	Still
FMCU	Dec-10	6.8	465.0	7.0	Trickle
FMCD	Dec-10	7.21	1580	<5	Slow
1	Jan-11	6.9	536.0	36.0	Still
8	Jan-11	7.19	943	<5	Trickle
9	Jan-11	NS	NS	NS	-
10	Jan-11	7.41	1680	5	Still
11	Jan-11	7.05	568	18	Slow
FMCU	Jan-11	6.7	528.0	14.0	Still
FMCD	Jan-11	6.79	138	6	Slow
1	Feb-11	6.7	424.0	100	Still
8	Feb-11	7.25	624	49	Still
9	Feb-11	NS	NS	NS	-
10	Feb-11	7.16	519	31	Still
11	Feb-11	7.44	1570	20	Still
FMCU	Feb-11	6.7	488.0	16.0	Still
FMCD	Feb-11	6.85	139	<5	Slow
1	Mar-11	NS	NS	NS	Dry
8	Mar-11	7.29	151	20	Still
9	Mar-11	NS	NS	NS	-
10	Mar-11	NS	NS	NS	Dry
11	Mar-11	7.13	578	16	Still
FMCU	Mar-11	NS	NS	NS	Dry
FMCD	Mar-11	6.73	122	<5	Steady
1	Apr-11	NS	NS	NS	Dry
8	Apr-11	7.27	650	9	Still
9	Apr-11	NS	NS	NS	-
10	Apr-11	7.12	487	230	Trickle
11	Apr-11	6.82	577	48	Still
FMCU	Apr-11	7.1	292.0	20.0	Still
FMCD	Apr-11	7.26	133	<5	Steady
1	May-11	NS	NS	NS	Dry
8	May-11	7.22	717	5	Still
9	May-11	NS	NS	NS	-
10	May-11	6.99	1203	5	Still
11	May-11	6.87	320	22	Still
FMCU	May-11	6.5	278.0	12.0	Still
FMCD	May-11	6.78	120	6	Steady

NS - Sample Unobtainable

Surface Water Quality Monitoring Results – 2011/2012

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow
1	Jun-11	6.55	607	25	Slow
8	Jun-11	6.63	771	20	Steady
9	Jun-11	NS	NS	NS	NS
10	Jun-11	6.69	854	25	Steady
11	Jun-11	6.56	757	14	Still
FMCU	Jun-11	7	460	8	Slow
FMCD	Jun-11	7.48	138	8	Steady
1	Jul-11	6.59	227	38	Steady
8	Jul-11	6.6	255	16	Fast
9	Jul-11	NS	NS	NS	NS
10	Jul-11	6.65	248	74	Fast
11	Jul-11	6.54	200	91	Steady
FMCU	Jul-11	6.87	639	5	Trickle
FMCD	Jul-11	7.03	146	16	Steady
1	Aug-11	6.93	527	24	Slow
8	Aug-11	6.81	301	14	Slow
9	Aug-11	NS	NS	NS	NS
10	Aug-11	7.11	821	102	Slow
11	Aug-11	6.93	1060	29	Slow
FMCU	Aug-11	7.74	611	NS	Trickle
FMCD	Aug-11	6.95	180	5	Steady
1	Sep-11	6.78	674	8	Trickle
8	Sep-11	6.81	770	7	Slow
9	Sep-11	NS	NS	NS	NS
10	Sep-11	7.18	1410	5	0
11	Sep-11	6.97	866	26	Trickle
FMCU	Sep-11	6.81	502	10	Still
FMCD	Sep-11	7.08	200	10	Steady
1	Oct-11	6.96	781	5	Trickle
8	Oct-11	7.09	932	5	Trickle
9	Oct-11	NS	NS	NS	NS
10	Oct-11	7.08	1150	6	Slow
11	Oct-11	7.13	606	624	Trickle
FMCU	Oct-11	6.78	597	12	Slow
FMCD	Oct-11	6.98	180	11	Steady
1	Nov-11	7.05	455	173	Slow
8	Nov-11	6.97	217	18	Fast
9	Nov-11	NS	NS	NS	NS
10	Nov-11	7.23	285	342	Fast
11	Nov-11	7.22	1180	16	Steady
FMCU	Nov-11	7.1	270	51	Still
FMCD	Nov-11	7.17	133	132	Steady

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow
1	Dec-11	7.0	545.0	30.0	Slow
8	Dec-11	7.49	615	10	Steady
9	Dec-11	NS	NS	NS	NS
10	Dec-11	7.32	752	24	Slow
11	Dec-11	7.31	526	49	Slow
FMCU	Dec-11	7.2	452.0	8.0	Trickle
FMCD	Dec-11	7.33	248	5	Steady
1	Jan-12	7.2	673.0	14.0	Still
8	Jan-12	7.33	296	60	Steady
9	Jan-12	NS	NS	NS	NS
10	Jan-12	7.36	1440	33	Steady
11	Jan-12	7.56	494	85	Still
FMCU	Jan-12	7.4	511.0	18.0	Still
FMCD	Jan-12	7.51	147	10	Still
1	Feb-12	7.3	388.0	44.0	Slow
8	Feb-12	7.5	480	20	Slow
9	Feb-12	NS	NS	NS	NS
10	Feb-12	7.47	618	30	Slow
11	Feb-12	7.4	393	25	Slow
FMCU	Feb-12	7.1	384.0	16.0	Slow
FMCD	Feb-12	7.49	253	55	Steady
1	Mar-12	7.0	687.0	16.0	Trickle
8	Mar-12	7.64	668	16	Slow
9	Mar-12	NS	NS	NS	NS
10	Mar-12	7.51	850	18	Slow
11	Mar-12	7.31	767	8	Slow
FMCU	Mar-12	6.9	199.0	21.0	Fast
FMCD	Mar-12	6.96	186	42	Fast
1	Apr-12	7.0	579.0	36.0	Slow
8	Apr-12	7.44	448	12	Steady
9	Apr-12	NS	NS	NS	NS
10	Apr-12	7.5	753	24	Steady
11	Apr-12	7.25	510	16	Slow
FMCU	Apr-12	7.3	432.0	26.0	Steady
FMCD	Apr-12	7.52	196	228	Fast
1	May-12	7.0	1190.0	37.0	Still
8	May-12	7.36	634	5	Slow
9	May-12	NS	NS	NS	NS
10	May-12	7.54	1440	22	Slow
11	May-12	7.35	1010	78	Still
FMCU	May-12	7.4	491.0	15.0	Slow
FMCD	May-12	7.59	192	33	Fast

D - Dry, N - Nil Flow, L - Low Flow, M - Medium Flow, H - High Flow NS - Sample Unobtainable

Surface Water Quality Monitoring Results – 2012/2013

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow	Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow
1	Jun-12	6.97	699	22	-	1	Dec-12	0.0	0.0	0.0	Dry
8	Jun-12	7.35	841	<5	-	8	Dec-12	0	0	0	NS
9	Jun-12	NS	NS	NS	NS	9	Dec-12	NS	NS	NS	NS
10	Jun-12	7.41	825	22	-	10	Dec-12	0	0	0	NS
11	Jun-12	7.1	822	19	-	11	Dec-12	0	0	0	NS
FMCU	Jun-12	7.03	228	29	-	FMCU	Dec-12	7.4	427.0	16.0	-
FMCD	Jun-12	7.13	215	26	-	FMCD	Dec-12	7.69	142	5	-
1	Jul-12	6.97	906	<5	-	1	Jan-13	0.0	0.0	0.0	Dry
8	Jul-12	7.3	431	32	-	8	Jan-13	0	0	0	NS
9	Jul-12	NS	NS	NS	NS	9	Jan-13	NS	NS	NS	NS
10	Jul-12	7.66	1020	12	-	10	Jan-13	0	0	0	NS
11	Jul-12	0	0	0	NS	11	Jan-13	0	0	0	NS
FMCU	Jul-12	7.35	624	22	-	FMCU	Jan-13	7.7	461.0	20.0	-
FMCD	Jul-12	7.52	230	40	-	FMCD	Jan-13	7.77	157	<5	-
1	Aug-12	7.13	1330	17	-	1	Feb-13	6.9	483.0	28.0	-
8	Aug-12	7.36	717	174	-	8	Feb-13	0	0	0	NS
9	Aug-12	NS	NS	NS	NS	9	Feb-13	NS	NS	NS	NS
10	Aug-12	7.67	1520	9	-	10	Feb-13	7.08	724	18	-
11	Aug-12	7.43	1070	25	-	11	Feb-13	6.72	391	23	-
FMCU	Aug-12	7.32	477	6	-	FMCU	Feb-13	6.7	325.0	5.0	-
FMCD	Aug-12	7.52	235	6	-	FMCD	Feb-13	7.21	257	6	-
1	Sep-12	7.18	1590	17	-	1	Mar-13	7.0	922.0	24.0	-
8	Sep-12	0	0	0	NS	8	Mar-13	0	0	0	NS
9	Sep-12	NS	NS	NS	NS	9	Mar-13	NS	NS	NS	NS
10	Sep-12	7.62	1720	106	-	10	Mar-13	7.47	1210	6	-
11	Sep-12	7.4	1290	95	-	11	Mar-13	6.98	595	13	-
FMCU	Sep-12	7.21	500	7	-	FMCU	Mar-13	7.1	284.0	26.0	-
FMCD	Sep-12	7.57	206	<5	-	FMCD	Mar-13	7.19	300	<5	-
1	Oct-12	7.24	1760	18	-	1	Apr-13	7.1	1030.0	8.0	-
8	Oct-12	0	0	0	NS	8	Apr-13	0	0	0	NS
9	Oct-12	NS	NS	NS	NS	9	Apr-13	NS	NS	NS	NS
10	Oct-12	7.67	1750	12	-	10	Apr-13	7.42	1490	6	-
11	Oct-12	7.62	1650	57	-	11	Apr-13	7.1	675	10	-
FMCU	Oct-12	7.37	453	16	-	FMCU	Apr-13	7.1	269.0	25.0	-
FMCD	Oct-12	7.65	171	8	-	FMCD	Apr-13	7.37	172	82	-
1	Nov-12	0	0	0	Dry	1	May-13	7.0	648.0	22.0	-
8	Nov-12	0	0	0	NS	8	May-13	0	0	0	NS
9	Nov-12	NS	NS	NS	NS	9	May-13	NS	NS	NS	NS
10	Nov-12	0	0	0	NS	10	May-13	7.55	1070	38	-
11	Nov-12	7.67	2550	108	-	11	May-13	7.16	603	15	-
FMCU	Nov-12	7.11	549	36	-	FMCU	May-13	0.0	0.0	0.0	NS
FMCD	Nov-12	7.44	149	43	-	FMCD	May-13	0	0	0	NS

D - Dry, N - Nil Flow, L - Low Flow, M - Medium Flow, H - High Flow NS - Sample Unobtainable

Surface Water Quality Monitoring Results – 2013/2014

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow	Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow
1	Jun-13	6.97	702	<5	-	1	Dec-13	6.7	706.0	9.0	-
8	Jun-13	NF	NF	NF	NF	8	Dec-13	NF	NF	NF	NF
9	Jun-13	NS	NS	NS	NS	9	Dec-13	NS	NS	NS	NS
10	Jun-13	7.54	1240	<5	-	10	Dec-13	7.02	1130	13	-
11	Jun-13	7.09	799	5	-	11	Dec-13	6.85	542	30	-
FMCU	Jun-13	7.17	306	83	Low	FMCU	Dec-13	6.6	337.0	6.0	Pond
FMCD	Jun-13	7.55	140	<5	Low	FMCD	Dec-13	7.27	187	<5	Mod
1	Jul-13	6.59	593	7	-	1	Jan-14	6.9	740.0	84.0	-
8	Jul-13	NF	NF	NF	NF	8	Jan-14	NF	NF	NF	NF
9	Jul-13	NS	NS	NS	NS	9	Jan-14	NS	NS	NS	NS
10	Jul-13	6.98	787	12	-	10	Jan-14	7.42	1270	6	-
11	Jul-13	6.84	392	5	-	11	Jan-14	7.32	896	66	-
FMCU	Jul-13	7.16	334	24	Low	FMCU	Jan-14	6.9	353.0	7.0	Pond
FMCD	Jul-13	7.6	142	<5	Low	FMCD	Jan-14	7.19	140	<5	Mod
1	Aug-13	6.81	955	9	-	1	Feb-14	7.3	865.0	10.0	-
8	Aug-13	NF	NF	NF	NF	8	Feb-14	NF	NF	NF	NF
9	Aug-13	NS	NS	NS	NS	9	Feb-14	NS	NS	NS	NS
10	Aug-13	7.44	1350	<5	-	10	Feb-14	7.66	1690	<5	-
11	Aug-13	7.16	569	31	-	11	Feb-14	0	0	0	Dry
FMCU	Aug-13	7	354	<5	Pond	FMCU	Feb-14	7.5	460.0	25.0	Pond
FMCD	Aug-13	7.5	132	<5	Mod	FMCD	Feb-14	7.65	146	<5	Low
1	Sep-13	7.32	1120	18	-	1	Mar-14	7.0	276.0	32.0	-
8	Sep-13	NF	NF	NF	NF	8	Mar-14	NF	NF	NF	NF
9	Sep-13	NS	NS	NS	NS	9	Mar-14	NS	NS	NS	NS
10	Sep-13	7.81	1500	9	-	10	Mar-14	7.4	815	14	-
11	Sep-13	7.74	1040	14	-	11	Mar-14	6.85	532	20	-
FMCU	Sep-13	7.21	377	<5	Pond	FMCU	Mar-14	6.9	169.0	18.0	Pond
FMCD	Sep-13	7.52	128	<5	Low	FMCD	Mar-14	7.23	139	11	Low
1	Oct-13	7.28	1090	9	-	1	Apr-14	6.9	166.0	24.0	-
8	Oct-13	NF	NF	NF	NF	8	Apr-14	NF	NF	NF	NF
9	Oct-13	NS	NS	NS	NS	9	Apr-14	NS	NS	NS	NS
10	Oct-13	7.64	1920	<5	-	10	Apr-14	7.32	533	28	-
11	Oct-13	8.03	1260	126	-	11	Apr-14	7.03	531	27	-
FMCU	Oct-13	7.31	428	12	Pond	FMCU	Apr-14	6.6	140.0	11.0	Pond
FMCD	Oct-13	7.33	132	<5	Low	FMCD	Apr-14	7.18	134	21	Mod
1	Nov-13	7.21	1060	5	-	1	May-14	6.7	502.0	6.0	-
8	Nov-13	NF	NF	NF	NF	8	May-14	NF	NF	NF	NF
9	Nov-13	NS	NS	NS	NS	9	May-14	NS	NS	NS	NS
10	Nov-13	7.6	2060	34	-	10	May-14	7.16	730	<5	-
11	Nov-13	7.05	585	16	-	11	May-14	6.77	513	<5	-
FMCU	Nov-13	6.85	202	6	Pond	FMCU	May-14	6.8	209.0	9.0	Pond
FMCD	Nov-13	6.88	274	5	Mod	FMCD	May-14	7.44	131	<5	Mod

D - Dry, N - Nil Flow, L - Low Flow, M - Medium Flow, H - High Flow NS - Sample Unobtainable

Surface Water Quality Monitoring Results – 2014

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow	Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow
1	Jun-14	7.11	481	10	Low	1	Dec-14	0.0	0.0	0.0	No
8	Jun-14	0	0	0	Dry	8	Dec-14	0	0	0	0
9	Jun-14	0	0	0	Not	9	Dec-14	0	0	0	0
10	Jun-14	0	936	8	Low	10	Dec-14	0	0	0	No
11	Jun-14	6.99	352	290	Low	11	Dec-14	0	0	0	No
FMCU	Jun-14	7.05	185	7	Low	FMCU	Dec-14	0.0	0.0	0.0	No
FMCD	Jun-14	7.19	119	25	Mod	FMCD	Dec-14	7.43	189	<5	Low
1	Jul-14	7.01	530	<5	0						
8	Jul-14	0	0	0	Dry						
9	Jul-14	0	0	0	Not						
10	Jul-14	0	1490	<5	Low						
11	Jul-14	7.07	756	<5	0						
FMCU	Jul-14	7.35	223	6	Poole						
FMCD	Jul-14	7.74	129	<5	Low						
1	Aug-14	6.73	200	26	No						
8	Aug-14	0	0	0	Dry						
9	Aug-14	0	0	0	No						
10	Aug-14	0	931	40	Low						
11	Aug-14	6.8	860	8	Low						
FMCU	Aug-14	6.8	151	<5	Low						
FMCD	Aug-14	7.09	140	<5	Low						
1	Sep-14	7.03	497	<5	Low						
8	Sep-14	0	0	0	Dry						
9	Sep-14	0	0	0	0						
10	Sep-14	0	1120	<5	Low						
11	Sep-14	7.1	512	<5	Low						
FMCU	Sep-14	0	0	0	No						
FMCD	Sep-14	7.53	144	<5	Low						
1	Oct-14	7.01	420	18	Low						
8	Oct-14	0	0	0	No						
9	Oct-14	0	0	0	0						
10	Oct-14	0	1410	22	Low						
11	Oct-14	7.29	585	24	Low						
FMCU	Oct-14	0	0	0	No						
FMCD	Oct-14	7.54	127	<5	Low						
1	Nov-14	0	0	0	No						
8	Nov-14	0	0	0	No						
9	Nov-14	0	0	0	0						
10	Nov-14	0	1120	7	Low						
11	Nov-14	6.9	670	87	Low						
FMCU	Nov-14	0	0	0	No						
FMCD	Nov-14	7.42	203	<5	Low						

D - Dry, N - Nil Flow, L - Low Flow, M - Medium Flow, H - High Flow NS - Sample Unobtainable

Surface Water Quality Monitoring Results – 2015

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow
1	Jan-15	6.52	218	64	Low
8	Jan-15	5.55	116.3	17	Low
9	Jan-15	NS	NS	NS	NS
10	Jan-15	7.02	673	104	Mod
11	Jan-15	6.17	229	51	Mod
FMCU	Jan-15	6.49	204	13	
FMCD	Jan-15	6.97	201	10	
1	Feb-15	6.44	2910	14	Low
8	Feb-15	NS	NS	NS	No
9	Feb-15	NS	NS	NS	NS
10	Feb-15	6.95	766	<5	Low
11	Feb-15	6.75	545	19	Low
FMCU	Feb-15	NS	NS	NS	N
FMCD	Feb-15	7.12	164.5	<5	Low
1	Mar-15	NS	NS	NS	N
8	Mar-15	NS	NS	NS	N
9	Mar-15	NS	NS	NS	NS
10	Mar-15	6.89	1107	<5	Low
11	Mar-15	NS	NS	NS	N
FMCU	Mar-15	NS	NS	NS	N
FMCD	Mar-15	7.53	170	<5	Low
1	Apr-15	6.67	382	22	Low
8	Apr-15	6.45	506	<5	Low
9	Apr-15	NS	NS	NS	NS
10	Apr-15	6.69	803	<5	Low
11	Apr-15	6.62	1334	53	Low
FMCU	Apr-15	7.11	307	14	Low
FMCD	Apr-15	6.13	372	9	Low
1	May-15	6.28	838	6	Low
8	May-15	6.15	478	<5	Low
9	May-15	NS	NS	NS	NS
10	May-15	6.46	977	<5	Low
11	May-15	6.23	1140	23	Low
FMCU	May-15	7.04	214	13	Mod
FMCD	May-15	6.71	217	9	Mod
1	Jun-15	6.02	599	<5	Low
8	Jun-15	5.97	482	<5	Low
9	Jun-15	NS	NS	NS	NS
10	Jun-15	6.35	834	<5	Low
11	Jun-15	6.15	1426	<5	Low
FMCU	Jun-15	6.33	202	6	Low
FMCD	Jun-15	6.08	200	<5	Mod

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow
1	Jul-15	7.0	872.0	<5	Low
8	Jul-15	6.56	642	<5	Low
9	Jul-15	NS	NS	NS	NS
10	Jul-15	7.03	1364	<5	Low
11	Jul-15	7.22	1492	<5	Low
FMCU	Jul-15	NS	NS	NS	N
FMCD	Jul-15	7.27	223	<5	Low
1	Aug-15	5.8	762.0	<5	Low
8	Aug-15	7.62	533	7	N
9	Aug-15	NS	NS	NS	NS
10	Aug-15	7.52	1315	<5	Low
11	Aug-15	7.67	1072	7	N
FMCU	Aug-15	7.9	267.0	<5	N
FMCD	Aug-15	7.92	145.7	17	Low
1	Sep-15	7.3	698.0	15.0	No
8	Sep-15	7.25	499	<5	No
9	Sep-15	NS	NS	NS	NS
10	Sep-15	7.7	1237	<5	Low
11	Sep-15	6.72	714	8	N
FMCU	Sep-15	7.2	252.0	8.0	N
FMCD	Sep-15	8	135.4	<5	Low
1	Oct-15	7.0	578.0	13.0	N
8	Oct-15	7.04	459	9	N
9	Oct-15	NS	NS	NS	NS
10	Oct-15	7.57	1332	8	Low
11	Oct-15	6.92	822	18	No
FMCU	Oct-15	7.0	226.9	<5	No
FMCD	Oct-15	7.6	134.9	<5	Low
1	Nov-15	7.3	442.0	<5	Low
8	Nov-15	6.99	452	<5	N
9	Nov-15	NS	NS	NS	NS
10	Nov-15	7.38	1022	<5	Low
11	Nov-15	7.13	1945	40	Low
FMCU	Nov-15	7.5	232.5	<5	N
FMCD	Nov-15	7.4	148.9	<5	Low
1	Dec-15	7.1	286.0	30.0	N
8	Dec-15	7.07	294	<5	Low
9	Dec-15	NS	NS	NS	NS
10	Dec-15	7.28	901	6	Low
11	Dec-15	7.08	626	10	N
FMCU	Dec-15	7.2	208.3	14.0	N
FMCD	Dec-15	7.58	175.1	<5	Low

D - Dry, N - Nil Flow, L - Low Flow, M - Medium Flow, H - High Flow NS - Sample Unobtainable

Surface Water Quality Monitoring Results – 2016

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow	Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow
1	Jan-16	6.85	765	6	N	1	Jul-16	7.4	238.0	12.0	N
8	Jan-16	7.22	545	5	N	8	Jul-16	6.96	427	5	N
9	Jan-16	NS	NS	NS	NS	9	Jul-16	NS	NS	NS	NS
10	Jan-16	7.2	1215	6	N	10	Jul-16	7.34	1267	<5	L
11	Jan-16	6.87	828	6	L	11	Jul-16	7.08	1245	14	N
FMCU	Jan-16	6.65	200.9	5		FMCU	Jul-16	7.3	169.7	5.0	
FMCD	Jan-16	7.08	208.2	5		FMCD	Jul-16	7.67	158.1	10	
1	Feb-16	7.09	1004	5	N	1	Aug-16	7.1	432.0	5.0	N
8	Feb-16	7.04	541	5	L	8	Aug-16	6.95	408	5	N
9	Feb-16	NS	NS	NS	NS	9	Aug-16	NS	NS	NS	NS
10	Feb-16	7.24	1230	<5	N	10	Aug-16	7.22	1569	<5	L
11	Feb-16	7.07	1091	16	L	11	Aug-16	7.34	972	7	N
FMCU	Feb-16	7.19	259	5	N	FMCU	Aug-16	7.5	173.2	5.0	
FMCD	Feb-16	7.3	193.6	5	N	FMCD	Aug-16	8.06	148.8	5	
1	Mar-16	7.4	1060	5	N	1	Sep-16	7.3	374.0	10.0	N
8	Mar-16	7.34	556	5	N	8	Sep-16	6.91	374	5	N
9	Mar-16	NS	NS	NS	NS	9	Sep-16	NS	NS	NS	NS
10	Mar-16	7.5	1421	5	L	10	Sep-16	7.27	1303	<5	N
11	Mar-16	7.39	1388	16	N	11	Sep-16	7.07	321	8	N
FMCU	Mar-16	7.17	289	18	N	FMCU	Sep-16	7.3	197.4	5.0	
FMCD	Mar-16	7.8	183.2	5	N	FMCD	Sep-16	0	134.5	17	
1	Apr-16	7.81	498	151	N	1	Oct-16	7.3	400.0	10.0	N
8	Apr-16	7.34	270	10	N	8	Oct-16	7.21	394	7	N
9	Apr-16	NS	NS	NS	NS	9	Oct-16	NS	NS	NS	NS
10	Apr-16	7.42	1484	6	L	10	Oct-16	7.39	1653	8	N
11	Apr-16	7.69	1105	15	N	11	Oct-16	7.29	152.1	10	N
FMCU	Apr-16	7.36	229.5	5	N	FMCU	Oct-16	7.4	194.9	5.0	N
FMCD	Apr-16	8.07	133.8	5	N	FMCD	Oct-16	7.8	172.8	5	N
1	May-16	7.35	487	22	N	1	Nov-16	7.3	403.0	10.0	N
8	May-16	7.3	479	5	N	8	Nov-16	7.13	398	5	N
9	May-16	NS	NS	NS	NS	9	Nov-16	NS	NS	NS	NS
10	May-16	7.35	1701	<5	M	10	Nov-16	7.18	1893	11	N
11	May-16	7.53	1421	22	N	11	Nov-16	7.16	154.2	5	N
FMCU	May-16	6.97	226	5		FMCU	Nov-16	7.2	175.1	8.0	
FMCD	May-16	7.65	133.6	5		FMCD	Nov-16	7.62	145.2	5	
1	Jun-16	7.19	226	32	N	1	Dec-16	7.0	378.0	63.0	N
8	Jun-16	6.92	437	5	N	8	Dec-16	6.86	328	11	N
9	Jun-16	NS	NS	NS	NS	9	Dec-16	NS	NS	NS	NS
10	Jun-16	7.23	1044	<5	L	10	Dec-16	7.28	1946	12	N
11	Jun-16	7	901	6	N	11	Dec-16	0	0	0	N
FMCU	Jun-16	6.8	176.3	5		FMCU	Dec-16	7.1	213.9	30.0	N
FMCD	Jun-16	7.6	142.9	18		FMCD	Dec-16	7.29	176.6	5	N

D - Dry, N - Nil Flow, L - Low Flow, M - Medium Flow, H - High Flow NS - Sample Unobtainable

Surface Water Quality Monitoring Results – 2017

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow
1	Jan-17	6.91	259	113	NF
8	Jan-17	NS	NS	NS	NF
9	Jan-17	NS	NS	NS	
10	Jan-17	NS	NS	NS	NF
11	Jan-17	6.51	142.1	9	NF
FMCU	Jan-17	7.05	181.7	22	
FMCD	Jan-17	7.19	164.4	9	
1	Feb-17	6.93	443	16	NF
8	Feb-17	NS	NS	NS	NF
9	Feb-17	NS	NS	NS	
10	Feb-17	NS	NS	NS	NF
11	Feb-17	6.6	171.9	22	NF
FMCU	Feb-17	6.98	198.3	23	
FMCD	Feb-17	7.49	173.2	5	
1	Mar-17	6.34	404	5	LF
8	Mar-17	5.89	580	<5	LF
9	Mar-17	NS	NS	NS	
10	Mar-17	6.76	1092	9	LF
11	Mar-17	6.5	904	10	NF
FMCU	Mar-17	6.09	252.9	8	
FMCD	Mar-17	7.45	241	9	
1	Apr-17	6.92	592	11	NF
8	Apr-17	6.33	521	<5	LF
9	Apr-17	NS	NS	NS	
10	Apr-17	6.85	1044	<5	LF
11	Apr-17	6.94	978	10	NF
FMCU	Apr-17	6.55	289	6	
FMCD	Apr-17	7.29	186.6	<5	
1	May-17	6.93	603	17	NF
8	May-17	6.7	685	16	NF
9	May-17	NS	NS	NS	
10	May-17	7.34	1493	30	NF
11	May-17	5.88	348	14	NF
FMCU	May-17	7.48	291	<5	
FMCD	May-17	6.94	168.6	<5	
1	Jun-17	6.67	450	6	LF
8	Jun-17	6.67	455	<5	NF
9	Jun-17	NS	NS	NS	
10	Jun-17	6.68	811	8	NF
11	Jun-17	6.75	1278	15	NF
FMCU	Jun-17	7.38	267	8	
FMCD	Jun-17	8.24	186	5	

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow
1	Jul-17	7.8	565.0	5.0	NF
8	Jul-17	7.04	506	<5	NF
9	Jul-17	NS	NS	NS	
10	Jul-17	7	1438	<5	NF
11	Jul-17	7.37	387	14	NF
FMCU	Jul-17	7.5	298.0	14.0	Light brown
FMCD	Jul-17	8.15	110.1	<5	
1	Aug-17	8.1	494.0	5.0	NF
8	Aug-17	7.33	536	<5	NF
9	Aug-17	NS	NS	NS	
10	Aug-17	7.27	1361	<5	NF
11	Aug-17	7.31	476	176	NF
FMCU	Aug-17	6.7	303.0	122.0	
FMCD	Aug-17	6.83	110.8	86	
1	Sep-17	7.4	586.0	37.0	NF
8	Sep-17	7.21	581	28	NF
9	Sep-17	NS	NS	NS	
10	Sep-17	6.89	2071	30	NF
11	Sep-17	7.64	222	24	NF
FMCU	Sep-17	7.4	340.0	<5	
FMCD	Sep-17	7.22	202.3	<5	
1	Oct-17	NS	NS	NS	NF
8	Oct-17	NS	NS	NS	NF
9	Oct-17	NS	NS	NS	
10	Oct-17	7.07	2240	111	NF
11	Oct-17	NS	NS	NS	NF
FMCU	Oct-17	6.2	468.0	23.0	Pooled
FMCD	Oct-17	8.15	225	<5	
1	Nov-17	7.3	202.1	33.0	NF
8	Nov-17	6.28	348	<5	NF
9	Nov-17	NS	NS	NS	
10	Nov-17	7	456	21	NF
11	Nov-17	NS	NS	NS	NF
FMCU	Nov-17	6.5	163.5	10.0	
FMCD	Nov-17	7.53	149.2	5	
1	Dec-17	6.4	242.0	24.0	NF
8	Dec-17	NS	NS	NS	NF
9	Dec-17	NS	NS	NS	
10	Dec-17	6.43	1185	41	NF
11	Dec-17	NS	NS	NS	NF
FMCU	Dec-17	6.5	190.8	16.0	
FMCD	Dec-17	7.75	170.9	<5	

D - Dry, N - Nil Flow, L - Low Flow, M - Medium Flow, H - High Flow NS - Sample Unobtainable

Surface Water Quality Monitoring Results – 2018

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow	Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow
1	Jan-18	NS	NS	NS	N	1	Jul-18	NS	NS	NS	N
8	Jan-18	NS	NS	NS	N	8	Jul-18	7.13	630	24	
9	Jan-18	NS	NS	NS	N	9	Jul-18	NS	NS	NS	
10	Jan-18	NS	NS	NS		10	Jul-18	7.19	1776	11	
11	Jan-18	6.69	178.2	16		11	Jul-18	7	276	5	
FMCU	Jan-18	NS	NS	NS	L	FMCU	Jul-18	6.8	210.0	5.0	
FMCD	Jan-18	7.2	190.9	5		FMCD	Jul-18	8.02	255	5	
1	Feb-18	NS	NS	NS	N	1	Aug-18	7.3	253.0	31.0	
8	Feb-18	NS	NS	NS	N	8	Aug-18	NS	NS	NS	N
9	Feb-18	NS	NS	NS	N	9	Aug-18	NS	NS	NS	
10	Feb-18	NS	NS	NS		10	Aug-18	7.25	1343	5	
11	Feb-18	6.59	158.9	13		11	Aug-18	6.95	134.4	5	
FMCU	Feb-18	5.42	313	16		FMCU	Aug-18	6.3	239.0	13.0	
FMCD	Feb-18	7.98	208.2	10		FMCD	Aug-18	7.35	149.5	7	
1	Mar-18	NS	NS	NS	N	1	Sep-18	6.9	225.6	57.0	
8	Mar-18	6.87	389	7		8	Sep-18	NS	NS	NS	N
9	Mar-18	NS	NS	NS		9	Sep-18	NS	NS	NS	
10	Mar-18	6.91	1071	235		10	Sep-18	6.9	1469	5	
11	Mar-18	7.03	275	5		11	Sep-18	6.85	139.9	5	
FMCU	Mar-18	6.67	245	6		FMCU	Sep-18	6.8	193.9	10.0	
FMCD	Mar-18	7.89	151.8	8		FMCD	Sep-18	7.76	126.6	6	
1	Apr-18	7.14	580	10		1	Oct-18	6.7	486.0	5.0	
8	Apr-18	6.85	583	8		8	Oct-18	6.58	367	5	
9	Apr-18	NS	NS	NS		9	Oct-18	NS	NS	NS	
10	Apr-18	6.82	1121	16		10	Oct-18	6.98	1077	5	
11	Apr-18	7.4	311	5		11	Oct-18	6.74	272	5	
FMCU	Apr-18	6.06	291	7		FMCU	Oct-18	6.5	434.0	10.0	
FMCD	Apr-18	7.12	157.1	5		FMCD	Oct-18	8.03	148.4	11	
1	May-18	7.08	625	10		1	Nov-18	6.7	324.0	10.0	
8	May-18	6.8	650	9		8	Nov-18	6.89	441	12	
9	May-18	NS	NS	NS		9	Nov-18	NS	NS	NS	
10	May-18	7.35	1436	5		10	Nov-18	6.94	1437	12	
11	May-18	7.2	182.8	5		11	Nov-18	6.74	182.9	22	
FMCU	May-18	7.11	288	6		FMCU	Nov-18	6.9	440.0	15.0	
FMCD	May-18	8.44	154.8	5		FMCD	Nov-18	8.08	166.9	5	
1	Jun-18	6.96	302	9		1	Dec-18	6.4	294.0	15.0	
8	Jun-18	6.15	410	5		8	Dec-18	6.32	326	6	
9	Jun-18	NS	NS	NS		9	Dec-18	NS	NS	NS	
10	Jun-18	6.96	1157	8		10	Dec-18	6.95	523	23	
11	Jun-18	6.85	359	5		11	Dec-18	6.65	204	14	
FMCU	Jun-18	6.63	193.9	5		FMCU	Dec-18	6.9	239.0	5.0	
FMCD	Jun-18	7.8	147.7	26		FMCD	Dec-18	7.24	240	26	

D - Dry, N - Nil Flow, L - Low Flow, M - Medium Flow, H - High Flow NS - Sample Unobtainable

Surface Water Quality Monitoring Results – 2019

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow
1	Jan-19	6.92	350	15	N
8	Jan-19	NS	NS	NS	N
9	Jan-19	NS	NS	NS	N
10	Jan-19	6.78	1676	9	N
11	Jan-19	7.26	163.5	5	N
FMCU	Jan-19	6.95	314	28	N
FMCD	Jan-19	7.44	190.3	5	M
1	Feb-19	6.98	443	26	N
8	Feb-19	NS	NS	NS	N
9	Feb-19	NS	NS	NS	N
10	Feb-19	NS	NS	NS	N
11	Feb-19	7.26	196.6	10	N
FMCU	Feb-19	NS	NS	NS	N
FMCD	Feb-19	7.84	147.9	5	M
1	Mar-19	6.55	193.9	50	N
8	Mar-19	6.41	498	26	N
9	Mar-19	NS	NS	NS	N
10	Mar-19	6.54	410	28	N
11	Mar-19	6.94	214	5	N
FMCU	Mar-19	7.09	163	10	N
FMCD	Mar-19	7.64	224	26	L
1	Apr-19	5.73	329	27	N
8	Apr-19	6.3	275.2	10	N
9	Apr-19	NS	NS	NS	N
10	Apr-19	6.64	673.7	22	N
11	Apr-19	7.25	241	5	N
FMCU	Apr-19	6.87	189	5	N
FMCD	Apr-19	7.45	283	5	L
1	May-19	6.83	330	48	N
8	May-19	NS	NS	NS	N
9	May-19	NS	NS	NS	N
10	May-19	6.85	961	10	N
11	May-19	6.94	249	5	N
FMCU	May-19	7	178.9	12	N
FMCD	May-19	8.07	241	5	L
1	Jun-19	7.1	294	NS	N
8	Jun-19	NS	NS	NS	N
9	Jun-19	NS	NS	NS	N
10	Jun-19	6.82	1027	NS	N
11	Jun-19	7.09	238	NS	N
FMCU	Jun-19	7.22	151.8	10	N
FMCD	Jun-19	8.1	219	6	L

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow
1	Jul-19	7.0	296.6	15.0	N
8	Jul-19	7.2	451.3	11	N
9	Jul-19	NS	NS	NS	N
10	Jul-19	7.36	751.6	5	N
11	Jul-19	7.37	183.9	5	N
FMCU	Jul-19	6.7	219.3	5.0	N
FMCD	Jul-19	7.69	237	5	L
1	Aug-19	NS	NS	NS	N
8	Aug-19	NS	NS	NS	N
9	Aug-19	NS	NS	NS	N
10	Aug-19	7.19	1004	9	N
11	Aug-19	7.47	257	5	L
FMCU	Aug-19	NS	NS	NS	N
FMCD	Aug-19	7.88	256	5	L
1	Sep-19	6.8	315.0	20.0	N
8	Sep-19	NS	NS	NS	N
9	Sep-19	NS	NS	NS	N
10	Sep-19	7	666	10	N
11	Sep-19	7.27	588	10	N
FMCU	Sep-19	6.9	162.9	18.0	N
FMCD	Sep-19	7.57	225	5	L
1	Oct-19	7.1	341.0	5.0	N
8	Oct-19	NS	NS	NS	N
9	Oct-19	NS	NS	NS	N
10	Oct-19	7.7	931	8	N
11	Oct-19	7.68	160.3	5	N
FMCU	Oct-19	6.9	210.6	21.0	N
FMCD	Oct-19	7.68	232.7	5	L
1	Nov-19	6.7	369.0	44.0	N
8	Nov-19	NS	NS	NS	N
9	Nov-19	NS	NS	NS	N
10	Nov-19	7.28	1100	6	N
11	Nov-19	6.65	314	24	N
FMCU	Nov-19	NS	NS	NS	D
FMCD	Nov-19	7.86	274	10	L
1	Dec-19	NS	NS	NS	N
8	Dec-19	NS	NS	NS	N
9	Dec-19	NS	NS	NS	N
10	Dec-19	7.23	1285	12	N
11	Dec-19	6.65	366	38	N
FMCU	Dec-19	NS	NS	NS	D
FMCD	Dec-19	7.79	332	68	N

D - Dry, N - Nil Flow, L - Low Flow, M - Medium Flow, H - High Flow NS - Sample Unobtainable

Surface Water Quality Monitoring Results – 2020

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow	Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow
1	Jan-20	NS	NS	NS	N	1	Jul-20	7.1	250.8	13.0	N
8	Jan-20	NS	NS	NS	N	8	Jul-20	6.29	235.8	<5	N
9	Jan-20	NS	NS	NS	NS	9	Jul-20	NS	NS	NS	NS
10	Jan-20	NS	NS	NS	NS	10	Jul-20	7.35	366	15	L
11	Jan-20	6.94	527	16	N	11	Jul-20	8.73	947	76	N
EM1	Jan-20	7.26	172.3	46	N	EM1	Jul-20	6.92	210.6	19	N
EM3	Jan-20	7.86	259	5	N	EM3	Jul-20	7.19	169.6	155	L
1	Feb-20	6.62	272.7	16	L	1	Aug-20	6.8	583.0	6.0	N
8	Feb-20	6.33	469	15	N	8	Aug-20	6.64	507	<5	L
9	Feb-20	NS	NS	NS	NS	9	Aug-20	NS	NS	NS	NS
10	Feb-20	6.82	600	29	L	10	Aug-20	7.3	864	6	L
11	Feb-20	6.55	662	32	N	11	Aug-20	6.87	915	7	N
EM1	Feb-20	6.66	276.4	<5	L	EM1	Aug-20	6.77	338.2	<5	N
EM3	Feb-20	6.79	274.5	5	N	EM3	Aug-20	7.16	225	5	L
1	Mar-20	7.26	295	36	N	1	Sep-20	7.1	564.0	5.0	N
8	Mar-20	6.8	474	522	N	8	Sep-20	6.31	559	7	N
9	Mar-20	NS	NS	NS	NS	9	Sep-20	NS	NS	NS	NS
10	Mar-20	6.96	359	8	N	10	Sep-20	7.43	1051	5	N
11	Mar-20	9.28	549	14	N	11	Sep-20	7.02	888	7	N
EM1	Mar-20	6.71	350	12	N	EM1	Sep-20	6.96	307	7	N
EM3	Mar-20	8.97	9.5	5	L	EM3	Sep-20	6.68	157.8	5	L
1	Apr-20	6.74	291.1	15	N	1	Oct-20	7.1	524.0	42.0	N
8	Apr-20	6.7	585.8	<5	N	8	Oct-20	6.39	480	11	L
9	Apr-20	NS	NS	NS	NS	9	Oct-20	NS	NS	NS	NS
10	Apr-20	7.15	749.6	12	N	10	Oct-20	7.28	1300	13	L
11	Apr-20	6.71	714.6	20	N	11	Oct-20	7	976	22	N
EM1	Apr-20	7.19	335.4	14	N	EM1	Oct-20	7.02	335.1	8	N
EM3	Apr-20	7.63	177.9	5	N	EM3	Oct-20	6.47	156.3	15	L
1	May-20	7.3	253.2	<5	N	1	Nov-20	6.9	450.0	14.0	N
8	May-20	6.94	327.7	6	N	8	Nov-20	6.31	431	8	N
9	May-20	NS	NS	NS	NS	9	Nov-20	NS	NS	NS	NS
10	May-20	7.23	851	20	N	10	Nov-20	6.99	940	6	N
11	May-20	6.75	597.3	8	N	11	Nov-20	6.99	1416	<5	N
EM1	May-20	7.31	233.4	17	N	EM1	Nov-20	6.67	301.2	7	L
EM3	May-20	7.33	240.5	5	L	EM3	Nov-20	7.04	177	7	L
1	Jun-20	7.26	172.3	46	N	1	Dec-20	7.0	394.0	25.0	L
8	Jun-20	6.68	380.1	<5	L	8	Dec-20	6.43	546	8	L
9	Jun-20	NS	NS	NS	NS	9	Dec-20	NS	NS	NS	NS
10	Jun-20	7.42	468.3	9	L	10	Dec-20	7.28	707	5	L
11	Jun-20	7.37	1216	10	N	11	Dec-20	6.91	1169	25	N
EM1	Jun-20	6.79	161.2	22	N	EM1	Dec-20	6.62	268.3	15	L
EM3	Jun-20	7.15	153.7	5	M	EM3	Dec-20	7.07	188.8	6	L

D - Dry, N - Nil Flow, L - Low Flow, M - Medium Flow, H - High Flow NS - Sample Unobtainable

Surface Water Quality Monitoring Results – 2021

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow
1	Jan-20	NS	NS	NS	N
8	Jan-20	NS	NS	NS	N
9	Jan-20	NS	NS	NS	NS
10	Jan-20	NS	NS	NS	NS
11	Jan-20	6.94	527	16	N
EM1	Jan-20	7.26	172.3	46	N
EM3	Jan-20	7.86	259	5	N
1	Feb-20	6.62	272.7	16	L
8	Feb-20	6.33	469	15	N
9	Feb-20	NS	NS	NS	NS
10	Feb-20	6.82	600	29	L
11	Feb-20	6.55	662	32	N
EM1	Feb-20	6.66	276.4	<5	L
EM3	Feb-20	6.79	274.5	5	N
1	Mar-20	7.26	295	36	N
8	Mar-20	6.8	474	522	N
9	Mar-20	NS	NS	NS	NS
10	Mar-20	6.96	359	8	N
11	Mar-20	9.28	549	14	N
EM1	Mar-20	6.71	350	12	N
EM3	Mar-20	8.97	9.5	5	L
1	Apr-20	6.74	291.1	15	N
8	Apr-20	6.7	585.8	<5	N
9	Apr-20	NS	NS	NS	NS
10	Apr-20	7.15	749.6	12	N
11	Apr-20	6.71	714.6	20	N
EM1	Apr-20	7.19	335.4	14	N
EM3	Apr-20	7.63	177.9	5	N
1	May-20	7.3	253.2	<5	N
8	May-20	6.94	327.7	6	N
9	May-20	NS	NS	NS	NS
10	May-20	7.23	851	20	N
11	May-20	6.75	597.3	8	N
EM1	May-20	7.31	233.4	17	N
EM3	May-20	7.33	240.5	5	L
1	Jun-20	7.26	172.3	46	N
8	Jun-20	6.68	380.1	<5	L
9	Jun-20	NS	NS	NS	NS
10	Jun-20	7.42	468.3	9	L
11	Jun-20	7.37	1216	10	N
EM1	Jun-20	6.79	161.2	22	N
EM3	Jun-20	7.15	153.7	5	M

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow
1	Jul-20	7.1	250.8	13.0	N
8	Jul-20	6.29	235.8	<5	N
9	Jul-20	NS	NS	NS	NS
10	Jul-20	7.35	366	15	L
11	Jul-20	8.73	947	76	N
EM1	Jul-20	6.92	210.6	19	N
EM3	Jul-20	7.19	169.6	155	L
1	Aug-20	6.8	583.0	6.0	N
8	Aug-20	6.64	507	<5	L
9	Aug-20	NS	NS	NS	NS
10	Aug-20	7.3	864	6	L
11	Aug-20	6.87	915	7	N
EM1	Aug-20	6.77	338.2	<5	N
EM3	Aug-20	7.16	225	5	L
1	Sep-20	7.1	564.0	5.0	N
8	Sep-20	6.31	559	7	N
9	Sep-20	NS	NS	NS	NS
10	Sep-20	7.43	1051	5	N
11	Sep-20	7.02	888	7	N
EM1	Sep-20	6.96	307	7	N
EM3	Sep-20	6.68	157.8	5	L
1	Oct-20	7.1	524.0	42.0	N
8	Oct-20	6.39	480	11	L
9	Oct-20	NS	NS	NS	NS
10	Oct-20	7.28	1300	13	L
11	Oct-20	7	976	22	N
EM1	Oct-20	7.02	335.1	8	N
EM3	Oct-20	6.47	156.3	15	L
1	Nov-20	6.9	450.0	14.0	N
8	Nov-20	6.31	431	8	N
9	Nov-20	NS	NS	NS	NS
10	Nov-20	6.99	940	6	N
11	Nov-20	6.99	1416	<5	N
EM1	Nov-20	6.67	301.2	7	L
EM3	Nov-20	7.04	177	7	L
1	Dec-20	7.0	394.0	25.0	L
8	Dec-20	6.43	546	8	L
9	Dec-20	NS	NS	NS	NS
10	Dec-20	7.28	707	5	L
11	Dec-20	6.91	1169	25	N
EM1	Dec-20	6.62	268.3	15	L
EM3	Dec-20	7.07	188.8	6	L

D - Dry, N - Nil Flow, L - Low Flow, M - Medium Flow, H - High Flow NS - Sample Unobtainable

Surface Water Quality Monitoring Results – 2022

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow	Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow
1	Jan-22	7.16	684	12	Still	1	Jul-22	7.2	1053.0	<5	Trickl
8	Jan-22	6.69	575	9	Still	8	Jul-22	6.97	478.1	<5	Stead
9	Jan-22	NS	NS	NS	NS	9	Jul-22	NS	NS	NS	NS
10	Jan-22	7.28	1028	6	Still	10	Jul-22	7.35	800.1	9	Slow
11	Jan-22	7.23	665	8	Still	11	Jul-22	7.31	910.2	6	Stead
EM1	Jan-22	6.86	315	9	Still	EM1	Jul-22	6.86	315	9	Still
EM3	Jan-22	7.14	230.8	<5	Trickl	EM3	Jul-22	7.14	230.8	<5	Trickl
1	Feb-22	7.1	674.4	16	Still	1	Aug-22	7.0	1565.0	<5	Still
8	Feb-22	7.07	472.8	151	Trickl	8	Aug-22	7.02	653.3	<5	Trickl
9	Feb-22	NS	NS	NS	NS	9	Aug-22	NS	NS	NS	NS
10	Feb-22	7.23	1261	13	Trickl	10	Aug-22	7.4	1329	<5	Trickl
11	Feb-22	7.19	603.1	52	Still	11	Aug-22	7.4	2950	<5	Trickl
EM1	Feb-22	6.79	276	17	Still	EM1	Aug-22	7.28	589.9	<5	Stead
EM3	Feb-22	7.25	155.3	<5	Trickl	EM3	Aug-22	7.4	242.9	10	Stead
1	Mar-22	7.3	542.1	14	Trickl	1	Sep-22	6.8	1371.0	<5	Still
8	Mar-22	6.96	515.3	<5	Trickl	8	Sep-22	6.8	658.8	<5	Trickl
9	Mar-22	NS	NS	NS	NS	9	Sep-22	NS	NS	NS	NS
10	Mar-22	7.04	719.6	19	Trickl	10	Sep-22	7.26	1190	<5	Slow
11	Mar-22	7.18	1044	13	Trickl	11	Sep-22	7.28	2006	<5	Trickl
EM1	Mar-22	7.6	290.6	14	Stead	EM1	Sep-22	7.35	429	18	Stead
EM3	Mar-22	7.38	267.8	<5	Slow	EM3	Sep-22	7.53	410	22	Stead
1	Apr-22	6.78	625.4	<5	Slow	1	Oct-22	7.4	885.0	8.0	Slow
8	Apr-22	6.94	471.3	<5	Slow	8	Oct-22	6.88	540	<5	Stead
9	Apr-22	NS	NS	NS	NS	9	Oct-22	NS	NS	NS	NS
10	Apr-22	7.16	589.1	11	Slow	10	Oct-22	7.14	572	23	Slow
11	Apr-22	7.08	1335	9	Slow	11	Oct-22	8.09	1078	13	Slow
EM1	Apr-22	7.1	319	17	Trickl	EM1	Oct-22	7.35	420.1	<5	Slow
EM3	Apr-22	7.1	259.8	<5	Trickl	EM3	Oct-22	7.17	231.8	<5	Slow
1	May-22	7.32	504.8	27	Slow	1	Nov-22	7.1	1574.0	6.0	Still
8	May-22	6.66	303.7	6	Slow	8	Nov-22	6.76	629.1	<5	Trickl
9	May-22	NS	NS	NS	NS	9	Nov-22	NS	NS	NS	NS
10	May-22	7.21	486.8	10	Slow	10	Nov-22	7.22	1329	<5	Trickl
11	May-22	7.28	495.2	10	Stead	11	Nov-22	7.3	1902	6	Still
EM1	May-22	7.64	274.2	16	Stead	EM1	Nov-22	7.09	471.3	8	Still
EM3	May-22	7.13	194.6	10	Stead	EM3	Nov-22	7.2	218.3	<5	Trickl
1	Jun-22	6.88	956.3	10	Slow	1	Dec-22	7.3	1642.0	15.0	Still
8	Jun-22	6.88	446.7	<5	Trickl	8	Dec-22	7.11	551.5	6	Still
9	Jun-22	NS	NS	NS	NS	9	Dec-22	NS	NS	NS	NS
10	Jun-22	7.21	1080	7	Trickl	10	Dec-22	7.38	1473	6	Still
11	Jun-22	7.2	1347	<5	Trickl	11	Dec-22	7.42	1825	14	Still
EM1	Jun-22	6.88	361.4	<5	Trickl	EM1	Dec-22	7.22	474.9	<5	Still
EM3	Jun-22	6.35	180.1	<5	Trickl	EM3	Dec-22	7	160.3	10	Still

D - Dry, N - Nil Flow, L - Low Flow, M - Medium Flow, H - High Flow NS - Sample Unobtainable

Surface Water Quality Monitoring Results – 2023

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow	Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)	Flow
1	Jan-23	7.23	1769	12	Trickl	1	Jul-23	6.9	740.5	7.0	Still
8	Jan-23	6.89	527.1	8	Still	8	Jul-23	7.28	485.6	<5	Still
9	Jan-23	NS	NS	NS	NS	9	Jul-23	NS	NS	NS	NS
10	Jan-23	7.29	1549	11	Trickl	10	Jul-23	6.97	1207	5	Trickl
11	Jan-23	7.01	1885	8	Trickl	11	Jul-23	7.13	159.9	43	Slow
EM1	Jan-23	7.12	495.5	209	Still	EM1	Jul-23	7.12	495.5	209	Still
EM3	Jan-23	6.79	190.9	<5	Trickl	EM3	Jul-23	6.79	190.9	<5	Trickl
1	Feb-23	6.48	540.5	84	Slow	1	Aug-23	7.1	780.1	11.0	Still.
8	Feb-23	6.95	518	6	Trickl	8	Aug-23	7.24	509.6	<5	Still
9	Feb-23	NS	NS	NS	NS	9	Aug-23	NS	NS	NS	NS
10	Feb-23	7.73	533	30	Slow	10	Aug-23	7.39	1254	6	Still
11	Feb-23	6.93	1145	111	Trickl	11	Aug-23	6.78	208.4	13	Slow
EM1	Feb-23	6.91	206.2	16	Slow	EM1	Aug-23	8.02	225.2	5	Still
EM3	Feb-23	7.67	251	<5	Slow	EM3	Aug-23	7.67	125	<5	Trickl
1	Mar-23	7.42	545.1	12	Still	1	Sep-23	7.3	828.8	14.0	Still.
8	Mar-23	6.96	467.8	<5	Still	8	Sep-23	7.09	608.4	40	Still.
9	Mar-23	NS	NS	NS	NS	9	Sep-23	NS	NS	NS	NS
10	Mar-23	7.08	629.3	11	Trickl	10	Sep-23	7.25	1434	8	Still.
11	Mar-23	7.57	304.2	19	Stead	11	Sep-23	7.46	160.6	9	Trickl
EM1	Mar-23	6.78	172.8	21	Trickl	EM1	Sep-23	0	0	0	No
EM3	Mar-23	7.81	148.2	<5	Trickl	EM3	Sep-23	7.46	162.8	<5	Trickl
1	Apr-23	7.62	769.7	12	Still	1	Oct-23	7.2	789.1	10.0	Still
8	Apr-23	7.11	506.5	34	Trickl	8	Oct-23	0	0	0	Dry
9	Apr-23	NS	NS	NS	NS	9	Oct-23	NS	NS	NS	NS
10	Apr-23	7.4	392.2	18	Trickl	10	Oct-23	7.39	1211	<5	Still
11	Apr-23	7.92	210.6	73	Trickl	11	Oct-23	7.7	162.7	16	Slow
EM1	Apr-23	7.61	228.7	24	Slow	EM1	Oct-23	0	0	0	No
EM3	Apr-23	6.3	161.5	15	Trickl	EM3	Oct-23	6.51	126.4	<5	Trickl
1	May-23	7.37	818.7	6	Still	1	Nov-23	0.0	0.0	0.0	Dry
8	May-23	7.54	545.2	<5	Still	8	Nov-23	6.33	669.3	<5	Still
9	May-23	NS	NS	NS	NS	9	Nov-23	NS	NS	NS	NS
10	May-23	7.42	1084	<5	Stead	10	Nov-23	0	0	0	Dry
11	May-23	7.22	162.2	11	Slow	11	Nov-23	7.6	205.6	78	Trickl
EM1	May-23	7.1	224.8	17	Still	EM1	Nov-23	7.06	161.1	12	Still
EM3	May-23	7.77	143.5	<5	Trickl	EM3	Nov-23	7.58	148.5	<5	Trickl
1	Jun-23	7.01	863.6	22	Still	1	Dec-23	0.0	0.0	0.0	Dry
8	Jun-23	7.06	597.8	<5	Still	8	Dec-23	0	0	0	Dry
9	Jun-23	NS	NS	NS	NS	9	Dec-23	NS	NS	NS	NS
10	Jun-23	7.01	1340	12	Still	10	Dec-23	7.38	1197	<5	Still
11	Jun-23	7.11	183.4	14	Slow	11	Dec-23	7.59	200.1	12	Still.
EM1	Jun-23	7.36	207.3	7	Still	EM1	Dec-23	0	0	0	No
EM3	Jun-23	8.09	186.8	<5	Trickl	EM3	Dec-23	7.71	210.1	5	Still

D - Dry, N - Nil Flow, L - Low Flow, M - Medium Flow, H - High Flow NS - Sample Unobtainable

Groundwater 2008 to 2023

Groundwater Quality Monitoring Results – 2008/2009

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Jun-08	6.1	3740	362
7	Jun-08	6.8	2200	1130
12	Jun-08	6.1	4640	148
13	Jun-08	6.8	12830	32
JRD1	Jun-08	7	2660	132
JRD2	Jun-08	6.7	600	130
6	Jul-08	6.1	3970	174
7	Jul-08	7.1	2590	616
12	Jul-08	6.7	6720	121
13	Jul-08	6.7	14710	6
JRD1	Jul-08	6.8	3210	28
JRD2	Jul-08	7	3040	15
6	Aug-08	6.1	3930	804
7	Aug-08	6.7	2350	98
12	Aug-08	6.8	10130	216
13	Aug-08	7	13610	15
JRD1	Aug-08	7.0	3220	35
JRD2	Aug-08	7.2	2980	57
6	Sep-08	6.2	2860	261
7	Sep-08	6.9	2300	130
12	Sep-08	6.6	1630	152
13	Sep-08	6.8	13580	30
JRD1	Sep-08	7.3	3230	71
JRD2	Sep-08	6.5	220	78
6	Oct-08	6.4	3950	14
7	Oct-08	6.6	2260	878
12	Oct-08	6.8	11530	407
13	Oct-08	6.8	13910	9
JRD1	Oct-08	6.8	3650	28
JRD2	Oct-08	6	220	125
6	Nov-08	6	3750	550
7	Nov-08	6.9	2250	670
12	Nov-08	6.7	8880	182
13	Nov-08	7	13180	3
JRD1	Nov-08	6.7	3830	12
JRD2	Nov-08	6.9	240	178

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Dec-08	6.1	3750	356
7	Dec-08	6.8	2490	416
12	Dec-08	6.9	11300	173
13	Dec-08	7	13280	11
JRD1	Dec-08	6.9	3800	28
JRD2	Dec-08	6.4	410	180
6	Jan-09	6.6	4260	1160
7	Jan-09	6.5	2250	160
12	Jan-09	6.8	12440	1550
13	Jan-09	6.8	14450	7
JRD1	Jan-09	6.8	3830	13
JRD2	Jan-09	7.1	3080	16
6	Feb-09	6.3	3090	165
7	Feb-09	6.6	2070	177
12	Feb-09			
13	Feb-09	6.9	13090	18
JRD1	Feb-09	6.9	3790	59
JRD2	Feb-09	6.7	500	63
6	Mar-09	6.3	3820	204
7	Mar-09	6.5	2090	534
12	Mar-09	6.3	2390	106
13	Mar-09	7	13250	9
JRD1	Mar-09	6.8	3870	14
JRD2	Mar-09	6.7	490	27
6	Apr-09	6.7	3340	192
7	Apr-09	6.3	2060	196
12	Apr-09	6.8	7970	727
13	Apr-09	6.8	14680	2
JRD1	Apr-09	6.6	3770	11
JRD2	Apr-09	7	2620	15
6	May-09	6.8	4250	136
7	May-09	7	2530	264
12	May-09	6.7	11550	454
13	May-09	6.9	13410	18
JRD1	May-09	6.7	3260	23
JRD2	May-09	6.9	560	25

Groundwater Quality Monitoring Results – 2009/2010

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Jun-09	6.5	4460	459
7	Jun-09	6.5	2140	551
12	Jun-09	NS	NS	NS
13	Jun-09	7.1	11920	15
JRD1	Jun-09	6.8	2250	29
JRD2	Jun-09	7.4	730	91
6	Jul-09	6.6	4290	945
7	Jul-09	6.8	2260	103
12	Jul-09	6.7	5330	1380
13	Jul-09	6.8	14850	25
JRD1	Jul-09	6.6	3720	21
JRD2	Jul-09	7	2660	15
6	Aug-09	6.7	4580	807
7	Aug-09	6.8	2380	16
12	Aug-09	6.9	8730	15
13	Aug-09	7.1	12600	20
JRD1	Aug-09	6.8	3090.0	52.0
JRD2	Aug-09	7	1160	97
6	Sep-09	6.6	4380	119
7	Sep-09	6.6	2460	12
12	Sep-09	NS	NS	NS
13	Sep-09	6.6	13490	14
JRD1	Sep-09	6.8	3130	66
JRD2	Sep-09	7.9	1230	61
6	Oct-09	6.9	3940	51
7	Oct-09	6.8	2000	147
12	Oct-09	NS	NS	NS
13	Oct-09	7.2	11610	12
JRD1	Oct-09	7.1	3250	106
JRD2	Oct-09	7.6	1770	61
6	Nov-09	7.2	8400	266
7	Nov-09	6.8	3590	246
12	Nov-09	NS	NS	NS
13	Nov-09	7.3	260	14
JRD1	Nov-09	6.9	10230	47
JRD2	Nov-09	7.1	350.0	47.0

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Dec-09	6.9	4270.0	193.0
7	Dec-09	6.9	2390	14
12	Dec-09	NS	NS	NS
13	Dec-09	7	12390	26
JRD1	Dec-09	6.7	3650	63
JRD2	Dec-09	7.3	1920.0	87.0
6	Jan-10	6.7	5310	173
7	Jan-10	NS	NS	NS
12	Jan-10	6.7	13200.0	37.0
13	Jan-10	6.5	12990	31
JRD1	Jan-10	6.8	3580	22
JRD2	Jan-10	7.3	2050.0	44.0
6	Feb-10	6.9	4570	193
7	Feb-10	NS	NS	NS
12	Feb-10	6.9	12280	46
13	Feb-10	7.1	11560	28
JRD1	Feb-10	6.9	3750	40
JRD2	Feb-10	7.3	960	139
6	Mar-10	6.7	4180	394
7	Mar-10	NS	NS	NS
12	Mar-10	6.5	6880	30
13	Mar-10	7	11430	32
JRD1	Mar-10	6.8	4040	38
JRD2	Mar-10	7.4	1220	100
6	Apr-10	6.4	3900.0	397.0
7	Apr-10	NS	NS	NS
12	Apr-10	8.2	8440	67
13	Apr-10	7	11430	32
JRD1	Apr-10	6.7	3930	52
JRD2	Apr-10	6.3	1990	101
6	May-10	6.89	1590	268
7	May-10	NS	NS	NS
12	May-10	6.75	8310	34
13	May-10	NS	NS	NS
JRD1	May-10	6.73	3780	23
JRD2	May-10	7.41	1590	136

Groundwater Quality Monitoring Results – 2010/2011

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Jun-10	6.9	3320	206
7	Jun-10	NS	NS	NS
12	Jun-10	7.3	3200	63
13	Jun-10	7.6	10300	12
JRD1	Jun-10	7.5	3780	43
JRD2	Jun-10	7.2	315	14
6	Jul-10	7.23	3920	194
7	Jul-10	6.81	2630	22
12	Jul-10	6.41	7790	50
13	Jul-10	6.64	13100	6
JRD1	Jul-10	6.65	3520	22
JRD2	Jul-10	7.1	338	52
6	Aug-10	6.37	4020	234
7	Aug-10	6.8	2680	62
12	Aug-10	6.85	7840	12
13	Aug-10	6.65	13400	16
JRD1	Aug-10	7.2	3960.0	22.0
JRD2	Aug-10	7.2	2380	48
6	Sep-10	7.05	3700	412
7	Sep-10	4.76	2580	36
12	Sep-10	6.78	7800	22
13	Sep-10	6.78	11800	5
JRD1	Sep-10	8.03	3840	16
JRD2	Sep-10	7.05	2460	34
6	Oct-10	6.58	2320	152
7	Oct-10	7.03	2660	86
12	Oct-10	6.6	10800	17
13	Oct-10	6.99	12000	9
JRD1	Oct-10	8.05	4380	76
JRD2	Oct-10	7.27	2500	17
6	Nov-10	6.64	1090	141
7	Nov-10	7.21	2870	65
12	Nov-10	6.44	3260	30
13	Nov-10	6.97	13100	10
JRD1	Nov-10	8.34	4720	57
JRD2	Nov-10	7.2	2520.0	58.0

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Dec-10	6.5	1410.0	244.0
7	Dec-10	7.01	2670	232
12	Dec-10	6.31	2390	71
13	Dec-10	6.84	11000	5
JRD1	Dec-10	8.31	4460	229
JRD2	Dec-10	7.0	1120.0	99.0
6	Jan-11	6.51	3020	708
7	Jan-11	6.92	2800	68
12	Jan-11	6.4	7560.0	40.0
13	Jan-11	6.86	12400	30
JRD1	Jan-11	7.87	4990	51
JRD2	Jan-11	7.2	2110.0	222.0
6	Feb-11	6.47	2850	173
7	Feb-11	6.8	2760.0	147.0
12	Feb-11	6.35	7480	94
13	Feb-11	6.6	12400	25
JRD1	Feb-11	7.93	4660	69
JRD2	Feb-11	7.03	2500	62
6	Mar-11	6.68	2590	380
7	Mar-11	7.04	2560	39
12	Mar-11	6.58	13800	12
13	Mar-11	6.86	12200	24
JRD1	Mar-11	8.23	4710	32
JRD2	Mar-11	7.68	2080	69
6	Apr-11	7.4	3950.0	287.0
7	Apr-11	7.69	2780	150
12	Apr-11	7.46	14200	82
13	Apr-11	6.86	12200	24
JRD1	Apr-11	8.38	4840	24
JRD2	Apr-11	7.77	2520	50
6	May-11	6.7	4140	84
7	May-11	7.01	2860	18
12	May-11	6.5	9230	24
13	May-11	6.88	12600	42
JRD1	May-11	8.2	4970	76
JRD2	May-11	7.15	2080	70

Groundwater Quality Monitoring Results – 2011/2012

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Jun-11	6.72	4020	143
7	Jun-11	6.84	2720	18
12	Jun-11	6.46	6820	18
13	Jun-11	6.99	8970	16
JRD1	Jun-11	8.18	4750	26
JRD2	Jun-11	7.08	2280	94
6	Jul-11	7.17	4120	123
7	Jul-11	7.2	2380	40
12	Jul-11	6.7	1840	210
13	Jul-11	7.37	11000	14
JRD1	Jul-11	8.18	4720	18
JRD2	Jul-11	6.32	441	32
6	Aug-11	6.78	3530	-
7	Aug-11	6.47	2160	258
12	Aug-11	7.33	1540	-
13	Aug-11	6.98	3770	-
JRD1	Aug-11	8.3	4640.0	-
JRD2	Aug-11	7.04	337	-
6	Sep-11	6.77	3890	144
7	Sep-11	6.56	2190	154
12	Sep-11	6.29	4560	40
13	Sep-11	6.89	11000	17
JRD1	Sep-11	NS	NS	NS
JRD2	Sep-11	6.25	351	48
6	Oct-11	6.69	2370	94
7	Oct-11	6.31	1540	113
12	Oct-11	6.01	1080	108
13	Oct-11	6.88	10200	36
JRD1	Oct-11	NS	NS	NS
JRD2	Oct-11	6.21	408	45
6	Nov-11	7.28	3730	194
7	Nov-11	7.06	2010	15
12	Nov-11	6.83	4290	101
13	Nov-11	7.34	11400	15
JRD1	Nov-11	8.25	4620	52
JRD2	Nov-11	7.1	386.0	54.0

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Dec-11	7.0	2680.0	262.0
7	Dec-11	6.78	2050	142
12	Dec-11	6.18	2720	80
13	Dec-11	7.28	9180	66
JRD1	Dec-11	NS	NS	NS
JRD2	Dec-11	6.8	313.0	76.0
6	Jan-12	7.08	2740	542
7	Jan-12	7.18	2190	240
12	Jan-12	6.4	9120.0	22.0
13	Jan-12	7.24	11000	21
JRD1	Jan-12	8.17	4120	36
JRD2	Jan-12	7.1	389.0	28.0
6	Feb-12	7.1	3260	66
7	Feb-12	7.2	2180.0	40.0
12	Feb-12	6.12	1460	27
13	Feb-12	7.21	8210	22
JRD1	Feb-12	8.26	4260	14
JRD2	Feb-12	8.06	471	18
6	Mar-12	7.11	3140	35
7	Mar-12	7.04	2190	124
12	Mar-12	6.17	517	46
13	Mar-12	7.03	3710	14
JRD1	Mar-12	8.05	4170	40
JRD2	Mar-12	7.26	390	48
6	Apr-12	7.3	3120.0	222.0
7	Apr-12	7.55	2740	105
12	Apr-12	6.5	2170	161
13	Apr-12	7.03	3710	14
JRD1	Apr-12	8.18	4500	57
JRD2	Apr-12	8	506	50
6	May-12	7.16	3170	174
7	May-12	7.49	2720	106
12	May-12	6.37	1250	130
13	May-12	7.34	11200	80
JRD1	May-12	8.17	4380	26
JRD2	May-12	6.57	315	69

Groundwater Quality Monitoring Results – 2012/2013

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Jun-12	7.04	662	6400
7	Jun-12	7.14	2340	78
12	Jun-12	6.28	452	40
13	Jun-12	7.3	7560	87
JRD1	Jun-12	8.36	4280	40
JRD2	Jun-12	6.78	256	88
6	Jul-12	7.15	3320	384
7	Jul-12	7.47	2750	94
12	Jul-12	6.44	1980	84
13	Jul-12	7.25	11200	57
JRD1	Jul-12	8.63	4590	54
JRD2	Jul-12	6.9	317	72
6	Aug-12	0	NS	NS
7	Aug-12	7.41	2760	78
12	Aug-12	6.39	1030	63
13	Aug-12	7.48	9580	63
JRD1	Aug-12	8.4	4530.0	17.0
JRD2	Aug-12	6.93	336	118
6	Sep-12	NS	NS	NS
7	Sep-12	7.53	2820	166
12	Sep-12	6.57	1400	99
13	Sep-12	7.37	11500	19
JRD1	Sep-12	8.42	4550	22
JRD2	Sep-12	7.22	421	53
6	Oct-12	NS	NS	NS
7	Oct-12	7.08	2410	61
12	Oct-12	6.59	1910	118
13	Oct-12	7.29	12400	11
JRD1	Oct-12	8.44	4660	12
JRD2	Oct-12	7.24	404	37
6	Nov-12	NS	NS	NS
7	Nov-12	7.07	2490	232
12	Nov-12	6.78	3060	96
13	Nov-12	7.09	12400	44
JRD1	Nov-12	8.31	4730	8
JRD2	Nov-12	7.0	434.0	25.0

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Dec-12	NS	NS	NS
7	Dec-12	7.1	1190	90
12	Dec-12	7.42	4340	93
13	Dec-12	7.56	11600	66
JRD1	Dec-12	8.41	4480	22
JRD2	Dec-12	8.0	474.0	50.0
6	Jan-13	NS	NS	NS
7	Jan-13	6.78	2170	34
12	Jan-13	7.0	5770.0	130.0
13	Jan-13	7.45	12100	158
JRD1	Jan-13	8.3	4590	22
JRD2	Jan-13	7.6	483.0	25.0
6	Feb-13	NS	NS	NS
7	Feb-13	7.4	2760.0	16.0
12	Feb-13	6.45	1010	27
13	Feb-13	7.4	8840	69
JRD1	Feb-13	8.26	4810	31
JRD2	Feb-13	6.66	351	28
6	Mar-13	NS	NS	NS
7	Mar-13	7.19	2550	18
12	Mar-13	6.31	636	73
13	Mar-13	7.26	6050	328
JRD1	Mar-13	8.33	4460	38
JRD2	Mar-13	6.66	242	120
6	Apr-13	NS	NS	NS
7	Apr-13	6.79	1280	72
12	Apr-13	6.73	1800	61
13	Apr-13	7.26	6050	328
JRD1	Apr-13	8.31	4540	32
JRD2	Apr-13	6.77	255	67
6	May-13	NS	NS	NS
7	May-13	7.12	2160	136
12	May-13	6.78	2520	81
13	May-13	7.46	6660	130
JRD1	May-13	8.37	4610	37
JRD2	May-13	7.31	407	656

Groundwater Quality Monitoring Results – 2013/2014

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Jun-13	NS	NS	NS
7	Jun-13	6.98	2910	<5
12	Jun-13	6.92	3750	664
13	Jun-13	7.62	6280	136
JRD1	Jun-13	8.28	4560	94
JRD2	Jun-13	7.16	372	201
6	Jul-13	6.45	807	11600
7	Jul-13	7.26	2530	1620
12	Jul-13	6.85	4200	3530
13	Jul-13	7.2	6910	1520
JRD1	Jul-13	8.46	4350	68
JRD2	Jul-13	7.22	1870	795
6	Aug-13	6.86	2590	6840
7	Aug-13	NS	NS	NS
12	Aug-13	7.02	5310	3070
13	Aug-13	7.82	10200	820
JRD1	Aug-13	8.3	4320	150.0
JRD2	Aug-13	7.43	2500	402
6	Sep-13	7.04	2410	4800
7	Sep-13	NS	NS	NS
12	Sep-13	6.9	6590	892
13	Sep-13	7.42	5950	180
JRD1	Sep-13	8.04	4390	30
JRD2	Sep-13	7.55	2350	178
6	Oct-13	6.69	2350	2560
7	Oct-13	NS	NS	NS
12	Oct-13	7.12	9590	157
13	Oct-13	7.49	5320	43
JRD1	Oct-13	8.31	4350	9
JRD2	Oct-13	7.54	2400	271
6	Nov-13	7.06	2300	207
7	Nov-13	NS	NS	NS
12	Nov-13	6.94	11100	332
13	Nov-13	7.64	5950	22
JRD1	Nov-13	8.39	4560	18
JRD2	Nov-13	7.5	2530	100.0

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Dec-13	6.8	967	44.0
7	Dec-13	NS	NS	NS
12	Dec-13	6.07	1940	14
13	Dec-13	7.42	5670	118
JRD1	Dec-13	NS	NS	NS
JRD2	Dec-13	6.2	282	<5
6	Jan-14	6.86	2260	655
7	Jan-14	NS	NS	NS
12	Jan-14	6.7	8240	120.0
13	Jan-14	7.28	6170	135
JRD1	Jan-14	8.39	4440	45
JRD2	Jan-14	7.4	2140	371.0
6	Feb-14	7.12	2350	1950
7	Feb-14	NS	NS	NS
12	Feb-14	NS	NS	NS
13	Feb-14	7.51	6430	78
JRD1	Feb-14	8.35	4520	28
JRD2	Feb-14	7.48	2390	497
6	Mar-14	6.98	2240	512
7	Mar-14	NS	NS	NS
12	Mar-14	NS	NS	NS
13	Mar-14	7.47	5480	133
JRD1	Mar-14	8.35	4220	70
JRD2	Mar-14	7.4	1800	932
6	Apr-14	7.2	2400	790.0
7	Apr-14	NS	NS	NS
12	Apr-14	NS	NS	NS
13	Apr-14	7.47	5480	133
JRD1	Apr-14	8.36	4330	121
JRD2	Apr-14	7.4	2150	364
6	May-14	7.04	2350	3590
7	May-14	NS	NS	NS
12	May-14	NS	NS	NS
13	May-14	7.3	5260	36
JRD1	May-14	8.35	4200	57
JRD2	May-14	7.55	1440	230

Groundwater Quality Monitoring Results – 2015

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Jan-15	6.64	2190	550
7	Jan-15	0	0	0
12	Jan-15	0	0	0
13	Jan-15	7.06	5490	75
JRD1	Jan-15	NS	NS	NS
JRD2	Jan-15	6.6	1784	171
6	Feb-15	6.74	2310	38
7	Feb-15	0	0	0
12	Feb-15	0	0	0
13	Feb-15	6.97	5480	40
JRD1	Feb-15	NS	NS	NS
JRD2	Feb-15	6.58	446	24
6	Mar-15	6.78	2350	424
7	Mar-15	0	0	0
12	Mar-15	0	0	0
13	Mar-15	6.91	5890	76
JRD1	Mar-15	NS	NS	NS
JRD2	Mar-15	6.68	788	110
6	Apr-15	6.45	2440	626
7	Apr-15	0	0	0
12	Apr-15	0	0	0
13	Apr-15	6.68	3220	86
JRD1	Apr-15	NS	NS	NS
JRD2	Apr-15	6.74	2080	130
6	May-15	6.53	2270	44
7	May-15	0	0	0
12	May-15	0	0	0
13	May-15	6.95	4030	27
JRD1	May-15	NS	NS	NS
JRD2	May-15	6.83	1910	41
6	Jun-15	6.47	2290	38
7	Jun-15	0	0	0
12	Jun-15	0	0	0
13	Jun-15	6.92	4250	71
JRD1	Jun-15	NS	NS	NS
JRD2	Jun-15	6.7	2030	37.0

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Jul-15	6.9	2099	90.0
7	Jul-15	0	0	0
12	Jul-15	0	0	0
13	Jul-15	7.28	2540	94
JRD1	Jul-15	NS	NS	NS
JRD2	Jul-15	7.3	914	9.0
6	Aug-15	7.4	2260	62
7	Aug-15	0	0	0
12	Aug-15	0.0	0	0.0
13	Aug-15	7.45	4780	122
JRD1	Aug-15	NS	NS	NS
JRD2	Aug-15	7.7	2168	24.0
6	Sep-15	6.65	2399	31
7	Sep-15	0.0	0	0.0
12	Sep-15	0	0	0
13	Sep-15	7.1	4810	62
JRD1	Sep-15	NS	NS	NS
JRD2	Sep-15	6.94	2580	38
6	Oct-15	6.74	2267	68
7	Oct-15	0	0	0
12	Oct-15	0	0	0
13	Oct-15	7.01	4040	23
JRD1	Oct-15	NS	NS	NS
JRD2	Oct-15	7.13	1961	100
6	Nov-15	6.8	2450	103.0
7	Nov-15	0	0	0
12	Nov-15	0	0	0
13	Nov-15	7.01	4040	23
JRD1	Nov-15	NS	NS	NS
JRD2	Nov-15	7.12	2335	196
6	Dec-15	6.81	2417	342
7	Dec-15	0	0	0
12	Dec-15	0	0	0
13	Dec-15	7.15	5290	30
JRD1	Dec-15	NS	NS	NS
JRD2	Dec-15	7.13	2160	108

Groundwater Quality Monitoring Results – 2016

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Jan-16	6.72	2425	128
12	Jan-16	0	0	0
13	Jan-16	7.03	3060	584
JRD1	Jan-16	NS	NS	NS
JRD2	Jan-16	6.29	527	142
6	Feb-16	6.64	2580	63
12	Feb-16	0	0	0
13	Feb-16	6.89	3670	20
JRD1	Feb-16	NS	NS	NS
JRD2	Feb-16	6.96	2113	15
6	Mar-16	6.67	2650	25
12	Mar-16	0	0	0
13	Mar-16	6.99	4410	33
JRD1	Mar-16	NS	NS	NS
JRD2	Mar-16	7.05	2436	38
6	Apr-16	6.72	2194	50
12	Apr-16	0	0	0
13	Apr-16	7.13	4240	31
JRD1	Apr-16	NS	NS	NS
JRD2	Apr-16	7.14	2360	36
6	May-16	6.8	2550	154
12	May-16	0	0	0
13	May-16	6.99	4840	45
JRD1	May-16	NS	NS	NS
JRD2	May-16	7.12	2650	21
6	Jun-16	6.7	2230	148
12	Jun-16	0	0	0
13	Jun-16	6.99	4540	19
JRD1	Jun-16	NS	NS	NS
JRD2	Jun-16	7.1	2470	24.0

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Jul-16	6.7	2390	47.0
12	Jul-16	0	0	0
13	Jul-16	7.09	5310	146
JRD1	Jul-16	NS	NS	NS
JRD2	Jul-16	7.1	2660	75.0
6	Aug-16	6.68	2560	10
12	Aug-16	0.0	0	0.0
13	Aug-16	6.98	4200	9
JRD1	Aug-16	NS	NS	NS
JRD2	Aug-16	7.0	2120	106.0
6	Sep-16	6.73	2480	65
12	Sep-16	0	0	0
13	Sep-16	7.06	4040	10
JRD1	Sep-16	NS	NS	NS
JRD2	Sep-16	7.04	2330	12
6	Oct-16	6.9	2560	148
12	Oct-16	0	0	0
13	Oct-16	7.06	4240	18
JRD1	Oct-16	NS	NS	NS
JRD2	Oct-16	6.98	2550	28
6	Nov-16	6.8	2550	160.0
12	Nov-16	0	0	0
13	Nov-16	7.06	4240	18
JRD1	Nov-16	NS	NS	NS
JRD2	Nov-16	6.91	1015	42
6	Dec-16	6.57	2502	47
12	Dec-16	0	0	0
13	Dec-16	6.98	4520	30
JRD1	Dec-16	NS	NS	NS
JRD2	Dec-16	6.96	2515	30

Groundwater Quality Monitoring Results – 2017

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Jan-17	6.93	2469	152
13	Jan-17	NS	NS	NS
JRD2	Jan-17	7.05	2522	32
6	Feb-17	6.68	2163	89
13	Feb-17	NS	NS	NS
JRD2	Feb-17	6.81	2202	44
6	Mar-17	6.62	2470	100
13	Mar-17	NS	NS	NS
JRD2	Mar-17	5.99	304	252
6	Apr-17	6.6	2219	104
13	Apr-17	NS	NS	NS
JRD2	Apr-17	6.26	506	33
6	May-17	6.69	2350	98
13	May-17	NS	NS	NS
JRD2	May-17	7.26	583	32
6	Jun-17	6.54	1720	30
13	Jun-17	NS	NS	NS
JRD2	Jun-17	5.8	330	152.0

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Jul-17	6.5	2230	92.0
13	Jul-17	NS	NS	NS
JRD2	Jul-17	6.9	1661	62.0
6	Aug-17	6.75	2130	611
13	Aug-17	NS	NS	NS
JRD2	Aug-17	7.1	1533	28.0
6	Sep-17	6.63	2250	183
13	Sep-17	NS	NS	NS
JRD2	Sep-17	6.85	2410	11
6	Oct-17	6.51	2340	55
13	Oct-17	NS	NS	NS
JRD2	Oct-17	6.98	2480	27
6	Nov-17	5.4	363	658.0
13	Nov-17	NS	NS	NS
JRD2	Nov-17	6.6	425	146
6	Dec-17	5.93	1875	378
13	Dec-17	NS	NS	NS
JRD2	Dec-17	6.41	1330	28

Groundwater Quality Monitoring Results – 2018

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Jan-18	NS	NS	NS
13	Jan-18	NS	NS	NS
JRD2	Jan-18	7.11	1432	51
6	Feb-18	5.87	203	190
13	Feb-18	NS	NS	NS
JRD2	Feb-18	6.81	1373	98
6	Mar-18	5.98	171	27
13	Mar-18	NS	NS	NS
JRD2	Mar-18	6.91	1100	12
6	Apr-18	6.59	2220	114
13	Apr-18	NS	NS	NS
JRD2	Apr-18	6.79	2230	5
6	May-18	6.8	2180	108
13	May-18	NS	NS	NS
JRD2	May-18	7.02	2060	60
6	Jun-18	6.67	2400	38
13	Jun-18	NS	NS	NS
JRD2	Jun-18	7.0	2350	18.0

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Jul-18	6.7	2310	34.0
13	Jul-18	NS	NS	NS
JRD2	Jul-18	6.7	1252	29.0
6	Aug-18	6.26	2036	161
13	Aug-18	NS	NS	NS
JRD2	Aug-18	6.4	1770	44.0
6	Sep-18	6.64	2280	37
13	Sep-18	NS	NS	NS
JRD2	Sep-18	7.24	1182	78
6	Oct-18	6.63	2240	72
13	Oct-18	NS	NS	NS
JRD2	Oct-18	6.86	1198	81
6	Nov-18	6.8	2360	27.0
13	Nov-18	NS	NS	NS
JRD2	Nov-18	6.97	961	52
6	Dec-18	6.26	1177	616
13	Dec-18	NS	NS	NS
JRD2	Dec-18	5.88	178	158

Groundwater Quality Monitoring Results – 2019

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Jan-19	6.59	2420	77
13	Jan-19	NS	NS	NS
JRD2	Jan-19	6.27	146	68
6	Feb-19	6.82	2310	60
13	Feb-19	NS	NS	NS
JRD2	Feb-19	6.66	1103	119
6	Mar-19	6.65	2170	134
13	Mar-19	NS	NS	NS
JRD2	Mar-19	6.87	2290	98
6	Apr-19	6.7	2340	74
13	Apr-19	NS	NS	NS
JRD2	Apr-19	7.19	2550	34
6	May-19	6.84	2360	55
13	May-19	NS	NS	NS
JRD2	May-19	7.03	2460	5
6	Jun-19	6.7	1960	28
13	Jun-19	NS	NS	NS
JRD2	Jun-19	7.1	2410	27.0

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Jul-19	6.8	1997	90.0
13	Jul-19	NS	NS	NS
JRD2	Jul-19	7.1	2540	6.0
6	Aug-19	6.88	2350	26
13	Aug-19	NS	NS	NS
JRD2	Aug-19	7.1	2500	28.0
6	Sep-19	6.66	2080	26
13	Sep-19	NS	NS	NS
JRD2	Sep-19	6.68	2100	136
6	Oct-19	6.89	2404	23
13	Oct-19	NS	NS	NS
JRD2	Oct-19	7.16	2548	24
6	Nov-19	7.0	2370	28.0
13	Nov-19	NS	NS	NS
JRD2	Nov-19	7.28	2490	13
6	Dec-19	6.93	2410	18
13	Dec-19	NS	NS	NS
JRD2	Dec-19	7.22	2470	5

Groundwater Quality Monitoring Results – 2020

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Jan-20	6.76	2210	42
13	Jan-20	NS	NS	NS
JRD2	Jan-20	7.01	2310	23
6	Feb-20	NS	NS	NS
13	Feb-20	NS	NS	NS
JRD2	Feb-20	6.28	620	70
6	Mar-20	6.76	2615	443
13	Mar-20	NS	NS	NS
JRD2	Mar-20	6.3	720	83
6	Apr-20	6.92	2710	46
13	Apr-20	NS	NS	NS
JRD2	Apr-20	7.35	2188	49
6	May-20	6.88	2689	70
13	May-20	NS	NS	NS
JRD2	May-20	7.13	2557	64
6	Jun-20	5.89	188	75
13	Jun-20	NS	NS	NS
JRD2	Jun-20	7.2	1853	58.0

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Jul-20	6.0	275	168.0
13	Jul-20	NS	NS	NS
JRD2	Jul-20	7.1	2590	11.0
6	Aug-20	5.77	272	124
13	Aug-20	NS	NS	NS
JRD2	Aug-20	6.0	714	13.0
6	Sep-20	6.84	2065	627
13	Sep-20	NS	NS	NS
JRD2	Sep-20	7.17	1875	51
6	Oct-20	6.64	2391	181
13	Oct-20	NS	NS	NS
JRD2	Oct-20	7.13	2551	58
6	Nov-20	5.9	120	127.0
13	Nov-20	NS	NS	NS
JRD2	Nov-20	6.26	924	280
6	Dec-20	6.58	2116	526
13	Dec-20	NS	NS	NS
JRD2	Dec-20	6.26	869	194

Groundwater Quality Monitoring Results – 2021

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Jan-21	6.76	1825	164
13	Jan-21	7.2	1791	71
JRD2	Jan-21	NS	NS	NS
6	Feb-21	6.13	139	126
13	Feb-21	6.91	2211	35
JRD2	Feb-21	NS	NS	NS
6	Mar-21	6.03	602	203
13	Mar-21	5.23	491	88
JRD2	Mar-21	NS	NS	NS
6	Apr-21	6.71	2484	20
13	Apr-21	6.57	1921	54
JRD2	Apr-21	NS	NS	NS
6	May-21	6.7	2166	81
13	May-21	6.77	2067	50
JRD2	May-21	NS	NS	NS
6	Jun-21	6.65	2103	55
13	Jun-21	7.09	2523	186
JRD2	Jun-21	NS	NS	NS

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Jul-21	6.6	2267	70
13	Jul-21	6.89	2409	51
JRD2	Jul-21	NS	NS	NS
6	Aug-21	6.61	2308	44
13	Aug-21	NS	NS	NS
JRD2	Aug-21	NS	NS	NS
6	Sep-21	6.57	2488	214
13	Sep-21	7.02	2546	367
JRD2	Sep-21	NS	NS	NS
6	Oct-21	6.81	2341	105
13	Oct-21	7	2182	8
JRD2	Oct-21	NS	NS	NS
6	Nov-21	7.3	2602	447.0
13	Nov-21	7	2182	8
JRD2	Nov-21	NS	NS	NS
6	Dec-21	6.8	1921	72
13	Dec-21	6.02	614	295
JRD2	Dec-21	NS	NS	NS

Groundwater Quality Monitoring Results – 2022

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Jan-22	6.59	2122	71
13	Jan-22	6.09	1033	88
JRD2	Jan-22	0	0	0
6	Feb-22	6.56	2194	66
13	Feb-22	6.71	1917	59
JRD2	Feb-22	0	0	0
6	Mar-22	6.65	2067	46
13	Mar-22	5.92	608	68
JRD2	Mar-22	0	0	0
6	Apr-22	6.57	2035	139
13	Apr-22	5.92	560	126
JRD2	Apr-22	0	0	0
6	May-22	6.63	1452	387
13	May-22	6.06	397.2	138
JRD2	May-22	0	0	0
6	Jun-22	6.71	1838	192
13	Jun-22	5.85	432.1	52
JRD2	Jun-22	0.0	0	0.0

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Jul-22	6.7	1614	101.0
13	Jul-22	5.85	312.8	166
JRD2	Jul-22	0.0	0	0.0
6	Aug-22	6.68	2197	50
13	Aug-22	6.17	499	72
JRD2	Aug-22	0.0	0	0.0
6	Sep-22	6.51	1820	71
13	Sep-22	5.76	362	15
JRD2	Sep-22	0	0	0
6	Oct-22	6.68	2170	34
13	Oct-22	6.08	366	30
JRD2	Oct-22	0	0	0
6	Nov-22	6.6	1960	21.0
13	Nov-22	6.08	366	30
JRD2	Nov-22	0	0	0
6	Dec-22	6.67	2126	35
13	Dec-22	6.42	476	35
JRD2	Dec-22	0	0	0

Groundwater Quality Monitoring Results – 2023

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Jan-23	6.71	2180	29
13	Jan-23	0	0	0
JRD2	Jan-23	7.11	2248	48
6	Feb-23	6.73	1969	38
13	Feb-23	0	0	0
JRD2	Feb-23	6.82	2080	127
6	Mar-23	6.76	282	310
13	Mar-23	0	0	0
JRD2	Mar-23	6.98	2108	39
6	Apr-23	6.84	2110	89
13	Apr-23	0	0	0
JRD2	Apr-23	7.2	2326	32
6	May-23	6.59	2101	106
13	May-23	0	0	0
JRD2	May-23	0	0	0
6	Jun-23	6.57	2012	61
13	Jun-23	0	0	0
JRD2	Jun-23	7.0	2305	80.0

Sample Site	Date	pH	EC (uS/cm)	TSS (mg/L)
6	Jul-23	6.8	2217	36.0
13	Jul-23	0	0	0
JRD2	Jul-23	7.0	2458	72.0
6	Aug-23	6.74	2303	18
13	Aug-23	0	0	0
JRD2	Aug-23	7.0	2392	27.0
6	Sep-23	6.73	2320	56
13	Sep-23	0	0	0
JRD2	Sep-23	6.94	2298	19
6	Oct-23	6.8	2302	32
13	Oct-23	0	0	0
JRD2	Oct-23	6.93	2222	21
6	Nov-23	6.7	1819	35.0
13	Nov-23	0	0	0
JRD2	Nov-23	6.93	2222	21
6	Dec-23	6.82	2307	61
13	Dec-23	0	0	0
JRD2	Dec-23	7.05	2184	34

Appendix 3

Abel Mine Subsidence Management Plan End of Year Report 2023

(No. of pages including blank pages = 23)



DONALDSONCOAL

Part of the Yancoal Australia Group

**Abel Mine
Subsidence Management Plan
End of Year Report 2023**

31 March 2024

Approved by

William Farnworth
Operations Manager
Donaldson Coal

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ATTACHMENTS

Attachment 1 – Plan of Abel Mine Workings

1 INTRODUCTION

This Subsidence Management Plan End of Year Report fulfils the requirements of Condition 19 of the Abel Subsidence Management Plan (SMP) Approval Conditions for Area 1 and Condition 18 of the Approval Conditions for Area 2, 3 and 4.

A summary of monitoring results for the period January to December 2023 is presented in this report. Mining activities were suspended on 28th April 2016 due to the Mine being placed on Care and Maintenance. Therefore, no pillar extraction was undertaken during this reporting period.

Subsidence surveys, photographic monitoring and visual inspections were conducted over all pillar extraction areas in accordance with the approved Subsidence Monitoring Programs, with environmental monitoring conducted in accordance with the approved Environmental Management Plan.

2 PURPOSE AND SCOPE

The purpose of this document is to comply with the relevant approval condition which states:

“The Leaseholder shall prepare an end of year report. This report shall be submitted to the Director Environmental Sustainability, within the first three months of the subsequent year. The end of year report must:

- (a) include a summary of the subsidence and environmental results for the year;*
- (b) include an analysis of these monitoring results against the relevant;*
 - impact assessment criteria;*
 - monitoring results from previous years; and*
 - predictions in the SMP.*
- (c) identify any trends in the monitoring results over the life of the activity; and*
- (d) describe what actions were taken to ensure adequate management of any potential subsidence impacts due to mining.”*

3 SMP PILLAR EXTRACTION DURING REPORTING PERIOD

Area 1

SMP Approval was granted for Abel Area 1 (Panels 1 to 14 inclusive plus East Mains) on 27 May 2010. Pillar extraction has continued in East Mains during 2014. A Variation application for SMP Area 1 was submitted on the 8 August 2011 and was approved on the 29 September 2011. This variation was related to Panels 9 – 13 being removed from the SMP approved area. No extraction took place in this area during this period.

Area 2

SMP Approval was granted for Abel Area 2 (Panels 14 – 26) on 7 December 2011. A variation was submitted on 19 December 2011 relating to the removal of Panel 14 and the shortening of Panels 15 – 19. The second variation submitted, relating to partial pillar extraction Panel 20 – 22, was approved on the 3 September 2012. A third variation submitted, relating to Panels 19 & 19A, was approved on the 21 December 2012. A fourth variation submitted relating to Panel 22, was approved on the 16 April 2013. No extraction took place in this area during this period.

Area 3

SMP Approval was granted for Abel Area 3 (Panels 23 – 26 and part East Install Headings) on 16 July 2013. A variation was submitted to increase the width to part of Panel 24 and was approved on the 23 December 2013. No extraction took place in this area during this period.

Area 4

SMP/EP Approval was granted for Abel Area 4 (Panels 27 – 35) on the 19th September 2014. A variation was submitted to remove the Subsidence Control Zones around the protected farm dams and was approved on the 11th November 2014. The second variation submitted, relating to Panel 28 panel layout, was approved on 1 April 2015. The third variation submitted, relating to modifying the layout of Panels 29, 31, 33 and 35 which is now to be extracted in the Lower Donaldson Seam, was approved on 13 August 2015. The fourth variation submitted, relating to the removal of the Subsidence Control Zones beneath a principal residence. No extraction took place in this area during this period.

Table 1 below provides approval, plus mining commencement and completion dates for the Panels extracted since approval was granted.

Table 1 – Approval and Extraction Dates

Panel	Approval Date	Extraction Commenced	Extraction Completed
Panel 1	27 May 2010	12 July 2010	22 December 2010
Panel 2	27 May 2010	17 September 2010	12 November 2010
Panel 3	27 May 2010	7 January 2011	19 April 2011
Panel 4	27 May 2010	14 March 2011	20 July 2011
Panel 5	27 May 2010	30 May 2011	24 September 2011
Panel 6	27 May 2010	22 September 2011	2 February 2012
Panel 7	27 May 2010	19 November 2011	31 May 2012
Panel 8	7 December 2011	31 March 2012	17 July 2012
Panel 15	7 December 2011	20 February 2012	26 March 2012
Panel 20	3 September 2012	12 September 2012	3 December 2012
Panel 21	3 September 2012	8 November 2012	18 April 2013
East Mains	27 May 2010	18 July 2012	5 July 2014
East Install Headings	7 December 2011	4 December 2012	17 September 2014
Tailgate Headings	7 December 2011	5 June 2012	10 September 2012
Panel 19A	21 December 2012	20 January 2013	25 May 2013
Panel 19	21 December 2012	25 May 2013	7 August 2013
Panel 22	16 April 2013	19 April 2013	19 July 2013
Panel 23	16 July 2013	22 July 2013	10 March 2014
Panel 24	16 July 2013	16 September 2013	10 July 2014
Panel 25	16 July 2013	11 May 2014	8 May 2015
Panel 26	16 July 2013	11 August 2014	17 June 2015
Panel 27	19 September 2014	30 September 2014	12 August 2015
Panel 28	19 September 2014	11 May 2015	3 February 2016

Panel 30	19 September 2014	22 June 2015	28 April 2016
Panel 31	19 September 2014	25 February 2016	28 April 2016

4 SUBSIDENCE AND ENVIRONMENTAL PROGRAMS AND MANAGEMENT PLANS

Subsidence Monitoring Programs consisting of a combination of subsidence surveys, visual inspections and photographic monitoring, have been developed in consultation with and approved by the Principal Subsidence Engineer, DPE for all Panels extracted to date. All required subsidence monitoring lines have been installed and subsidence surveys completed in accordance with the agreed Subsidence Monitoring Programs.

Management Plans have been prepared for the following infrastructure outlined in **Table 2** and have been approved by the Director of Mine Safety Operations.

Table 2 – Approved Management Plans

Infrastructure Owners	Management Plans	Approved
Ausgrid	Ausgrid Powerline Management Plan SMP Area 2 – Tailgate Headings	21 June 2012
	Ausgrid Powerline Management Plan SMP Area 2 - Panels 20 - 22	2 November 2012
	Ausgrid Powerline Management Plan SMP Area 1 – East Mains	12 July 2013
	Ausgrid Powerline Management Plan SMP Area 3	17 July 2013
	Ausgrid Powerline Management Plan EP / SMP Area 4	1 October 2014
Telstra	Telstra Corporation Management Plan SMP Area 2 (Panels 21 & 22)	21 December 2012
	Telstra Corporation Management Plan SMP Area 3 (Panels 23 & 24)	17 July 2013
	Telstra Corporation Management Plan SMP Area 3 Optic Fibre (Panels 23 & 24)	6 December 2013
	Telstra Corporation Management Plan SMP Area 3	11 April 2014

Infrastructure Owners	Management Plans	Approved
	(Panels 25)	
	Telstra Corporation Management Plan SMP Area 3 (Panels 26)	3 September 2014
Telstra	Telstra Corporation Management Plan EP / SMP Area 4 (Panels 27, 28, 29)	1 October 2014
TransGrid	TransGrid Towers Management Plan SMP Area 1	22 March 2012
	TransGrid Towers Management Plan SMP Area 2	16 January 2013
Cessnock City Council	Blackhill Road and Taylors Road Management Plan SMP Area 2	7 December 2012
	Blackhill Road Management Plan SMP Area 3	11 September 2013
	Public Roads Management Plan	23 December 2014
Hunter Water	Hunter Water Corporation Water Pipeline Management Plan SMP Area 2	21 June 2012
	Hunter Water Corporation Water Pipeline Management Plan SMP Area 1 – East Mains	12 December 2012

5 SUMMARY OF SUBSIDENCE IMPACTS

Minor remediation works took place on a private property over Panel 24 due to water run off from a high rainfall event washing out previously remediated surface cracking. No additional subsidence observations were made and no further occurrences of subsidence were noted by site staff.

No surveys for subsidence, tilt and strain were undertaken during the year.

5.1 Impacts on General Surface and Roads / Tracks

Surface cracking had occurred generally as predicted on the surface above Panels 28, 30 & 31 in the both the cleared and vegetated areas, private access tracks, and sealed private access road, and sealed local government roads whilst mining was being undertaken.

Remedial works were carried out in consultation and agreement with the landholders and infrastructure owners.

5.2 Impacts on Hunter Water Corporation Waterline

No further impacts observed. Impacts were within predictions and infrastructure remained in a safe and serviceable condition.

5.3 Impacts on Ausgrid Powerlines

No further impacts observed. Impacts were within predictions and infrastructure remained in a safe and serviceable condition.

5.4 Impacts on TransGrid Transmission Towers

No further impacts observed. Impacts were within predictions and infrastructure remained in a safe and serviceable condition.

5.5 Impacts on Blackhill Road

No further impacts observed. Impacts were within predictions and infrastructure remained in a safe and serviceable condition.

5.6 Notification under SMP Approval Conditions

There have been no observed and/or reported subsidence impacts, incidents, service difficulties, community complaints, or any other relevant information, that would require notification under the approval conditions.

6 SUBSIDENCE SURVEY SUMMARY AND ANALYSIS

All required subsidence surveys have been completed and were completed shortly after mining effects ceased. A record of all completed subsidence surveys is shown in **Table 3**.

A summary of subsidence, strain and tilt results are detailed in **Table 4** with comparison to the SMP predictions.

All required subsidence monitoring lines have been installed and all pre-mining subsidence surveys completed in accordance with the agreed Subsidence Monitoring Programs.

Table 3 – Subsidence Monitoring Survey Dates

Survey / Monitoring Line	Survey / Monitoring Description	Pre – Mining Survey	Survey / Inspection / Monitoring Dates	Post – Mining
<i>Panel 1</i>	<i>Subsidence Survey</i>	Installation and pre-mining survey 7/07/2010	Weekly Surveys	11/02/2011 24/06/2011

Survey / Monitoring Line	Survey / Monitoring Description	Pre – Mining Survey	Survey / Inspection / Monitoring Dates	Post – Mining
				1/08/2012
Panel 2	<i>Subsidence Survey</i>			22/12/2010 21/06/2011 20/06/2012 9/10/2013
Panel 3	<i>Subsidence Survey</i>	23/12/2010	Weekly Surveys	10/06/2011 25/10/2011 9/05/2012
	<i>Visual inspection</i>		Weekly Surveys	
	<i>Photographic monitoring</i>	23/12/2010		
Panel 4	<i>Subsidence Survey</i>	4/03/2011	Weekly Surveys	24/08/2011 9/05/2011 3/09/2013
	<i>Visual inspection</i>		Weekly Surveys	
	<i>Photographic monitoring</i>	4/03/2011		
Panel 5	<i>Subsidence Survey</i>	27/05/2011		4/11/2011 2/05/2012 18/02/2013 14/09/2013
	<i>Visual inspection</i>		Weekly Surveys	
	<i>Photographic monitoring</i>	27/05/2011		
Panel 6	<i>Subsidence Survey</i>	14/09/2011		1/05/2012 4/09/2013
	<i>Visual inspection</i>		Weekly Surveys	

Survey / Monitoring Line	Survey / Monitoring Description	Pre – Mining Survey	Survey / Inspection / Monitoring Dates	Post – Mining
	<i>Photographic monitoring</i>	14/09/2011		
Panel 7	<i>Subsidence Survey</i>	8/02/2012		2/08/2012 28/05/2013 13/09/2013
	<i>Visual inspection</i>		Weekly Surveys	
	<i>Photographic monitoring</i>	8/02/2012		
Panel 8	<i>Subsidence Survey</i>	13/02/2012		31/10/2012 17/05/2013 6/09/2013
	<i>Visual inspection</i>		Weekly Surveys	
	<i>Photographic monitoring</i>	13/02/2012		
Panel 15	<i>Subsidence Survey</i>	9/02/2012		27/04/2012 14/01/2013 17/05/2013
	<i>Visual inspection</i>		Weekly Surveys	
	<i>Photographic monitoring</i>	9/02/2012		
Panel 20	<i>Subsidence Survey</i>	29/08/2012		10/01/2013 8/01/2014 9/07/2014
	<i>Visual inspection</i>		Weekly Surveys	
	<i>Photographic monitoring</i>	29/08/2012		
Panel 19	<i>Subsidence Survey</i>	1/05/2013		14/09/2013 9/07/2014

Survey / Monitoring Line	Survey / Monitoring Description	Pre – Mining Survey	Survey / Inspection / Monitoring Dates	Post – Mining
	<i>Visual inspection</i>		Weekly Surveys	
	<i>Photographic monitoring</i>	1/05/2013		
Panel 19A	<i>Subsidence Survey</i>	7/01/2013		4/06/2013 14/09/2013 5/11/2013 7/01/2014 7/07/2014
	<i>Visual inspection</i>		Weekly Surveys	
	<i>Photographic monitoring</i>	7/01/2013		
Panel 21	<i>Subsidence Survey</i>	7/11/2012		16/05/2013 24/01/2014 1/09/2014
	<i>Visual inspection</i>		Weekly Surveys	
	<i>Photographic monitoring</i>	7/11/2012		
Panel 22	<i>Subsidence Survey</i>	11/04/2013		30/07/2013 28/01/2014 19/02/2015
	<i>Visual inspection</i>		Weekly Surveys	
	<i>Photographic monitoring</i>	11/04/2013		
Panel 23	<i>Subsidence Survey</i>	12/07/2013		8/04/2014 3/03/2015 28/10/2015
	<i>Visual inspection</i>		Daily	

Survey / Monitoring Line	Survey / Monitoring Description	Pre – Mining Survey	Survey / Inspection / Monitoring Dates	Post – Mining
	<i>Photographic monitoring</i>	12/07/2013		
Panel 24	<i>Subsidence Survey</i>	19/02/2013		1/10/2014 3/03/2015 22/10/2015
	<i>Visual inspection</i>		Daily	
	<i>Photographic monitoring</i>	19/02/2013		
Panel 25	<i>Subsidence Survey</i>	13/03/2014		3/12/2015 22/09/2015
	<i>Visual inspection</i>		Daily	
	<i>Photographic monitoring</i>	13/03/2014		
Panel 26	<i>Subsidence Survey</i>	9/05/2014		6/08/2015 31/01/2017
	<i>Visual inspection</i>		Daily	
	<i>Photographic monitoring</i>	9/05/2014		
Panel 27	<i>Subsidence Survey</i>	16/10/2014		3/09/2015 31/01/2017
	<i>Visual inspection</i>		Daily	
	<i>Photographic monitoring</i>	22/09/2014		
Panel 28	<i>Subsidence Survey</i>	6/05/2014		20/12/2016 28/11/2017
	<i>Visual inspection</i>		3 times a week	
	<i>Photographic monitoring</i>	6/05/2014		

Survey / Monitoring Line	Survey / Monitoring Description	Pre – Mining Survey	Survey / Inspection / Monitoring Dates	Post – Mining
Panel 30	<i>Subsidence Survey</i>	<i>30/11/2015</i>		<i>20/12/2016</i>
	<i>Visual inspection</i>		<i>3 times a week</i>	
	<i>Photographic monitoring</i>	<i>30/11/2015</i>		
Panel 31	<i>Subsidence Survey</i>	<i>25/02/2016</i>		<i>5/12/2016</i>
	<i>Visual inspection</i>		<i>3 times a week</i>	
	<i>Photographic monitoring</i>	<i>25/02/2016</i>		
East Install Headings	<i>Subsidence Survey</i>	<i>14/11/2012</i>		<i>23/01/2013</i> <i>8/01/2014</i>
	<i>Visual inspection</i>		<i>Weekly Surveys</i>	
	<i>Photographic monitoring</i>	<i>14/11/2012</i>		
Tailgate Headings	<i>Subsidence Survey</i>	<i>18/05/2012</i>		<i>19/12/2012</i> <i>13/06/2013</i> <i>14/01/2014</i>
	<i>Visual inspection</i>		<i>Weekly Surveys</i>	
	<i>Photographic monitoring</i>	<i>18/05/2012</i>		
East Mains Headings	<i>Subsidence Survey</i>	<i>9/07/2012</i>		<i>14/01/2013</i> <i>30/05/2013</i>
	<i>Visual inspection</i>		<i>Weekly Surveys</i>	
	<i>Photographic monitoring</i>	<i>9/07/2012</i>		
Blackhill Road	<i>Subsidence Survey</i>	<i>19/02/2013</i>	<i>As detailed in Management Plan</i>	<i>Same date as Panel surveys</i>

Survey / Monitoring Line	Survey / Monitoring Description	Pre – Mining Survey	Survey / Inspection / Monitoring Dates	Post – Mining
	<i>Visual inspection</i>		<i>Daily Surveys</i>	
	<i>Photographic monitoring</i>	19/02/2013		
Hunter Water Corporation Pipeline	<i>Subsidence Survey</i>	7/07/2010 over P1 8/09/2010 over P2	Weekly Surveys	11/02/2011 & 24/06/2011 Over P1 22/12/2010 & 21/06/2011 Over P2
	<i>Visual inspection</i>		<i>As detailed in Management Plan</i>	
	<i>Photographic monitoring</i>			
Ausgrid Power Poles	<i>Subsidence Survey</i>	Same date as Panel surveys	Weekly Surveys	Same date as Panel surveys
	<i>Visual inspection</i>		Weekly Surveys	
	<i>Photographic monitoring</i>	Same date as Panel surveys		
TransGrid Transmission Towers	<i>Subsidence Survey</i>	28/03/2012	<i>As detailed in Management Plan</i>	Same date as Panel surveys
	<i>Visual inspection</i>		Daily Surveys	
	<i>Photographic monitoring</i>	28/03/2012		

Table 4 – Comparison of Subsidence Monitoring Results to SMP Predictions

PANEL 1 (W = 120 m; T = 2.35 - 3.0m)			
>75m Cover	Predicted	Final Measured	Comment
Subsidence	0.95 - 1.25m	0.72 - 1.228m	Measured subsidence < predictions
Tensile Strain	10 - 18 mm/m	4 - 12 mm/m (18 mm/m)	Measured tensile strains < predictions.
Compressive Strain	13 - 23 mm/m	5 - 14 mm/m	Measured compressive strains < predictions
Tilt	22 - 40 mm/m	22 - 46 mm/m	Measured tilts < predictions. One exceedance of 15%.
Other		Cracked Joint to Hunter Water Pipeline Repaired 11kv Power Line	All necessary repairs have been carried out.

PANEL 2 (W= 150m ; T = 2.5 m)			
< 75m Cover	Predicted	Final Measured	Comment
Subsidence	1.30 - 1.38m	0.977 - 1.041 m	Measured subsidence < predictions
Tensile Strain	18 - 31 mm/m	4 - 6 mm/m (5 mm/m)	Measured tensile strains < predictions
Compressive Strain	23 - 40 mm/m	4 - 7 mm/m	Measured compressive strains < predictions
Tilt	40 - 67 mm/m	22 - 32 mm/m	Measured tilts < predictions
Other			
>75m Cover	Predicted	Final Measured	Comment
Subsidence	1.20 - 1.32m	0.94 - 0.966m	Measured subsidence < predictions
Tensile Strain	13 - 20 mm/m	9 mm/m (15 mm/m)	Measured tensile strains < predictions
Compressive Strain	17 - 25 mm/m	6 mm/m	Measured compressive strains < predictions
Tilt	30 - 45 mm/m	27 mm/m	Measured tilts < predictions
Other			

PANEL 3 (W=160.5 m; T = 2.5 m)			
< 75m Cover	Predicted	Final Measured	Comment
Subsidence	1.33 - 1.34 m	1.003 m	Measured subsidence < predictions
Tensile Strain	19 - 31 mm/m	8 - 9 mm/m (26 mm/m)	Measured tensile strains < predictions
Compressive Strain	24 - 40 mm/m	5 - 7 mm/m	Measured compressive strains < predictions
Tilt	42 - 67 mm/m	28 - 39 mm/m	Measured tilts < predictions
Other			
>75m Cover	Predicted	Final Measured	Comment
Subsidence	1.26 - 1.27 m	0.884 - 0.982 m	Measured subsidence < predictions
Tensile Strain	14 - 21mm/m	8 mm/m (10 mm/m)	Measured tensile strains < predictions
Compressive Strain	18 - 27 mm/m	4 mm/m	Measured compressive strains < predictions
Tilt	33 - 49 mm/m	30 mm/m	Measured tilts < predictions
Other			

PANEL 4 (W= 160.5 m; T = 2.5 m)			
< 75m Cover	Predicted	Final Measured	Comment
Subsidence	1.27-1.29m	1.065m	Measured subsidence < predictions
Tensile Strain	19 - 31 mm/m	6 - 10 mm/m (37.5 mm/m)	Measured tensile strains < predictions with 1 exceedance of 20% at clay cap.
Compressive Strain	24 - 40 mm/m	6 - 18 mm/m	Measured compressive strains < predictions
Tilt	42 - 67 mm/m	36 - 60 mm/m	Measured tilts < predictions
Other			
>75m Cover	Predicted	Final Measured	Comment
Subsidence	1.29 - 1.32m	1.054 m	Measured subsidence < predictions
Tensile Strain	14 - 21mm/m	5 mm/m	Measured tensile strains < predictions
Compressive Strain	18 - 27 mm/m	5 mm/m	Measured compressive strains < predictions
Tilt	42 - 67 mm/m	25 - 36 mm/m	Measured tilts < predictions
Other			

PANEL 5 (W= 160.5 m; T = 2.5 m)			
< 75m Cover	Predicted	Final Measured	Comment
Subsidence	1.27-1.43	1.154m	Measured subsidence < predictions
Tensile Strain	14 - 15 mm/m	10 mm/m	Measured tensile strains < predictions
Compressive Strain	15 - 19 mm/m	4 mm/m	Measured compressive strains < predictions
Tilt	41 - 46 mm/m	68 mm/m	Measured tilts < predictions with 1 minor exceedance
Other			
>75m Cover	Predicted	Final Measured	Comment
Subsidence	1.42 - 1.43m	1.002 m	Measured subsidence < predictions
Tensile Strain	11 - 15 mm/m	2 mm/m	Measured tensile strains < predictions
Compressive Strain	15 - 18 mm/m	13 mm/m	Measured compressive strains < predictions
Tilt	38 - 46 mm/m	29.8 mm/m	Measured tilts < predictions
Other			

PANEL 6 (W= 160.5 m; T = 2.5 m)			
< 75m Cover	Predicted	Final Measured	Comment
Subsidence	1.21 - 1.32m	1.215m	Measured subsidence < predictions
Tensile Strain	14 mm/m	8 mm/m	Measured tensile strains < predictions
Compressive Strain	17 - 18 mm/m	21 mm/m	Measured compressive strains < predictions with 1 minor exceedance
Tilt	39 - 41 mm/m	89.6 mm/m	Measured tilts < predictions with 1 minor exceedance
Other			
>75m Cover	Predicted	Final Measured	Comment
Subsidence	1.32 - 1.42m	1.066 m	Measured subsidence < predictions
Tensile Strain	11 - 14mm/m	9 mm/m	Measured tensile strains < predictions
Compressive Strain	14 - 17 mm/m	7 mm/m	Measured compressive strains < predictions
Tilt	38 - 41 mm/m	30 mm/m	Measured tilts < predictions
Other			

PANEL 7 (W= 160.5 m; T = 2.5 m)			
< 75m Cover	Predicted	Final Measured	Comment
Subsidence	1.27 - 1.32m	0.771m	Measured subsidence < predictions
Tensile Strain	11 - 14 mm/m	5 mm/m	Measured tensile strains < predictions
Compressive Strain	14 - 18 mm/m	2 mm/m	Measured compressive strains < predictions
Tilt	41 mm/m	12 mm/m	Measured tilts < predictions
Other			
>75m Cover	Predicted	Final Measured	Comment
Subsidence	1.32 - 1.43m	1.336 m	Measured subsidence < predictions

Tensile Strain	11 - 15mm/m	23 mm/m	Measured tensile strains < predictions with 1 minor exceedance
Compressive Strain	14 - 18 mm/m	36 mm/m	Measured compressive strains < predictions with 1 minor exceedance
Tilt	41 mm/m	42.5 mm/m	Measured tilts < predictions with 1 minor exceedance
Other			

PANEL 8 (W= 160.5 m; T = 2.5 m)			
< 75m Cover	Predicted	Final Measured	Comment
Subsidence	< 1.32m	0.830m	Measured subsidence < predictions
Tensile Strain	14 - 15 mm/m	2 mm/m	Measured tensile strains < predictions
Compressive Strain	17 - 19 mm/m	3 mm/m	Measured compressive strains < predictions
Tilt	42 mm/m	11.4 mm/m	Measured tilts < predictions
Other			
>75m Cover	Predicted	Final Measured	Comment
Subsidence	1.25 - 1.32m	0.845 m	Measured subsidence < predictions
Tensile Strain	10 - 14mm/m	11 mm/m	Measured tensile strains < predictions with 1 minor exceedance
Compressive Strain	13 - 17 mm/m	6 mm/m	Measured compressive strains < predictions with 1 minor exceedance
Tilt	41 mm/m	33.8 mm/m	Measured tilts < predictions
Other			

PANEL 15 (W= 160.5 m; T = 2.5 m)			
>75m Cover	Predicted	Final Measured	Comment
Subsidence	1.17 - 1.23m	1.164m	Measured subsidence < predictions
Tensile Strain	7 - 12mm/m	15 mm/m	Measured tensile strains < predictions
Compressive Strain	9 - 15 mm/m	13 mm/m	Measured compressive strains < predictions
Tilt	19 - 32 mm/m	49 mm/m	Measured tilts < predictions with 2 minor exceedance
Other			

PANEL 20 (W= 128 m; T = 2.7 m)			
>75m Cover	Predicted	Final Measured	Comment
Subsidence	150 mm	62 mm	Measured subsidence < predictions
Tensile Strain	2 mm/m	1 mm/m	Measured tensile strains < predictions
Compressive Strain	2 mm/m	2 mm/m	Measured compressive strains < predictions
Tilt	3 mm/m	2.5 mm/m	Measured tilts < predictions
Other			

PANEL 21 (W= 212 m; T = 2.7 m)			
125m Cover	Predicted	Final Measured	Comment
Subsidence	150 mm	96 mm	Measured subsidence < predictions
Tensile Strain	2 mm/m	1 mm/m	Measured tensile strains < predictions
Compressive Strain	2 mm/m	1 mm/m	Measured compressive strains < predictions
Tilt	3 mm/m	2.1 mm/m	Measured tilts < predictions
Other			

TAILGATE HEADINGS (W= 80.5 m; T = 2.8 m)			
<110mCover	Predicted	Final Measured	Comment
Subsidence	0.88 – 0.99m	0.250m	Measured subsidence < predictions
Tensile Strain	8 - 9mm/m	2 mm/m	Measured tensile strains < predictions
Compressive Strain	8 - 9 mm/m	2 mm/m	Measured compressive strains < predictions
Tilt	18 - 33 mm/m	7 mm/m	Measured tilts < predictions
Other			

EAST INSTALL HEADINGS (W= 105m; T = 2.7 m)			
100m Cover	Predicted	Final Measured	Comment
Subsidence	0.9m	1.286m	Measured subsidence > predictions
Tensile Strain	13 – 19 mm/m	12 mm/m	Measured tensile strains < predictions
Compressive Strain	16 - 24 mm/m	9 mm/m	Measured compressive strains < predictions
Tilt	24 - 35 mm/m	44 mm/m	Measured tilts > predictions
Other			

EAST MAINS HEADINGS (W= 125m; T = 2.7 m)			
100m Cover	Predicted	Final Measured	Comment
Subsidence	1.59m	1.408m	Measured subsidence < predictions
Tensile Strain	10 - 16 mm/m	11 mm/m	Measured tensile strains < predictions
Compressive Strain	13 - 20 mm/m	15 mm/m	Measured compressive strains < predictions
Tilt	49 mm/m	48.6 mm/m	Measured tilts < predictions
Other			

Panel 19A (W= 227.9m; T = 2.6 m)			
100m Cover	Predicted	Final Measured	Comment
Subsidence	1.42m	1.261m	Measured subsidence < predictions
Tensile Strain	8 - 14 mm/m	3 - 12 mm/m	Measured tensile strains < predictions
Compressive Strain	11 - 18 mm/m	4 - 13 mm/m	Measured compressive strains < predictions
Tilt	40 mm/m	29 - 48 mm/m	Measured tilts < predictions with only a minor exceedance
Other			

PANEL 22 (W= 180.3 m; T = 2.8 m)			
125m Cover	Predicted	Final Measured	Comment
Subsidence	150 mm	44 mm	Measured subsidence < predictions
Tensile Strain	2 mm/m	1 mm/m	Measured tensile strains < predictions
Compressive Strain	2 mm/m	1 mm/m	Measured compressive strains < predictions
Other			

PANEL 23 (W= 215 m; T = 2.5 m)			
<130m Cover	Predicted	Final Measured	Comment
Subsidence	1.30m	0.983m	Measured subsidence < predictions
Tensile Strain	30 mm/m	13 mm/m	Measured tensile strains < predictions
Compressive Strain	30 mm/m	13 mm/m	Measured compressive strains < predictions
Other			

PANEL 24 (W= 220 m; T = 2.5 m)			
<130m Cover	Predicted	Final Measured	Comment
Subsidence	1.30m	1.061m	Measured subsidence < predictions
Tensile Strain	30 mm/m	7 mm/m	Measured tensile strains < predictions
Compressive Strain	30 mm/m	9 mm/m	Measured compressive strains < predictions
Other			

PANEL 25 (W= 220 m; T = 2.5 m)			
<130m Cover	Predicted	Final Measured	Comment
Subsidence	1.30m	1.087m	Measured subsidence < predictions
Tensile Strain	30 mm/m	21 mm/m	Measured tensile strains < predictions
Compressive Strain	30 mm/m	9 mm/m	Measured compressive strains < predictions
Other			

PANEL 26 (W= 220 m; T = 2.5 m)			
<130m Cover	Predicted	Final Measured	Comment
Subsidence	1.30m	1.130m	Measured subsidence < predictions
Tensile Strain	30 mm/m	9 mm/m	Measured tensile strains < predictions
Compressive Strain	30 mm/m	13 mm/m	Measured compressive strains < predictions
Other			

PANEL 27 (W= 190 m; T = 2.5 m)			
<170m Cover	Predicted	Final Measured	Comment
Subsidence	1.40m	1.005m	Measured subsidence < predictions
Tensile Strain	30 mm/m	2 mm/m	Measured tensile strains < predictions
Compressive Strain	30 mm/m	8 mm/m	Measured compressive strains < predictions
Other			

PANEL 28 (W= 190 m; T = 2.5 m)			
<190m Cover	Predicted	Final Measured	Comment
Subsidence	1.40m	1.319m	Measured subsidence < predictions
Tensile Strain	30 mm/m	1 mm/m	Measured tensile strains < predictions
Compressive Strain	30 mm/m	10 mm/m	Measured compressive strains < predictions
Other			

PANEL 30 (W= 190 m; T = 2.5 m)			
<200m Cover	Predicted	Final Measured	Comment
Subsidence	1.40m	1.131m	Measured subsidence < predictions
Tensile Strain	30 mm/m	11 mm/m	Measured tensile strains < predictions
Compressive Strain	30 mm/m	11 mm/m	Measured compressive strains < predictions
Other			

PANEL 31 (W= 170 m; T = 2.5 m)			
<200m Cover	Predicted	Final Measured	Comment
Subsidence	1.40m	0.307 m	Measured subsidence < predictions
Tensile Strain	30 mm/m	6 mm/m	Measured tensile strains < predictions
Compressive Strain	30 mm/m	7 mm/m	Measured compressive strains < predictions
Other			

7 PHOTOGRAPHIC MONITORING AND VISUAL INSPECTION SUMMARY AND ANALYSIS

Dates of photographic monitoring and visual inspections are shown in **Table 3**. No impacts or changes have been noted in either photographic monitoring or visual inspections and these results have been detailed in the Subsidence Management Status Report submitted in September 2018.

No evidence of impacts has been observed or noted during these inspections and monitoring.

Comparison of pre and post mining photographic monitoring did not reveal any evidence of impact.

8 ENVIRONMENTAL MONITORING SUMMARY AND ANALYSIS

Water

Monthly monitoring of regional groundwater levels and quality was undertaken throughout the year in accordance with the Site Water Management Plan.

A summary of groundwater and surface water quality is provided in **Tables 5** and **6**.

Table 5 – Summary of Groundwater Quality Monitoring Results 1 January to 31 December 2023.

Sampling Site	pH	EC ($\mu\text{S/cm}$)	TSS (mg/L)
6	6.57 – 6.84 (6.73)	283 – 2320 (1,994)	18– 310 (73)
13	No Access to site	No Access to site	No Access to site
JRD2	6.82 – 7.20 (7.00)	2080 – 2458 (2254)	<5 – 127 (50)

Table 6 – Summary of Surface Water Quality Monitoring Results 1 January to 31 December 2023

Sampling Site	pH	EC ($\mu\text{S/cm}$)	Turbidity (NTU)	TSS (mg/L)
1	6.48 - 7.62 (7.17)	541 - 1769 (845)	16.4 – 164 (38.1)	6 – 84 (19)
8	6.33 – 7.54 (7.05)	468 – 669 (544)	6.5 – 50.9 (21.2)	<5 – 40 (11.8)
10	6.97 – 7.73 (7.30)	392 – 1,549 (1076)	5.6 – 49 (17.0)	<5 – 30 (10.5)
11	6.78 – 7.92 (7.34)	160 – 1885 (416)	5.3 – 203 (62.2)	8 - 111 (33.9)
FMCU	6.78 – 8.02 (7.22)	161 – 496 (236)	57.9 – 86.7 (68.7)	<5 – 209 (35.1)
FMCD	7.57 – 8.35 (7.99)	144 – 256 (192)	2.5 – 8.5 (5.0)	<5 – 32 (9.8)

Surface Water

The pH values at all sites were slightly acidic to slightly alkaline. All results were within the upper and lower water quality trigger values for Lowland Rivers in NSW outlined in the Guidelines for Fresh and Marine Water Quality (ANZECC 2000). Previously there have been short term declines in pH following significant rainfall events such as in November 2013 (261.8mm rainfall), April 2015 (412mm rainfall), January 2016 (430.8mm) and March 2021 (234.8mm). This also occurred in March 2022 (271.4mm) and July 2022 (310.8mm). Overall, during the reporting period there were no significant differences in pH between the upstream and downstream sites.

The electrical conductivity (EC) results range between 144 μ S/cm and 1885 μ S/cm for all sites. There were no occasions where electrical conductivity was recorded outside of water quality trigger values for Lowland Rivers in NSW (125 to 2,200 μ S/cm) (ANZECC 2000).

The average EC values upstream are typically similar or slightly higher than the corresponding downstream values. No other long-term trends in EC are apparent.

Turbidity levels at four of the six sites exceeded the water quality trigger values for Lowland Rivers in NSW (6 to 50 NTU) outlined in the Guidelines for Fresh and Marine Water Quality (ANZECC 2000). Total suspended solids (TSS) exceeded the industry standard for TSS criteria (50mg/L) at Sites 1 and FMCU on one occasion and Site 11 on 3 occasions. Sites 1, FMCU and 11 are upstream of mine and it is not considered that the mine activities contributed to these levels but rather localised conditions.

No long-term trends are apparent within the monitoring data with widely varying results with spikes in turbidity and TSS not necessarily correlated with monthly rainfall. Baseline monitoring results for both upstream and downstream sites have previously recorded significantly elevated TSS which are considered to form part of the natural variation.

Groundwater Levels

Piezometers located within and to the south of the Abel mine area are behaving predictably, with drawdown in the Donaldson Seams and by a lesser amount in most overburden piezometers responding as expected to mining activities. Piezometers to the west of the Abel mine area appear to be influenced by mining activity at Bloomfield Colliery.

Monitoring confirms that there is no evidence of any drawdown response in the alluvium or regolith groundwater. In particular, Piezometers 81A and 81B are located adjacent the Pambalong Nature Reserve. Historical monitoring results from 81A (single vibrating wire transducer placed within the Lower Donaldson Seam) showed a drawdown response to mining the Donaldson Seam within the Abel Mine. However, Piezometer 81B is screened within overlying shallow Permian strata with water levels remaining stable throughout mining. The lack of response in the shallow piezometer indicates there has been no mining impact on the Pambalong Nature Reserve.

Piezometers 63A and B are located to the east of the Abel Mine adjacent to the F3 Freeway and near the Hexham Swamp. However, it appears that the shallow Piezometer 63B has failed or the bore has collapsed. Notwithstanding this, review of the responses from other shallow alluvium and regolith bores is still consistent with there being no impact on the Hexham Swamp.

During the period access to Site 13 was restricted with no access granted by the property owner.

10 MANAGEMENT ACTIONS

Actions taken to ensure adequate management of any potential subsidence impacts due to mining include:

- Various monitoring programs, subsidence surveys, visual inspections, photographic monitoring to detect any impact;
- TARPs (Trigger, Action, Response Plans) forming part of approved Public Safety Management Plans and Environmental Monitoring Programs which include mitigation/remediation options and notification procedures relating to subsidence monitoring, surface cracking on both roads / fire trails and vegetated areas and impacts on rock mass / steep slopes and Aboriginal sites.