



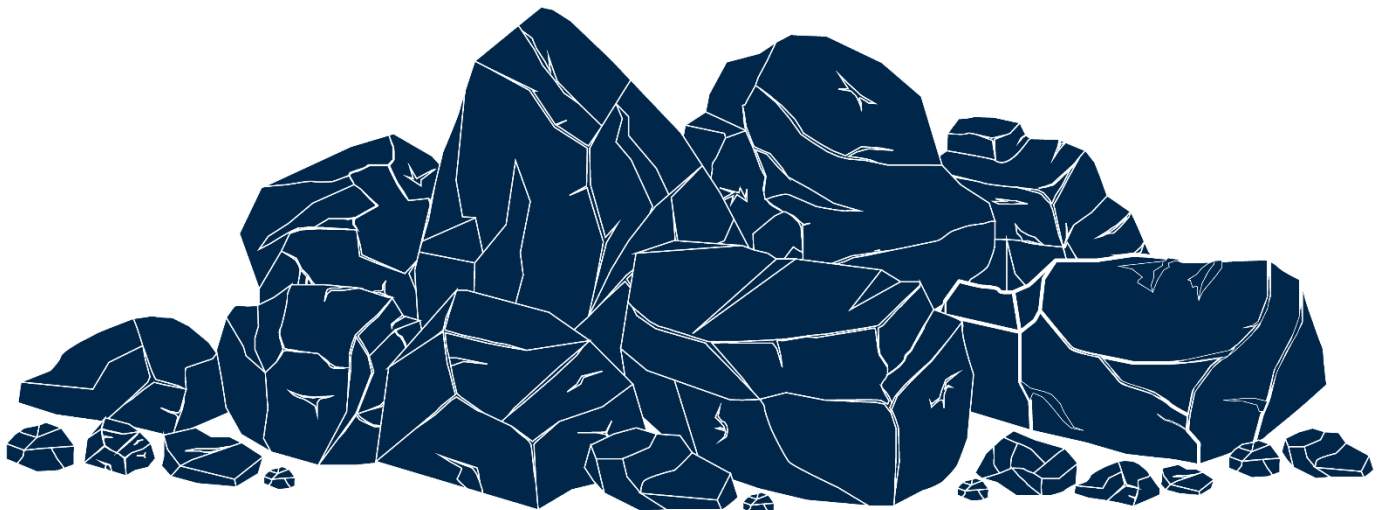
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Karuah Hard Rock Quarry

Environmental Monitoring Report

November 2023



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1.0 Introduction

This report has been completed to meet the requirements of Section 66(6) of the *Protection of the Environment Operations Act 1997* and the NSW Environmental Protection Authority's (EPA) Requirements for Publishing Pollution Monitoring Data (EPA, 2013). This report summarises the required monitoring data under Environmental Protection Licence 11569 (the EPL) and Development Consent for the Karuah Quarry (the Quarry) as summarised by **Table 1** and **Table 2** respectively.

Table 1 *Summary of Environment Protection Licence, EPL 11569*

EPL Number:	EPL 11569
Licensee's Name:	Hunter Quarries Pty Limited
Licensee's Address:	Karuah Hard Rock Quarry PO Box 3284, Thornton NSW 2322 Premises Address: Karuah Quarry, Corner of Andesite Road and The Branch Lane, Karuah NSW 2324.
Link to Full Licence on the EPA website:	EPL 11569

Table 2 *Summary of Project Approval, DA 265-10-2004*

Project Approval:	DA 265-10-2004
Applicant:	Hunter Quarries Pty Limited
Consent Authority:	Minister for Infrastructure, Planning and Natural Resources
Link to Full Project Approval on the DPE website:	Development Consent DA 265-10-2004

A summary of the environmental monitoring data for November 2023 is covered in this report. Tables throughout this report provide key monitoring information from the EPL and the Consent, including:

- location of monitoring;
- pollutant;
- unit of measurement; and
- monitoring frequency required.

Monitoring locations are illustrated by the site plan provided by **Appendix 1**.

2.0 Air Quality Monitoring

Dust emissions generated by the Quarry operation must not cause additional exceedances of ambient air quality criterion outlined in Schedule 3, Condition 13 of the Consent and summarised by **Table 3**, **Table 4** and **Table 5**.

Deposited dust monitoring is undertaken at the locations listed in **Table 6**, in accordance with the Approved Methods of Sampling and Analysis of Air Pollutants in NSW (EPA, 2022).

Table 3 Long-term Assessment Criteria for Deposited Dust (DA 265-10-2004).

Pollutant	Averaging Period	Maximum Increase in Deposited Dust Level ¹	Maximum Total Deposited Dust Level ¹
Deposited Dust	Annual	2 g/m ² /month	4 g/m ² /month

¹ Deposited dust is assessed as insoluble solids as defined by AS 3580.10.1-2003.

Table 4 Long-term Assessment Criteria for Particulate Matter (DA 265-10-2004).

Pollutant	Averaging Period	Criterion
Total Suspended Particulates	Annual	90 µg/m ³
Particulate Matter < 10 µm (PM10)	Annual	30 µg/m ³

Table 5 Short-term Assessment Criteria for Particulate Matter (DA 265-10-2004).

Pollutant	Averaging Period	Criterion
Particulate Matter < 10 µm (PM10)	24-hour	50 µg/m ³

Table 6 Air Quality Monitoring Locations (EPL 11569).

Site Monitoring Point ID	EPL Monitoring Point ID	Location	Address	Coordinates
DDG 1	2	South-West of Karuah Hard Rock Quarry	54 Mill Hill Close, Karuah NSW 2324	32°38'04"S 151°59'58"E
DDG 2	3	South-West of Karuah Hard Rock Quarry	64 Mill Hill Close, Karuah NSW 2324	32°38'02"S 152°00'09"E
DDG 3	4	South-West of Karuah Hard Rock Quarry	Lot 251 DP1092111, Karuah NSW 2324	32°37'57"S 151°59'41"E
DDG 4	5	East of Karuah Hard Rock Quarry	21 Halloran Road, North Arm Cove NSW 2324	32° 37' 30.87"S 152°01'10.18"E

Deposited dust results for the 12-months prior-to and including November 2023 are summarised by **Table 7**.

Table 7 *Deposited dust monitoring results.*

Reporting Period	Start Date	End Date	Days	DDG 1 EPL ID 2	DDG 2 EPL ID 3	DDG 3 EPL ID 4	DDG 4 EPL ID 5
Dec-22	5/12/2022	5/01/2023	31	0.7	0.7	0.3	0.6
Jan-23	5/01/2023	3/02/2023	29	0.2	0.4	0.8	0.1
Feb-23	3/02/2023	5/03/2023	31	0.9	0.7	0.2	0.3
Mar-23	5/03/2023	5/04/2023	30	1.1	1.5	1.1	1.1
Apr-23	5/04/2023	4/05/2023	29	0.3	0.5	0.3	0.2
May-23	4/05/2023	5/06/2023	32	0.2	0.3	0.3	0.4
Jun-23	6/06/2023	4/07/2023	28	0.6	2.5	1.8	–
Jul-23	4/07/2023	3/08/2023	30	0.4	0.9	1.2	1.1
Aug-23	3/08/2023	4/09/2023	32	0.7	0.3	0.5	0.5
Sep-23	4/09/2023	4/10/2023	30	1.5	2.6	1.4	1.4
Oct-23	4/10/2023	2/11/2023	29	1.4	2.4	2.2	1.6
Nov-23	2/11/2023	30/11/2023	28	1.6	–	1.4	1.0
Progressive Annual Average				0.8	1.2	1.0	0.8

Monitoring results for the November 2023 reporting period at four DDG monitoring sites are within the long-term annual deposited dust limit of 4 g/m²/month.

It should be noted that DDG 4 and DDG 2 samples in the June 2023 and November 2023 reporting periods respectively, become contaminated with vegetation matter and are therefore discounted from averaging. These two ‘failure to monitor events’ were reported to the NSW Department of Planning & Environment (DPE), the NSW EPA, and surrounding landholders in accordance with the relevant conditions of the Consent and EPL.

3.0 Blast Monitoring

Blast monitoring is undertaken for all blasts at the Quarry at the nearest residential location to ensure that air blast overpressure and ground vibration remain within the compliance limits, as summarised by **Table 9**.

There were no blasts within the November 2023 reporting period, as summarised by **Table 10**.

Table 9 *Blasting Airblast Overpressure and Ground Vibration Criteria (DA 265-10-2004 & EPL 11569).*

Location	Airblast Overpressure (dB(L))	Ground Vibration (mm/s)	Allowable Exceedance
Private Residence B	120	10	0%
EPL Monitoring Point ID 11	115	5	5% over 12-month reporting period.

Table 10 *Blasting Monitoring Results*

Date	Time	Location	Airblast Overpressure (dB(L))	Ground Vibration (mm/s)
-	-	-	-	-

*Not triggered = n/t
Ground Vibration < 0.5 mm/s
Overpressure < 108 dB(L)

4.0 Noise Monitoring

Noise monitoring is undertaken in accordance with the EPL and DPE approved Environmental Monitoring Program, which requires attended and unattended noise monitoring to be conducted on a 6 monthly basis.

During the November 2023 reporting period, attended noise monitoring was completed on Friday 24 November 2023; whilst unattended monitoring was completed at NM2 from 24 to 29 November and at NM1 from 29 to 7 December 2023. The results of the monitoring surveys are outlined by the Noise Monitoring Report provided by **Appendix 2**.

Noise levels from the site complied with the relevant limits at all monitoring locations during the H2 2023 survey.

5.0 Surface Water Monitoring

Water monitoring is undertaken in accordance with the EPL and DPE approved Water Management Plan, which includes 6 monthly surveillance sampling and daily sampling during discharge events, with results summarised in **Table 11** and **Table 12** respectively.

No surface water surveillance monitoring as undertaken in the November 2023 reporting period.

Table 11 *Surface Water Monitoring Results.*

Parameter	Units	EPL Discharge Limits	Sed Dam 2
Oil and Grease	mg/L	5 and/or non-visible	-
pH	pH	6.5 – 8.5	-
Total Suspended Solids	mg/L	50	-
Parameter	Units	ANZECC Guidelines ¹	Sed Dam 2
Conductivity	µS/cm	125 – 2,200	-

¹ Key default trigger values presented in ANZECC 2000 for slightly disturbed upland rivers in NSW. Heavy metals based on hard water (120-179 mg CaCO₃/L).

Daily discharge monitoring was conducted when discharging surface water from the Quarry via the licenced discharge points in accordance with Condition L2 and M2 of the EPL, as summarised by **Table 12**.

No discharging events occurred in November 2023.

Table 12 *Discharge Water Monitoring Results.*

Date	pH	Total Suspended Solids, TSS (mg/L)	Oil and Grease	Nitrogen (total) (mg/L)	Phosphorus (total) (mg/L)	Discharge Type
LDP 1 – Sediment Dam 2						
-	-	-	-	-	-	-

6.0 Weather Station Monitoring

The Quarry operates and maintains a permanent meteorological monitoring station to record weather parameters including temperature, wind speed and direction, solar radiation and rainfall. **Figure 3** below outlines the weather records for the November 2023 reporting period.

Monthly Weather Summary													
Site:		Karuah Quarry											
Month:		November 2023											
Date	Day	Temperature @ 2m			Temperature @ 10m			Winds			Solar Radiation		Rain ²
		Max ¹	Min ²	Ave ¹	Max ¹	Min ²	Ave ¹	Max Gust ¹	Ave Speed ¹	Dir Ave ¹	Max ¹	Ave ¹	
		°C	°C	°C	°C	°C	°C	km/h	km/h	deg	W/m ²	W/m ²	mm
1	Wed	33.7	12.2	20.7	32.0	13.1	20.5	47.3	7.5	179.3	1086.7	257.4	0.0
2	Thu	24.2	12.7	17.9	21.7	13.1	17.3	30.8	6.3	180.7	1075.0	218.6	0.0
3	Fri	25.1	11.5	17.1	21.5	12.4	16.9	31.9	4.9	166.3	1143.2	216.0	0.0
4	Sat	25.8	13.0	19.3	23.1	13.7	18.9	40.2	5.4	145.6	1084.2	224.0	0.0
5	Sun	24.6	14.3	18.6	21.7	14.7	18.0	50.9	5.5	167.2	1215.0	208.6	0.0
6	Mon	18.7	11.0	15.0	18.3	11.7	15.3	30.8	3.8	164.5	377.4	59.4	45.0
7	Tue	22.1	10.9	16.5	19.9	11.7	16.6	24.9	3.5	160.1	1199.2	116.9	0.0
8	Wed	24.9	12.0	18.8	22.5	12.8	18.6	37.9	5.8	135.6	1192.4	258.2	0.0
9	Thu	30.1	17.0	22.0	27.2	17.3	21.4	24.9	5.1	142.8	1035.0	243.9	0.0
10	Fri	29.3	15.8	19.0	26.5	16.0	18.7	49.7	4.3	172.7	1189.9	135.4	30.4
11	Sat	28.4	16.8	21.3	25.6	17.4	20.9	28.4	5.9	144.3	928.3	294.2	0.2
12	Sun	33.3	17.1	23.8	30.8	18.1	23.4	30.8	4.8	141.1	935.8	295.7	0.0
13	Mon	32.3	18.4	23.9	30.2	18.8	23.1	34.3	8.4	154.3	896.6	251.1	0.2
14	Tue	25.1	14.4	19.4	22.1	15.4	18.8	29.6	6.8	138.5	1180.0	235.3	0.0
15	Wed	29.5	16.1	21.9	26.4	16.3	21.1	29.6	4.7	181.1	1001.7	266.3	0.0
16	Thu	32.0	17.2	22.3	29.1	17.5	21.5	27.2	4.3	205.8	1018.2	236.0	0.0
17	Fri	30.1	15.9	21.4	26.4	16.0	20.7	43.8	7.2	166.7	1081.7	209.5	5.4
18	Sat	22.9	11.0	16.7	20.4	11.7	16.4	37.9	5.8	202.5	1184.9	203.8	5.4
19	Sun	25.3	11.3	18.1	22.2	12.3	17.9	35.5	5.8	149.8	1304.0	276.2	0.0
20	Mon	30.7	18.5	22.5	27.5	18.8	21.8	33.1	6.3	135.8	979.1	282.7	0.0
21	Tue	23.6	16.9	19.2	22.8	17.3	19.2	24.9	3.4	180.1	798.3	85.1	3.0
22	Wed	26.1	19.0	21.0	24.0	18.9	20.7	18.9	3.7	191.0	1257.4	152.9	0.8
23	Thu	24.9	15.3	19.7	22.7	15.9	19.4	24.9	4.1	192.9	984.2	138.8	0.2
24	Fri	27.2	18.1	21.6	24.0	18.2	20.7	26.0	4.5	181.1	1182.4	203.3	3.2
25	Sat	25.6	19.6	21.7	24.4	19.7	21.4	22.5	5.1	114.4	691.7	106.5	0.0
26	Sun	24.4	15.5	20.0	23.7	16.1	20.0	18.9	3.5	169.6	569.2	111.0	0.2
27	Mon	33.4	15.5	23.9	31.3	16.4	23.7	33.1	5.1	182.0	1158.3	264.8	0.0
28	Tue	29.9	19.3	23.3	26.3	19.7	22.3	33.1	6.0	152.8	976.7	271.6	0.0
29	Wed	26.7	19.6	22.0	24.2	19.6	21.6	31.9	6.8	138.5	1198.2	129.1	0.4
30	Thu	31.1	15.7	21.7	28.6	16.3	21.6	35.5	4.9	186.2	1291.7	228.1	4.8
Ave or Total		27.4	15.4	20.3	24.9	15.9	19.9	32.3	5.3	164.1	1040.5	206.0	3.3
High		33.7	19.6	23.9	32.0	19.7	23.7	50.9	8.4		1304.0	295.7	45.0
Low		18.7	10.9	15.0	18.3	11.7	15.3	18.9	3.4		377.4	59.4	
Notes: 1. Values are for the 24 hour period from 9am to 9am next day.												No. rain days >1mm:	
2. Values are for the 24 hours to 9am.												5.00	

Figure 3 Weather Records Summary – November 2023.

7.0 Production Data

Monthly monitoring of sales and truck movements are summarised by **Table 13**.

Table 13 *Quarry Production Data.*

Month	Truck Movements	Quarry Product Sales (t)
Jan-23	422	12,109
Feb-23	842	24,606
Mar-23	668	18,737
Apr-23	616	18,013
May-23	776	21,807
Jun-23	903	27,048
Jul-23	769	24,880
Aug-23	563	18,090
Sep-23	599	18,790
Oct-23	606	19,527
Nov-23	821	23,165

8.0 Reporting

8.1 Reportable Environmental Incidents

During the November 2023 reporting period, no reportable environmental incidents occurred at the Quarry.

8.2 Reportable Non-Compliances

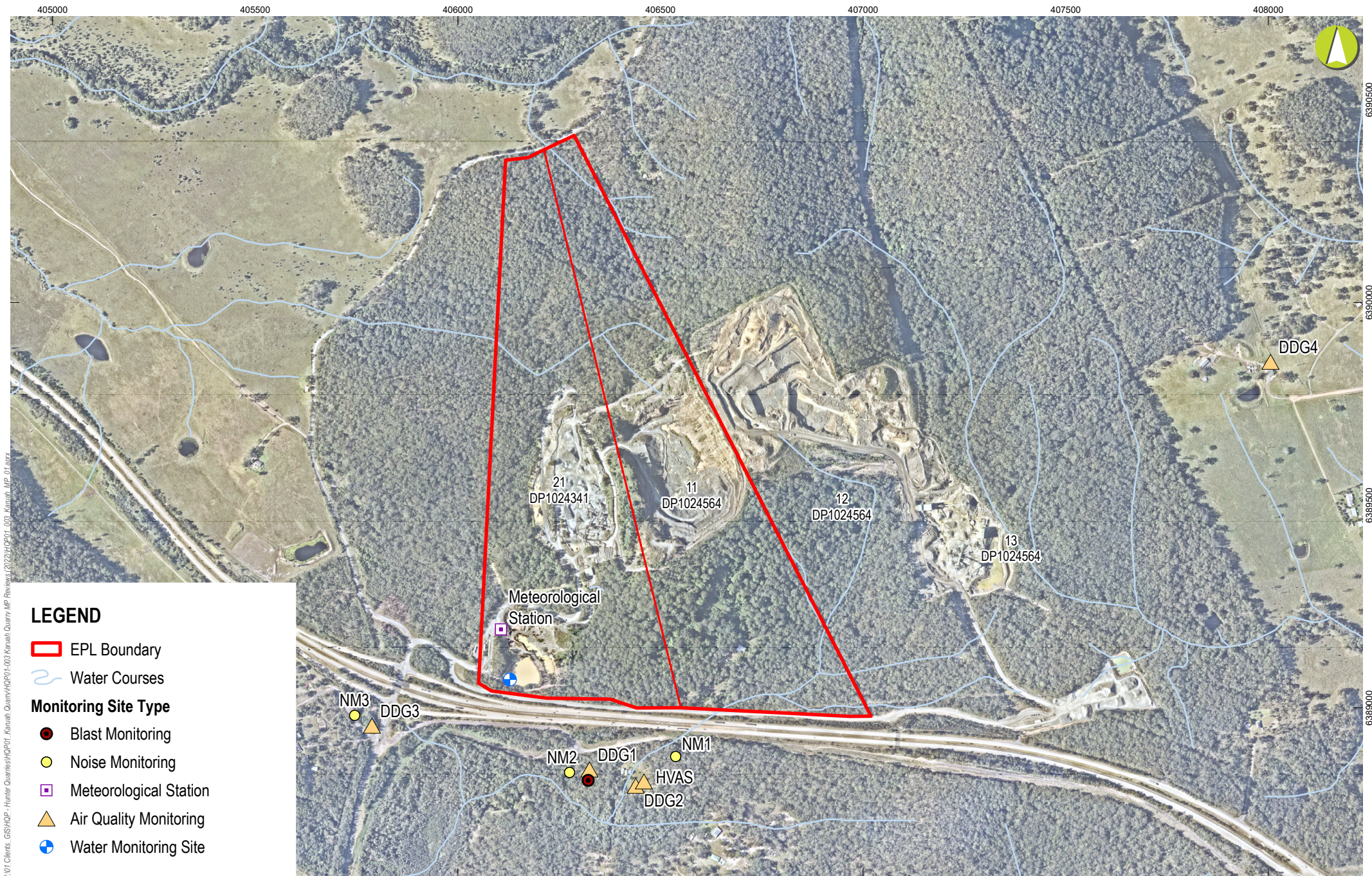
During the November 2023 reporting period, the Quarry had one reportable non-compliance in relation to air quality, including:

- Failure to Monitor event associated with contamination of one Depositional Dust Gauge with organic matter.

8.3 Community Complaints

During the November 2023 reporting period, there were no community complaints reported to the Quarry.

Appendix 1 – EPL 11569 Monitoring Locations



LEGEND

▭ EPL Boundary

~ Water Courses

Monitoring Site Type

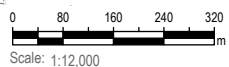
● Blast Monitoring

● Noise Monitoring

▣ Meteorological Station

▲ Air Quality Monitoring

⊕ Water Monitoring Site



Appendix 2 – Noise Monitoring Report

Karuah Quarry

Biannual attended noise monitoring - Semester 2 2023

Prepared for Hunter Quarries Pty Limited

December 2023

Karuah Quarry

Biannual Attended Noise Monitoring - S2 2023

Hunter Quarries Pty Limited

E230083 RP6

December 2023

Version	Date	Prepared by	Reviewed by	Comments
1	12 December 2023	Lucas Adamson	Najah Ishac	Draft
1	12 December 2023	Lucas Adamson	Najah Ishac	Final

Approved by



Najah Ishac

Director

12 December 2023

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This report has been prepared in accordance with the brief provided by Hunter Quarries Pty Limited and, in its preparation, EMM has relied upon the information collected at the times and under the conditions specified in this report. All findings, conclusions or recommendations contained in this report are based on those aforementioned circumstances. The contents of this report are private and confidential. This report is only for Hunter Quarries Pty Limited's use in accordance with its agreement with EMM and is not to be relied on by or made available to any other party without EMM's prior written consent. Except as permitted by the *Copyright Act 1968* (Cth) and only to the extent incapable of exclusion, any other use (including use or reproduction of this report for resale or other commercial purposes) is prohibited without EMM's prior written consent. Except where expressly agreed to by EMM in writing, and to the extent permitted by law, EMM will have no liability (and assumes no duty of care) to any person in relation to this document, other than to Hunter Quarries Pty Limited (and subject to the terms of EMM's agreement with Hunter Quarries Pty Limited).

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1 Introduction

1.1 Background

EMM Consulting Pty Ltd (EMM) was engaged by Hunter Quarries Pty Limited to conduct a bi-annual noise survey of operations at Karuah Quarry (KQ, the site) located at Blue Rock Close, Karuah NSW. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified limits.

Attended environmental noise monitoring described in this report was done during the day period of Friday 24 November 2023 at two monitoring locations.

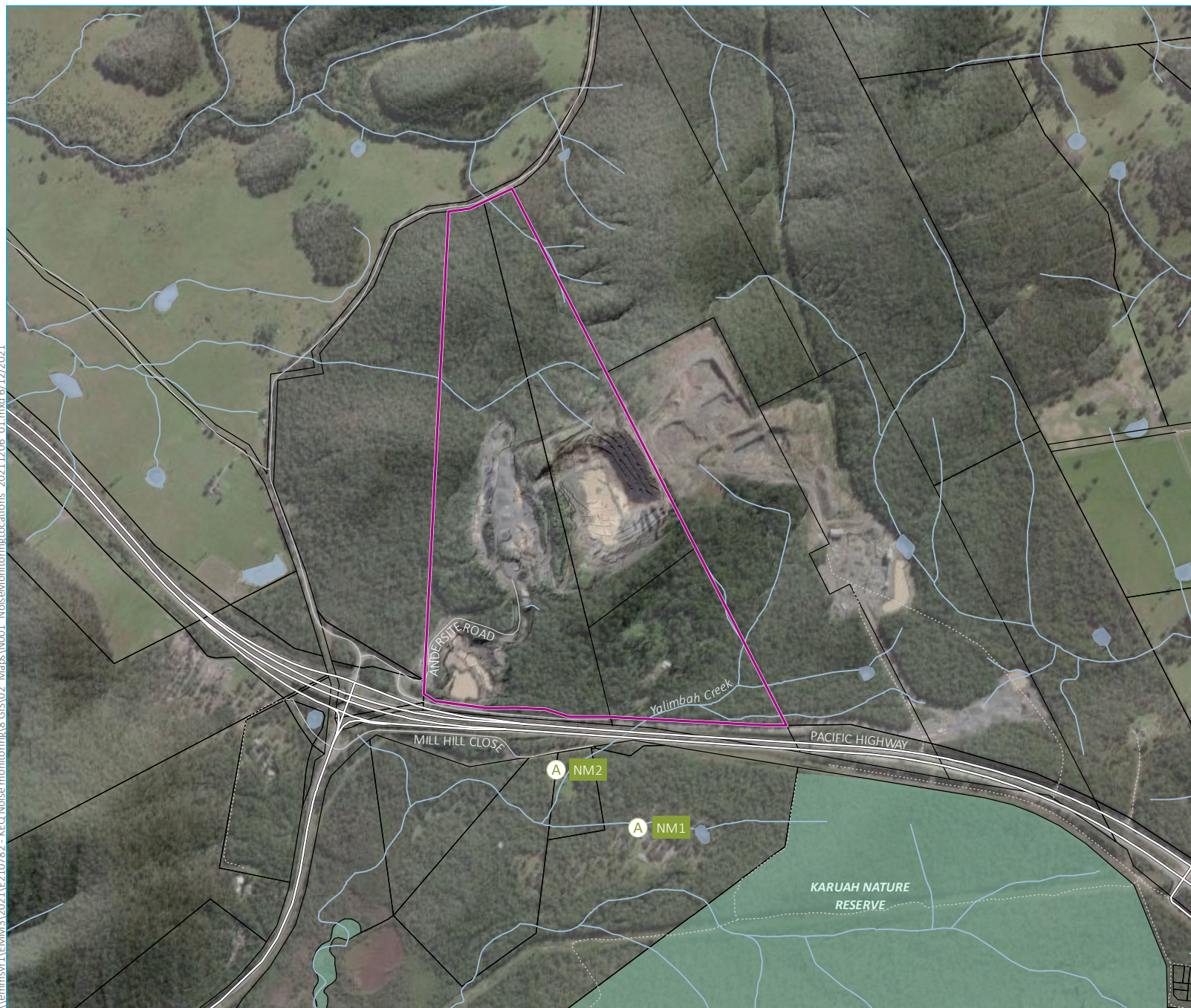
1.2 Attended monitoring locations

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

Table 1.1 **Attended noise monitoring locations**

Location descriptor/ID	Description/address	Coordinates (MGA56)	
		Easting	Northing
NM1	Private Residence - 74 Mill Hill Close, Karuah	406623	6388704
NM2	Private Residence - 64 Mill Hill Close, Karuah	406405	6388859

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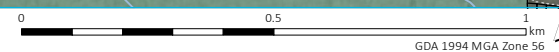
- Site boundary
- Noise monitoring location
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary
- Waterbody
- NPWS reserve
- State forest

Noise monitoring locations

Karuah Quarry
Bi-annual noise monitoring
Figure 3.1



Source: EMM (2021); ADW Johnson (2020); DFSI (2017); ICSM (2012); GA (2011); ASGC (2006)



1.3 Terminology and abbreviations

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

Table 1.2 Terminology and abbreviations

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

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

2 Noise limits

2.1 Development consent

Karuah Quarry noise limits are detailed in Condition 1 of Schedule 3 of Development Consent (DC) DA 265-10-2004. Relevant sections of DA 265-10-2004 are reproduced in Appendix B.1.

2.2 Environment protection licence

There are no noise limits detailed in the site's Environment Protection Licence (EPL) 11569.

2.3 Environmental monitoring program

The approved environmental monitoring program (EMP) adopts two attended noise monitoring locations that are representative of residences outlined in DA 265-10-2004. Relevant sections of the EMP are reproduced in Appendix B.2.

2.4 Noise limits

Noise impact limits based on the development consent are provided in Table 2.1.

Table 2.1 Noise impact limits, dB

Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	All other times L _{Aeq,15minute}
NM1	48	47	46
NM2	48	47	46

Notes: 1. Day: 7:00 am–6:00 pm Monday to Saturday; 8:00 am–6:00 pm Sundays and public holidays; Evening: 6:00 pm–10:00 pm; All other times: 10:00 pm–7:00 am Monday to Saturday; 10:00 pm–8:00 am Sundays and public holidays.

2.5 Meteorological conditions

The table notes for Table 2, Condition 1 of Schedule 3 of DA 265-10-2004 also state that noise generated by the project is to be measured in accordance with the following meteorological conditions:

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

2.6 Additional requirements

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

As outlined in Section 5.4.1 of the EMP, unattended noise monitoring is to be conducted at two locations (NM1 and NM2) on a bi-annual basis under the following conditions:

In order to measure the possible impact of noise resulting from quarry operations, the following monitoring will be undertaken at the two (2) nearest residences downwind and/or in line-of sight from the quarry and not owned or under agreement with HQPL:

- a) An unattended (continuous 24hr) noise monitor will be placed in the field to measure noise for at least four (4) full days of monitoring each six months;
- b) An attended survey (15-minutes meeting EPA standards) will be undertaken at the two nearest residences on a six monthly basis. This survey will be undertaken in conjunction with the unattended survey described above;
- c) A suitably qualified noise consultant will be engaged to undertake 15-minute attended noise surveys to investigate any complaints received by HQPL; and
- d) Onsite logged climatic data (particularly winds) will be utilised to assist with a timely management response to any noise issue that may arise. This is further discussed in Section 5.5.

3 Methodology

3.1 Overview

Attended environmental noise monitoring was done as guided by Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant EPA requirements. Meteorological data was obtained from the site automatic weather station (AWS) which allowed correlation of atmospheric parameters with measured site noise levels.

3.2 Attended noise monitoring

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

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

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

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, it was inaudible at the monitoring location. When site noise is noted as NM, this means it was audible but could not be quantified. All results noted as NM in this report were due to one or more of the following:

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

3.3 Unattended noise monitoring

The unattended noise monitoring was carried out using Svantek 977 and Acoustic Research Labs (ARL) Ngara and environmental noise loggers that were in place from Friday 24 to Wednesday 29 November 2023 (Svantek 977) and Wednesday 29 November to Thursday 7 December 2023 (ARL Ngara).

Calibration of instrumentation was checked prior to and following measurements. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates (refer Appendix C).

Data affected by adverse meteorological conditions and by spurious or uncharacteristic events has been excluded from the results in accordance with methodologies provided in the NPfI.

3.4 Meteorological data

Meteorological data for the monitoring period was sourced from the Karuah Quarry on-site meteorological station to determine applicability of criteria in accordance with the DC.

3.5 Modifying factors

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

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

3.6 Instrumentation

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

Table 3.1 Noise monitoring equipment

Item	Serial number	Calibration due date	Relevant standard
B&K 2250 sound level meter	3029363	3/11/2024	IEC 61672-1:2002
Svantek SV-36 calibrator	79952	27/9/2025	IEC 60942:2003
ARL Ngara unattended noise logger	878113	30/8/2024	IEC 61672-3:2013
Svantek 977 unattended noise logger	59682	29/11/2023	IEC 61672-3:2013

4 Results

4.1 Attended noise monitoring

4.1.1 Total measured noise levels and atmospheric conditions

Overall noise levels measured at each location during attended measurements are provided in Table 4.1. Discussion as to the noise sources responsible for these measured levels is provided in Section 5.1 of this report.

Table 4.1 Total measured 15-minute noise levels (attended) – Semester 2 2023¹

Location	Start date and time	L _{Amax} dB	L _{A1} dB	L _{A10} dB	L _{Aeq} dB	L _{A50} dB	L _{A90} dB	L _{Amin} dB
NM1	24/11/2023 8:33	60	55	53	51	51	48	44
NM2	24/11/2023 8:14	74	69	65	62	61	57	50

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

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

Table 4.2 Measured atmospheric conditions – Semester 2 2023

Location	Start date and time	Temperature °C	Wind speed m/s	Wind direction ° Magnetic north ¹	Cloud cover 1/8s
NM1	24/11/2023 8:33	22.2	<0.5	-	7
NM2	24/11/2023 8:14	22.1	<0.5	-	7

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

4.1.2 Site only noise levels

i Modifying factors

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

ii Monitoring results

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

Table 4.3 Site noise levels and limits – Semester 2 2023

Location	Start Date and Time	Wind		Stability Class	Limits apply? ¹	Limits, dB	Site levels, dB	Exceedances, dB ¹
		Speed m/s	Direction ³			L _{Aeq,15minute}	L _{Aeq,15minute} ²	L _{Aeq,15minute}
NM1	24/11/2023 8:33	0.9	208	A	Y	48	IA	Nil
NM2	24/11/2023 8:14	0.5	283	A	Y	48	IA	Nil

Notes:

1. Noise emission limits are applicable if weather conditions were within parameters specified in Section 2.5. NA in exceedance column indicates that limits were not applicable due to weather conditions.
2. Site-only L_{Aeq,15minute}, includes modifying factor penalties if applicable.
3. Degrees magnetic north, “-” indicates calm conditions.

4.2 Unattended noise monitoring

Overall noise levels measured at each location during attended measurements are provided in Table 4.4. Discussion as to the noise sources responsible for these measured levels is provided in Section 5.2 of this report.

Table 4.4 Total measured noise levels (unattended) – Semester 2 2023¹

Location	Period	Measured noise levels, dB	
		RBL	L _{Aeq,period}
NM1 29 November- 7 December 2023	Day	46	53
	Evening	45	55
	Night	45	52
NM2 24-29 November 2023	Day	57	65
	Evening	49	65
	Night	40	62

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

5 Discussion

5.1 Attended noise monitoring

5.1.1 Noted noise sources

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

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

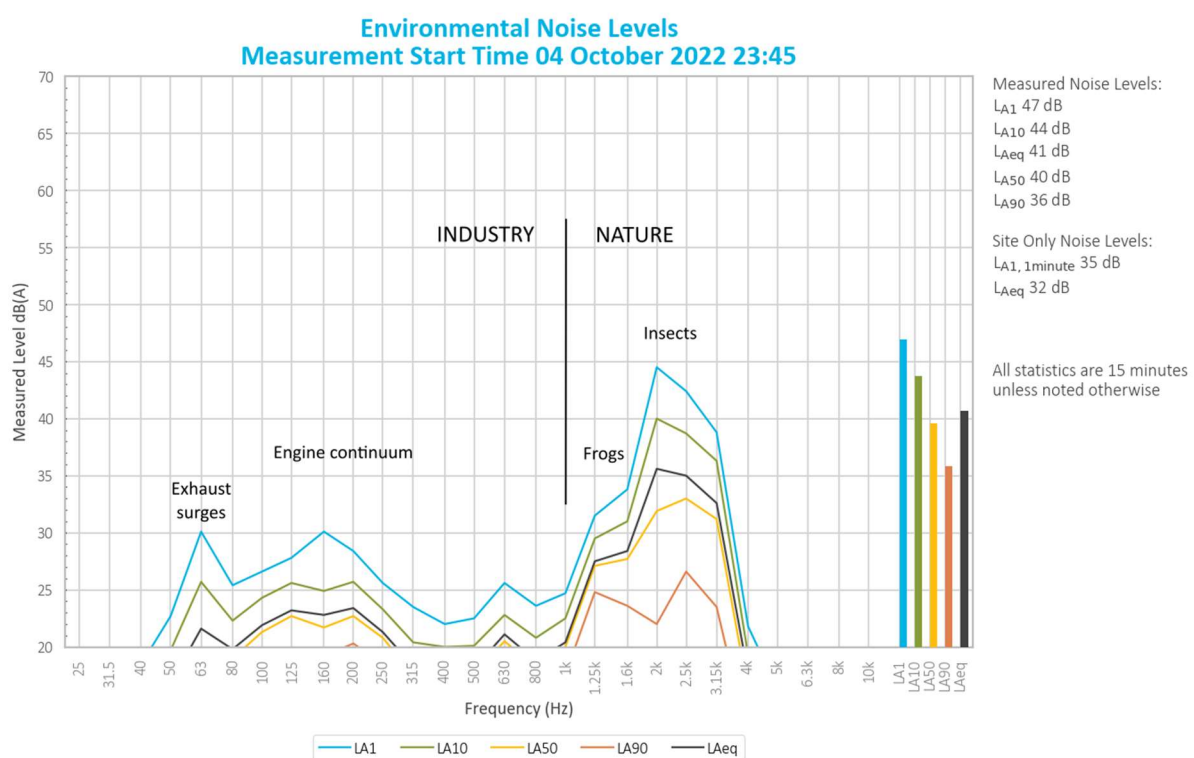


Figure 5.1 Example graph

5.1.2 NM1

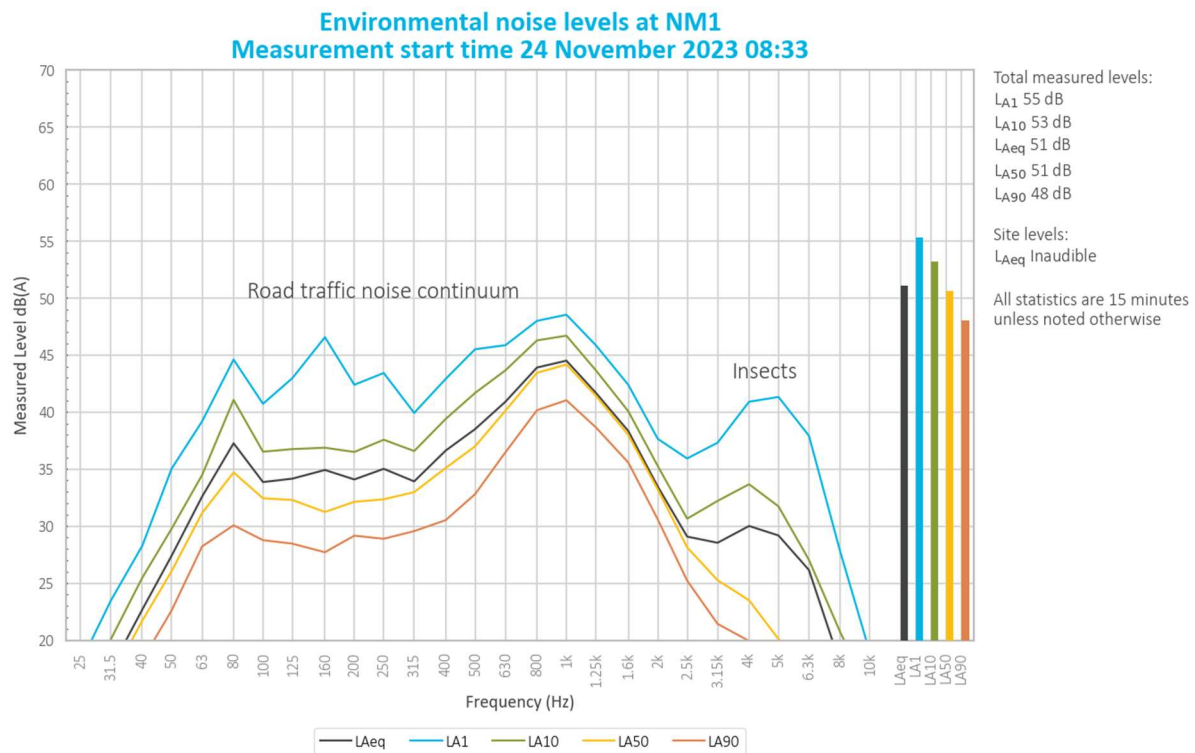


Figure 5.2 Environmental Noise Levels – NM1

Karuah Quarry operations were inaudible during the entire measurement. Typically, when this type of noise source is not audible above ambient (not withstanding insect noise and other sources of varied character), the likely level of that source is at least 10 dB below the measured background (L_{A90}) level. Given this, and the measured background noise level of 48 dB L_{A90} , the Karuah Quarry $L_{Aeq,15 \text{ minute}}$ was estimated to be <38 dB $L_{Aeq,15 \text{ minute}}$ and therefore did not exceed the 48 dB $L_{Aeq,15 \text{ minute}}$ noise limit.

Road traffic noise dominated the noise environment. Insects and road traffic noise were primarily responsible for the measured L_{A50} , L_{Aeq} and L_{A90} .

Noise from birds was also noted.

5.1.3 NM2

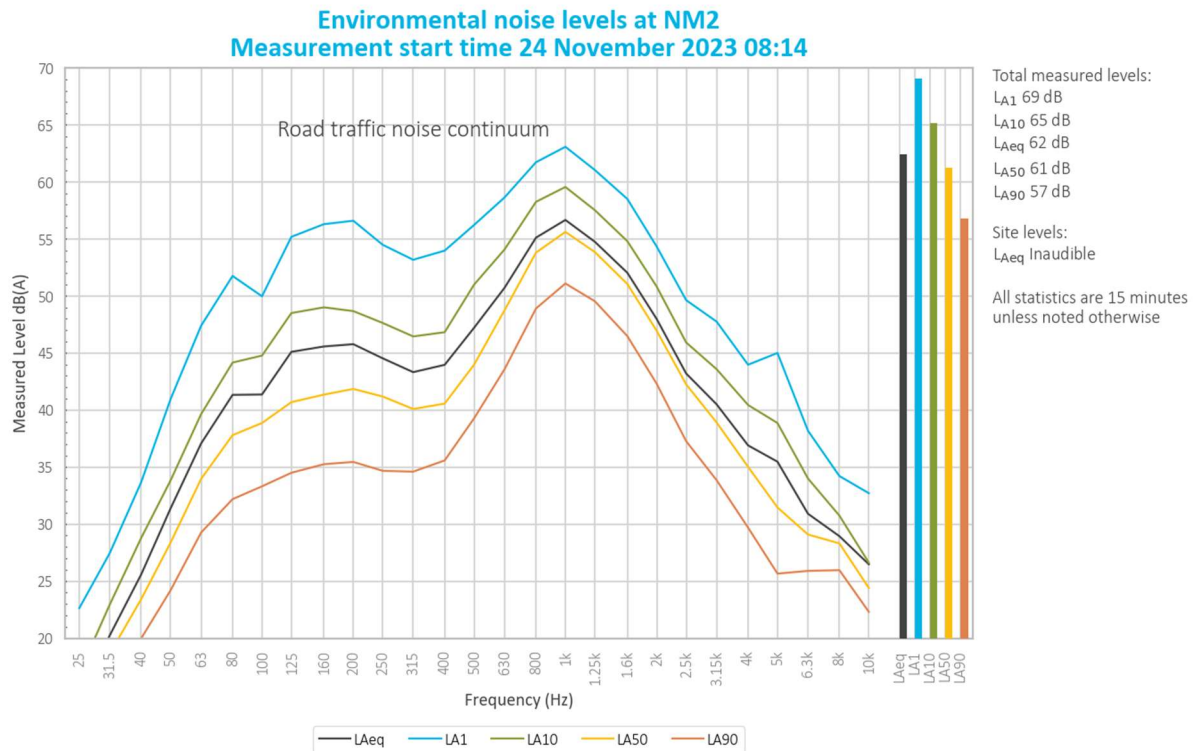


Figure 5.3 Environmental Noise Levels – NM2

Karuah Quarry operations were inaudible during the entire measurement. Typically, when this type of noise source is not audible above ambient (not withstanding insect noise and other sources of varied character), the likely level of that source is at least 10 dB below the measured background (L_{A90}) level. Given this, and the measured background noise level of 57 dB L_{A90} , the Karuah Quarry $L_{Aeq,15 \text{ minute}}$ was estimated to be <47 dB $L_{Aeq,15 \text{ minute}}$ and therefore below the relevant noise limit. Karuah Quarry noise contributions complied with the relevant DC noise limits.

Road traffic noise dominated the noise environment. Insects and road traffic noise were primarily responsible for the measured L_{A50} , L_{Aeq} and L_{A90} .

Noise from birds was also noted.

5.2 Unattended noise monitoring

Observations during the operator attended measurements indicate that the dominant source of noise at both unattended noise monitoring locations is road traffic noise from the Pacific Highway (particularly during peak traffic periods), with insects, birds and dogs barking also noted to be audible.

Notwithstanding, a review of the unattended noise monitoring data has found no correlation between recorded noise levels and events associated with Karuah Quarry operations. Without an operator present to discern the noise sources contributing to the measured noise levels, it is difficult to establish any meaningful conclusions or trends from the unattended noise monitoring data.

6 Summary

EMM was engaged by Hunter Quarries Pty Limited to conduct a bi-annual noise survey of operations at the site surrounds. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified limits.

Attended environmental noise monitoring described in this report was done during the day period of 24 November 2023 at two monitoring locations as required by the approved EMP.

Noise levels from site complied with relevant limits at all monitoring locations during the Semester 2 2023 survey.

A review of the unattended noise monitoring data found that no meaningful conclusions, events or trends could be associated with Karuah Quarry operations.

Appendix A

Noise perception and examples

A.1 Noise levels

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

Table A.1 Perceived change in noise

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

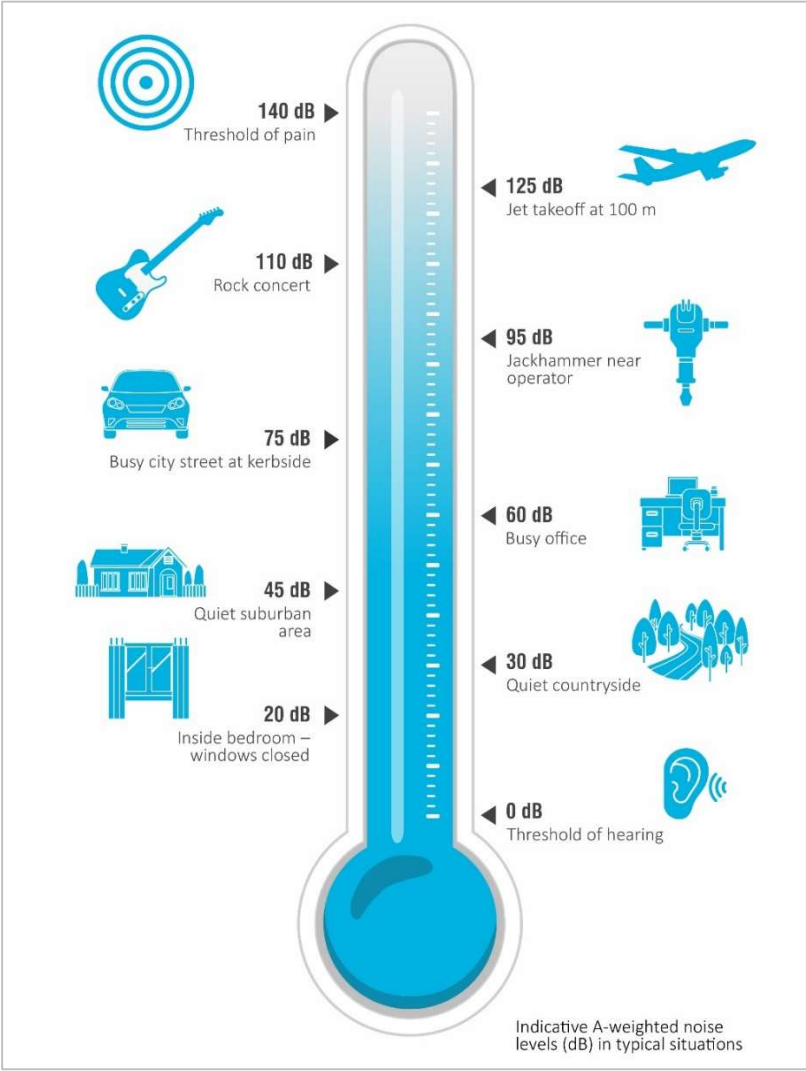


Figure A.1 Common noise levels

Appendix B

Regulator documents

SCHEDULE 3 SPECIFIC ENVIRONMENTAL CONDITIONS

¹NOISE

Noise Impact Assessment Criteria

- The Applicant shall ensure that the noise generated by the development does not exceed the criteria specified in Table 2 at any residence or noise sensitive receptor on privately owned land.

Time Period	Noise Limits dB(A)
	L_{Aeq} (15minute)
Day (7am to 6pm) Monday to Friday and 7am to 1pm Saturday	48
Evening (6pm to 10pm) Monday to Friday	47
At all other times	46

Table 2: Noise Impact Assessment Criteria for the Development

Notes:

- Noise from the site is to be measured within thirty meters of any residence or other noise sensitive areas to determine compliance with the noise criteria set out in Table 2.
- $LA_{eq(15\text{ minute})}$ is the equivalent continuous noise level - the level of noise equivalent to the energy average of noise levels occurring over a measurement period.
- For the purpose of noise measures required for this condition, the LA_{eq} noise level must be measured or computed at the point defined in this condition over a period of 15 minutes using "FAST" response on the sound level meter.
- For the purpose of the noise criteria for this condition, 5dBA must be added to the measured level if the noise is substantially tonal or impulsive in character. The location or point of impact can be different for each development, for example, at the closest residential receiver or at the closest boundary of the development. Measurement locations can be:
 - 1 meter from the facade of the residence for night time assessment;
 - at the residential boundary;
 - 30 meters from the residence (rural situations) where boundary is more than 30 meters from residence.
- The noise emission limits identified in this condition apply for prevailing meteorological conditions (winds up to 3m/s), except under conditions of temperature inversions. Noise impacts that may be enhanced by temperature inversions must be addressed by:
 - documenting noise complaints received to identify any higher level of impacts or patterns of temperature inversions;
 - where levels of noise complaints indicate a higher level of impact then actions to quantify and ameliorate any enhanced impacts under temperature inversions conditions should be developed and implemented.

Operating Hours

- The Applicant shall comply with the operating hours in Table 1:

Activity	Days of the Week	Time
<ul style="list-style-type: none"> Construction Extraction and processing Internal and off-site transportation of product 	Monday – Friday	7am to 6pm
	Saturday	7am to 1pm
	Sunday and public holidays	No work at any time
Minor maintenance works on plant and machinery	7 days a week and public holidays	7am to 6pm

Table 1: Operating Hours for the Development

Note: Delivery of material outside of the hours of operation permitted by condition 2 is only allowed, where that delivery is required by the police or other authorities for safety reasons; and/or where the operation or personnel or equipment are endangered. In such circumstances, prior notification should be provided to the DEC and affected residents as soon as possible, or within a reasonable period in the case of emergency.

Noise Monitoring

- Within 6 months of the date of this consent, the Applicant shall prepare and implement a Noise Monitoring Program for the development to evaluate compliance with the noise impact assessment criteria in this consent, in consultation with the DEC, and to the satisfaction of the Director-General.

¹ Incorporates DEC GTAs

B.2 Environmental monitoring program

area will be used to calculate the volume of water discharged. Samples will be taken during the discharge of water from the site.

The results of the water quality monitoring program for the quarry shall be reported as per **Section 6.0** of this *Environmental Monitoring Program*.

5.4 Noise and Blast Monitoring

5.4.1 Operational Noise

Schedule 2 Condition 1 of the Development Consent requires HQPL to ensure noise generated by the development does not exceed the criteria specified in **Table 6** below at any residence, or any noise sensitive receptor on privately owned land.

Table 6: Noise Impact Assessment Criteria for the Development

Time Period	Noise Limits dB(A)
	L _{Aeq} (15 min)
Day (7am to 6pm) Mon to Fri and 7am to 1pm Saturday	48
Evening (6pm to 10pm) Monday to Friday	47
At all other times	46

In order to measure the possible impact of noise resulting from quarry operations, the following monitoring will be undertaken at the two (2) nearest residences downwind and/or in line-of sight from the quarry and not owned or under agreement with HQPL:

- An unattended (continuous 24hr) noise monitor will be placed in the field to measure noise for at least four (4) full days of monitoring each six months;
- An attended survey (15-minutes meeting EPA standards) will be undertaken at the two nearest residences on a six monthly basis. This survey will be undertaken in conjunction with the unattended survey described above;
- A suitably qualified noise consultant will be engaged to undertake 15-minute attended noise surveys to investigate any complaints received by HQPL; and
- Onsite logged climatic data (particularly winds) will be utilised to assist with a timely management response to any noise issue that may arise. This is further discussed in Section 5.5.

During attended surveys, where the noise from operations is measured to be greater than approved criteria, a review of operational activities causing exceedances shall be undertaken and, where considered appropriate, the offending activity will cease until such times as the meteorological conditions improve (i.e. inversion lift) or other appropriate controls can be employed. In addition, the frequency of noise monitoring may be increased as appropriate, or until such time that it can be demonstrated that noise levels are well below required limits. Noise monitoring is completed by a trained external environmental consultancy.

5.4.2 Monitoring of Operational Blasting (Vibration and Overpressure)

In accordance with the Development Consent, blasts will only occur between 9am and 3pm Monday to Friday inclusive, once a week or at other times as approved by the OEH. In addition, blasting will only be undertaken in favourable weather conditions and by accredited specialist blasting contractors. Data from the site weather station will be checked prior to blasting. HQPL usually schedules blasts at 12:00pm on the day of blasting.

Appendix C

Calibration certificates

CERTIFICATE OF CALIBRATION

CERTIFICATE No: **SLM34169**

EQUIPMENT TESTED: Sound Level Meter

Manufacturer: B & K

Type No: 2250

Mic. Type: 4189

Pre-Amp. Type: ZC0032

Serial No: 3029363

Serial No: 3260501

Serial No: 30109

Filter Type: 1/3 Octave

Test No: F034175

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

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

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

CONDITIONS OF TEST:

Ambient Pressure 1002 hPa ± 1 hPa

Temperature 24 $^{\circ}\text{C} \pm 1^{\circ}\text{C}$

Relative Humidity 35 % $\pm 5\%$

Date of Receipt: 02/11/2022

Date of Calibration: 03/11/2022

Date of Issue: 04/11/2022

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

CHECKED BY: *[Signature]*

AUTHORISED SIGNATURE: *[Signature]*

Jack Kielt

Accredited for compliance with ISO/IEC 17025 - Calibration

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

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

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



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CALIBRATIONS SALES RENTALS REPAIRS

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

CERTIFICATE OF CALIBRATION

CERTIFICATE No: **C37508**

EQUIPMENT TESTED : Sound Level Calibrator

Manufacturer: Svantek

Type No: SV 36

Serial No: 79952

Class: 1

Owner: EMM Consulting Pty Ltd
L3, 175 Scott Street
Newcastle, NSW 2300

Tests Performed: Measured Output Pressure level, Frequency & Distortion

Comments: See Details and Class Tolerance overleaf.

CONDITION OF TEST:

Ambient Pressure 1005 hPa ± 1 hPa

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

Relative Humidity 47 % $\pm 5\%$

Date of Receipt : 26/09/2023

Date of Calibration : 27/09/2023

Date of Issue : 28/09/2023

Acu-Vib Test AVP02 (Calibrators)

Procedure: Test Method: AS IEC 60942 - 2017

CHECKED BY: *KB*

AUTHORISED
SIGNATURE:

Hein Soe

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Page 1 of 2 Calibration Certificate
AVCERT02.1 Rev.2.0 14.04.2021

CERTIFICATE OF CALIBRATION

CERTIFICATE No: **SLM31260**

EQUIPMENT TESTED: Sound & Vibration Analyser

Manufacturer: Svantek
Type No: Svan-977A
Mic. Type: 7052E
Pre-Amp. Type: SV12L
Serial No: 59682
Serial No: 79341
Serial No: 64882
Filter Type: 1/3 Octave
Test No: F031264

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

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

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

CONDITIONS OF TEST:

Ambient Pressure	1006 hPa ± 1 hPa	Date of Receipt :	25/11/2021
Temperature	22 $^{\circ}\text{C} \pm 1^{\circ}\text{C}$	Date of Calibration :	29/11/2021
Relative Humidity	55 % $\pm 5\%$	Date of Issue :	30/11/2021

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

CHECKED BY:  **AUTHORISED SIGNATURE:** 

Jack Kiedt

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Sound Level Meter

IEC 61672-3:2013

Calibration Certificate

Calibration Number C22561

Client Details		EMM Consulting Level 3/175 Scott Street Newcastle NSW 2300
Equipment Tested/ Model Number :		ARL Ngara
Instrument Serial Number :		878113
Microphone Serial Number :		322081
Pre-amplifier Serial Number :		28647
Firmware Version :		12.6
Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions
Ambient Temperature : 23.4°C		Ambient Temperature : 23.1°C
Relative Humidity : 39.8%		Relative Humidity : 39.8%
Barometric Pressure : 101.09kPa		Barometric Pressure : 101.09kPa
Calibration Technician : Lucky Jaiswal		Secondary Check: Shaheen Boaz
Calibration Date : 25 Aug 2022		Report Issue Date : 30 Aug 2022
Approved Signatory : 		Ken Williams

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

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

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

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

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



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

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

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

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

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Melbourne VIC 3000
T 03 9993 1900

PERTH

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