

# **Menangle Sand and Soil Quarry**

## **Noise Compliance Q2 Assessment**

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Prepared for Menangle Sand and Soil Pty Ltd

May 2024

# Menangle Sand and Soil Quarry

## Noise Compliance Q2 Assessment

Menangle Sand and Soil Pty Ltd

E240224 RP2

May 2024

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# 1 Introduction

## 1.1 Background

EMM Consulting Pty Ltd (EMM) was engaged by Menangle Sand and Soil Pty Ltd to conduct a noise survey of operations at Menangle Sand and Soil (the site) located at 15 Menangle Road, Menangle NSW. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified limits within the noise management plan. It is a requirement of the development consent LEC 2018/342158 for regular attended noise monitoring to be carried out every three months. Attended environmental noise monitoring described in this report was done during the shoulder and day periods of 17 May 2024 at five monitoring locations.

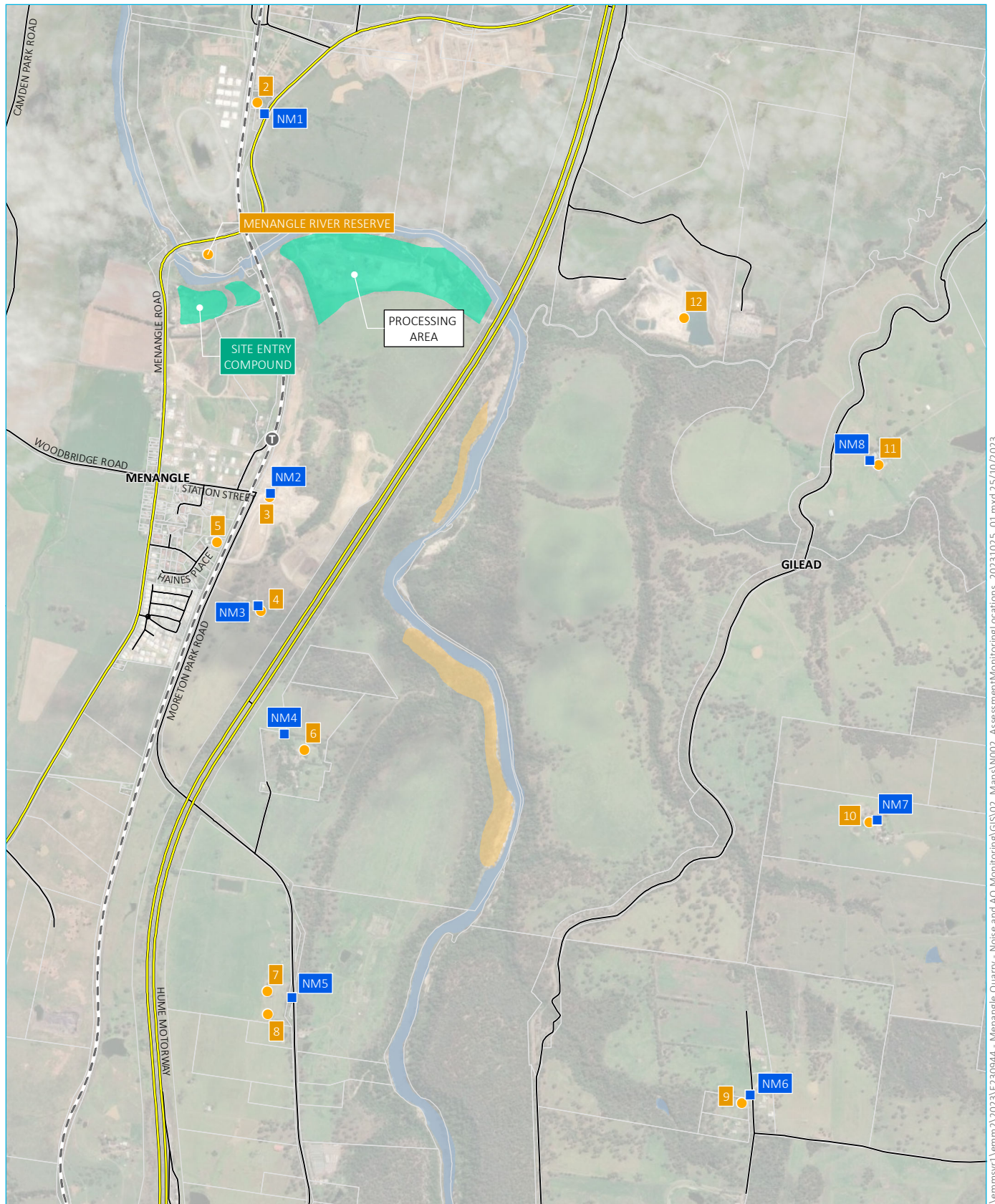
## 1.2 Assessment locations

The assessment 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. The locations in bold in Table 1.1 were the adopted monitoring locations as per the NMP.

**Table 1.1**      **Attended noise monitoring locations**

ID	Representative residences	Description	Coordinates (MGA56)	
			Easting	Northing
<b>NM1</b>	R2	Menangle Road North	291937	6223124
<b>NM2</b>	R3, R5	Station Street North	291964	6221374
<b>NM3</b>	R4	Station Street East	291907	6220855
<b>NM4</b>	R6	Morton Park Road North	292028	6220262
<b>NM5</b>	R7, R8	Morton Park Road South	292064	6219045
NM6	R9	Bulli Appin Road South	294179	6218595
NM7	R10	Bulli Appin Road North	294766	6219863
NM8	R11	Appin Road	294732	6221523





Source: EMM (2020); DFSI (2017); GA (2011)

# KEY

- Monitoring location
- Assessment location
- Ⓣ Train station
- Rail line
- Main road
- Local road
- Nepean River
- Cadastral boundary
- Extractive operations
- Stage 8

Site boundary, sensitive receivers  
and noise monitoring locations

Menangle Sand and Soil Quarry  
Environmental Noise Monitoring  
Figure 1.1



\\emm2\1\emm2\2023\230944 - Menangle Quarry - Noise and AQ Monitoring\GIS\02\_Maps\W002\_AssessmentMonitoringLocations\_20231025\_01.mxd 25/10/2023

## 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% of the time.
$L_{A1,1minute}$	The A-weighted noise level which is exceeded for 1% of the specified time period of 1 minute.
$L_{A10}$	The A-weighted noise level which is exceeded for 10% of the time.
$L_{Aeq}$	The energy average A-weighted noise level.
$L_{A50}$	The A-weighted noise level which is exceeded for 50% of the time, also the median noise level during a measurement period.
$L_{A90}$	The A-weighted noise level exceeded for 90% 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

LEC 2018/342158 B6 states that:

The applicant must carry out regular attended noise monitoring (every three months unless otherwise agreed with the planning secretary) to determine whether the development is complying with the relevant conditions of Schedule 2.

Relevant sections of the development consent are reproduced in Appendix B.2.

### 2.2 Noise management plan

Noise monitoring requirements are detailed in the site's Noise Management Plan (NMP), most recently approved in February 2022.

Noise criteria for the facility are stipulated in Table 2 of development consent Condition B4 and section 5 of the NMP. The noise criteria are specified for the day and shoulder periods and apply at all residential receivers which have the potential to be impacted by operational noise from the quarry (refer to Figure 1.1 for the nearest residential receivers).

Relevant sections of the NMP are reproduced in Appendix B.1.

### 2.3 Environmental Protection Licence

The site's Environmental Protection Licence (EPL, 3991), version date 13 December 2023 does not contain any noise limits.

### 2.4 Noise limit summary

Noise impact limits based on the approved NMP and LEC are provided in Table 2.1.

**Table 2.1** Noise impact limits, dB

Location	Day $L_{Aeq,15minute}$	Shoulder $L_{Aeq,15minute}$	Shoulder $L_{Amax}$
NM1	45	45	55
NM2	45	45	55
NM3	54	52	62
NM4	45	45	55
NM5	45	45	55
NM6	45	45	55
NM7	35	35	45
NM8	35	35	45

Notes:

1. Day period is between 7 am–6 pm Monday to Saturday and 8 am–6 pm Sundays and Public Holidays.
2. Shoulder period is between 6 am–7 am Monday to Saturday.



## 2.5 Meteorological conditions

The meteorological conditions will be used to determine if the noise criteria (refer to Table 2.1) apply in accordance with the INP. Condition 1 of Appendix 4 of the development consent states that:

The noise criteria in condition B4 of Schedule 2 are to apply under all meteorological conditions except the following:

(a) where 3°C/100 metres (m) lapse rates have been assessed, then:

- (i) wind speeds greater than 3 metres/second (m/s) measured at 10m above ground level;
- (ii) temperature inversion conditions between 1.5°C and 3°C/100m and wind speeds greater than 2m/s measured at 10m above ground level; or
- (iii) temperature inversion conditions greater than 3°C/100m.

(b) where Pasquill Stability Classes have been assessed, then:

- (i) wind speeds greater than 3m/s at 10m above ground level;
- (ii) stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or
- (iii) stability category G temperature inversion conditions.

## 2.6 Additional considerations

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

## 3 Methodology

### 3.1 Overview

Attended environmental noise monitoring was done in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant NSW government 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 at NM4 during the shoulder period and NM1, NM2, NM3, NM4 and NM5 in the day period. These locations were selected as they are the most exposed to site noise, from the pool detailed in the NMP. Due to meteorological and operational conditions on the day of monitoring, NM6, NM7 and NM8 would experience lesser noise levels than the locations selected. This is supported by historic sampling at NM6, NM7 and NM8, which has shown site noise has been inaudible. The duration of each measurement was 15 minutes. Atmospheric conditions were obtained from the site AWS and hand held readings were measured during noise surveys at each monitoring location.

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

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

- Site noise levels were very low, typically more than 10 dB below the measured background ( $L_{A90}$ ), and unlikely to be noticed.
- Site noise levels were masked by more dominant sources that are characteristic of the environment (such as breeze in foliage or continuous road traffic noise) that cannot be eliminated by monitoring at an alternate or intermediate location.
- It was not feasible or reasonable to employ methods, such as to move closer and back calculate. Cases may include rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

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

### 3.3 Modifying factors

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

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

### 3.4 Instrumentation and personnel

Attended noise monitoring was conducted by Jared Blackburn. Qualifications, experience, and competence is in accordance with the Approved methods and supportive documentation is available upon request.

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

**Table 3.1**      **Measurement equipment**

Item	Serial number	Calibration due date	Relevant standard
Brüel & Kjær Type 2250 sound level meter	3008201	12 July 2025	IEC 61672-1:2002
Svantek SV36 calibrator	138019	01 August 2024	IEC 60942:2003

## 4 Results

### 4.1 Total measured noise levels and atmospheric conditions

Total noise levels measured during each 15-minute attended measurement are provided in Table 4.1.

**Table 4.1** Total measured noise levels, dB – May 2024 <sup>1</sup>

Location	Start date and time	L <sub>Amax</sub>	L <sub>A1</sub>	L <sub>A10</sub>	L <sub>Aeq</sub>	L <sub>A50</sub>	L <sub>A90</sub>	L <sub>Amin</sub>
NM4 <sup>3</sup>	17/05/2024 6:45	78	60	57	56	55	52	49
NM4 <sup>3</sup>	17/05/2024 7:00	82	66	59	59	56	53	50
NM3 <sup>2</sup>	17/05/2024 7:20	68	64	62	61	60	59	57
NM2 <sup>2</sup>	17/05/2024 7:40	70	61	57	56	55	53	51
NM1 <sup>3</sup>	17/05/2024 8:01	83	78	74	71	69	60	50
NM5	17/05/2024 8:24	73	63	56	53	48	44	42

Notes: 1. Levels in this table are not necessarily the result of activity at site.  
 2. Non site constant construction and traffic noise was present during measurement  
 3. Constant non site traffic noise was present during measurement

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. This data was collected over a short duration of typically 5 minutes, however atmospheric conditions were observed to be relatively constant during the 15 minute noise measurement.

**Table 4.2** Measured (hand held meter) atmospheric conditions – May 2024

Location	Start date and time	Temperature °C	Wind speed m/s	Wind direction ° magnetic north <sup>1</sup>	Cloud cover 1/8s
NM4	17/05/2024 6:45	10	1.2	225-	1
NM4	17/05/2024 7:00	10	0.9	228-	1
NM3	17/05/2024 7:20	10	<0.5	--	1
NM2	17/05/2024 7:40	11	0.7	236-	0
NM1	17/05/2024 8:01	11	<0.5	--	0
NM5	17/05/2024 8:24	13	<0.5	--	0

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

### 4.2 Site only noise levels

#### 4.2.1 Modifying factors

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

#### 4.2.2 Monitoring results

Table 4.3 provides site noise levels in the absence of other sources, where possible, and includes weather data from the site AWS. Limits are applicable if weather conditions were within specified parameters during each measurement. The measurement at NM1 contained constant dominant non site traffic from Menangle Road which affected the  $L_{A90}$ . The non-site dominant source could not be eliminated by monitoring at an alternative or intermediate location. As an inaudible source is typically more than 10 dB below the measured background ( $L_{A90}$ ), the estimated site level is <50dB at NM1 and unlikely to be noticed during such relatively elevated background noise. Historic sampling at the same location has shown the site is compliant with the limit of 45dB.

The data shows that site was inaudible at all locations and confirms compliance with the site's consent conditions.

**Table 4.3 Site noise levels and limits – May 2024**

Location	Start date and time	Wind		Stability class	Limits apply? <sup>1</sup>	Limits, dB		Site levels, dB		Exceedances, dB <sup>1</sup>	
		Speed m/s	Direction <sup>3</sup>			$L_{Aeq,15minute}$	$L_{Amax}$	$L_{Aeq,15minute}$ <sup>2</sup>	$L_{Amax}$	$L_{Aeq,15minute}$	$L_{Amax}$
NM4	17/05/2024 6:45	0.7	189	A	Y	45	55	IA	IA	Nil	Nil
NM4	17/05/2024 7:00	0.8	202	A	Y	45	N/A	IA	N/A	Nil	N/A
NM3	17/05/2024 7:20	0.8	185	A	Y	54	N/A	IA	N/A	Nil	N/A
NM2	17/05/2024 7:40	0.6	185	A	Y	45	N/A	IA	N/A	Nil	N/A
NM1	17/05/2024 8:01	0.3	289	A	Y	45	N/A	IA	N/A	Nil	N/A
NM5	17/05/2024 8:24	0.5	231	A	Y	45	N/A	IA	N/A	Nil	N/A

Notes:

1. Noise emission limits are applicable if weather conditions were within parameters specified in Section 2.4. 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.



## 5 Summary

EMM was engaged by Menangle Sand and Soil Pty Ltd to conduct a noise survey of operations at the site. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified noise limits in the approved NMP.

Attended environmental noise monitoring described in this report was done during the shoulder or day period(s) of 17 May 2024 at five monitoring locations.

Noise levels from site complied with all relevant limits and consent noise conditions.

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# Appendix A

## Noise perception and examples

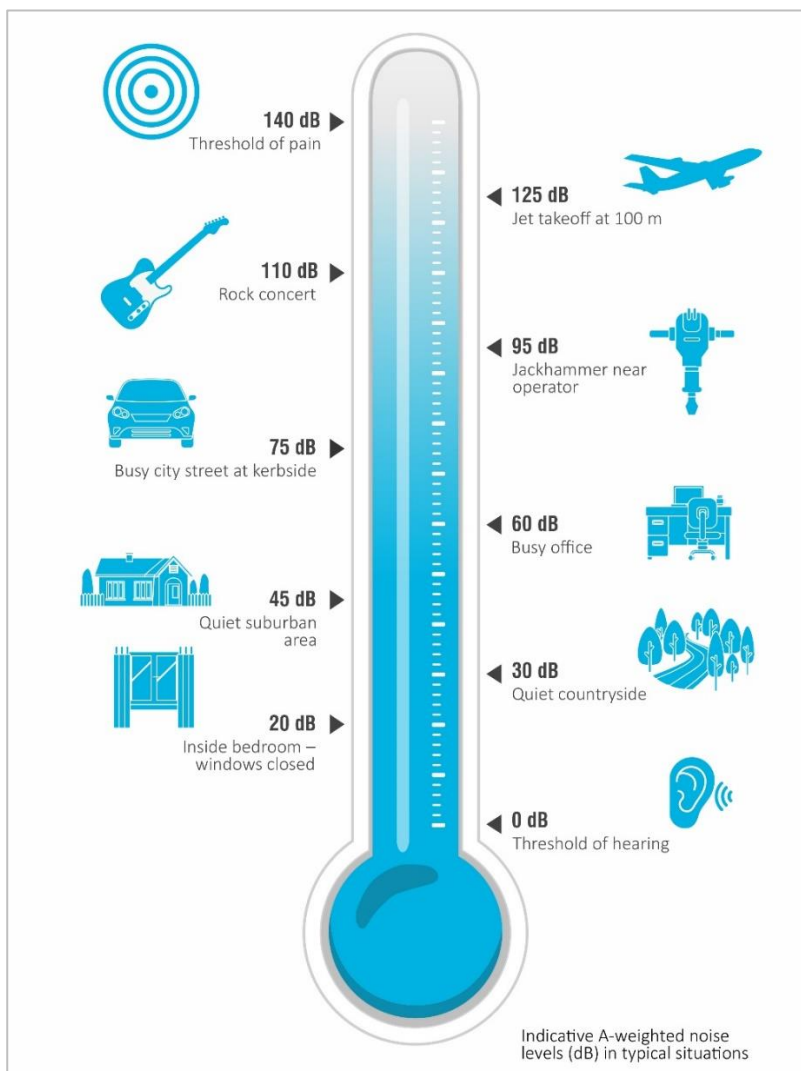
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## A.1 Noise levels

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

**Table A.1** Perceived change in noise

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



**Figure A.1** Common noise levels

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# Appendix B

## Regulator documents

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## PART B SPECIFIC ENVIRONMENTAL CONDITIONS

### EARLY WORKS

- B1. The Applicant may prepare an Early Works Construction Environmental Management Plan for the Early Works, to the satisfaction of the Planning Secretary. This plan must:
- (a) describe measures to be implemented to minimise construction-related impacts on biodiversity, including:
    - (i) specific measures to minimise impacts on tree hollows, termite mounds and fauna; and
    - (ii) detailed procedures for pre-clearance surveys and supervision (by an appropriately qualified person) of the felling of habitat trees within disturbance areas associated with the Early Works;
  - (b) describe measures to be implemented to manage sediment and erosion risks, including:
    - (i) a detailed description of the surface water management measures to be implemented in relation to the Early Works; and
    - (ii) appropriate clean water diversion systems and construction of appropriate erosion and sediment controls for the management of disturbed areas associated with the Early Works;
  - (c) include a Trigger Action Response Plan which outlines actions to be undertaken to rectify impacts associated with erosion and sedimentation during the Early Works (to the extent that these actions are not addressed by other management plans required to be in place prior to the commencement of Early Works); and
  - (d) describe detailed procedures to be implemented to receive, record, handle and respond to complaints associated with the Early Works construction.
- B2. If the Applicant opts to seek approval for Early Works, the Applicant must not commence Early Works until the Early Works Construction Environmental Management Plan is approved by the Planning Secretary.
- B3. If the Planning Secretary approves an Early Works Construction Environmental Management Plan, the Applicant must implement that plan as approved by the Planning Secretary.

### NOISE

#### Operational Noise Criteria

- B4. The Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 2 at any Residence on privately-owned land.

Table 2: Operational Noise Criteria dB(A)

Residences <sup>a</sup>	Day	Shoulder Period 6.00 am to 7.00 am Monday to Saturday	
	<i>L<sub>Aeq</sub></i> (15 minute)	<i>L<sub>Aeq</sub></i> (15 minute)	<i>L<sub>A</sub></i> (max)
2, 3, 5 <sup>b</sup> , 6, 7, 8, 9	45	45	55
4	54	52	62
10, 11	35	35	45
All other Residences	35	35	45

<sup>a</sup> Residence locations are shown as "Assessment Locations" in Figure 6 in Appendix 3.

<sup>b</sup> Receiver location 5 is representative of Residences in Menangle Village as identified in the red polygon on Figure 6 in Appendix 3.

Noise generated by the development must be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the *NSW Industrial Noise Policy* (EPA, 2000). Appendix 4 sets out the meteorological conditions under which these criteria apply and the requirements for evaluating compliance with these criteria.

- B5. The noise criteria in condition B4 do not apply if the Applicant has an agreement with the owner/s of the relevant residence or land to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement.

#### Noise Operating Conditions

- B6. The Applicant must:
- (a) take all reasonable steps to minimise all noise from operational activities, including low frequency noise and other audible characteristics, as well as road noise associated with the development;
  - (b) take all reasonable steps to minimise the noise impacts of the development during noise-enhancing meteorological conditions, particularly when the noise criteria in this consent do not apply (see Appendix 4);
  - (c) carry out regular attended noise monitoring (every three months unless otherwise agreed with the Planning Secretary) to determine whether the development is complying with the relevant conditions of Schedule 2; and



- (d) regularly assess the noise monitoring data and modify or stop operations on the site to ensure compliance with the relevant conditions of Schedule 2.

### Noise Management Plan

- B7. The Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:
- (a) be prepared by a suitably qualified and experienced person/s;
  - (b) be prepared in consultation with the EPA;
  - (c) describe the measures to be implemented to ensure:
    - (i) compliance with the noise criteria and operating conditions in this consent;
    - (ii) best practice noise management is being employed; and
    - (iii) noise impacts of the development are minimised during noise-enhancing meteorological conditions; under which the noise criteria in this consent do not apply (see Appendix 4); and
  - (d) include a monitoring program that:
    - (i) is capable of evaluating the performance of the development against the noise criteria;
    - (ii) monitors noise at the nearest and/or most affected residences; and
    - (iii) includes a protocol for identifying any noise-related exceedance, incident or non-compliance and for notifying the Department and relevant stakeholders of these events.
- B8. The Applicant must not commence Quarrying Operations in the Stage 8 Area until the Noise Management Plan is approved by the Planning Secretary.
- B9. The Applicant must implement the Noise Management Plan as approved by the Planning Secretary.

### AIR QUALITY

#### Odour

- B10. The Applicant must ensure that no offensive odours (as defined under the POEO Act) are emitted by the development.

#### Air Quality Criteria

- B11. The Applicant must ensure that particulate matter emissions generated by the development do not cause exceedances of the criteria in Table 3 at any residence on privately-owned land.

Table 3: Air Quality Criteria

<i><b>Pollutant</b></i>	<i><b>Averaging period</b></i>	<i><b>Criterion</b></i>	
Particulate matter < 10 µm (PM <sub>10</sub> )	Annual	<sup>a, c</sup> 25 µg/m <sup>3</sup>	
	24 hour	<sup>b</sup> 50 µg/m <sup>3</sup>	
Particulate matter < 2.5 µm (PM <sub>2.5</sub> )	Annual	<sup>a, c</sup> 8 µg/m <sup>3</sup>	
	24 hour	<sup>b</sup> 25 µg/m <sup>3</sup>	
Total suspended particulate (TSP) matter	Annual	<sup>a, c</sup> 90 µg/m <sup>3</sup>	
<sup>d</sup> Deposited dust	Annual	<sup>b</sup> 2 g/m <sup>2</sup> /month	<sup>a</sup> 4 g/m <sup>2</sup> /month

#### Notes:

<sup>a</sup> Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources).

<sup>b</sup> Incremental impact (i.e. incremental increase in concentrations due to the development on its own).

<sup>c</sup> Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary.

<sup>d</sup> Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method

- B12. The air quality criteria in Table 3 do not apply if the Applicant has an agreement with the owner/s of the relevant residence to exceed the air quality criteria, and the Applicant has advised the Department in writing of the terms of this agreement.

#### Air Quality Operating Conditions

- B13. The Applicant must:

## 3 Noise criteria

Noise criteria for the facility are stipulated in Table 2 of development consent Condition B4. The noise criteria are specified for the day and shoulder periods and apply at all residential receivers which have the potential to be impacted by operational noise from the quarry (refer to Figure 3.1 for the nearest residential receivers). The noise criteria for the facility are reproduced in Table 3.1.

**Table 3.1 Noise criteria**

Residences <sup>a</sup>	Day	Shoulder period 6 am to 7 am Monday to Saturday	
		L <sub>Aeq,15 minute</sub> dB(A)	L <sub>Amax</sub> dB(A)
2, 3, 5 <sup>b</sup> , 6, 7, 8, 9	45	45	55
4	54	52	62
10, 11	35	35	45
All other Residences	35	35	45

Notes:

a Residence locations are shown as “Assessment Locations” in Figure 6 in Appendix 3 [of the Consent].

b Receiver location 5 is representative of Residences in Menangle Village as identified in the red polygon on Figure 6 in Appendix 3 [of the consent].

1. Day period is between 7 am–6 pm Monday to Saturday and 8 am–6 pm Sundays and Public Holidays.

2. Shoulder period is between 6 am–7 am Monday to Saturday.

Condition B4 also states:

Noise generated by the development must be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy (EPA 2000). Appendix 4 sets out the meteorological conditions under which these criteria apply and the requirements for evaluating compliance with these criteria.

The noise criteria in Table 3.1 do not apply if Menangle Sand and Soil has negotiated an agreement with the owner/s of the relevant residence or land to exceed the noise criteria. As of the date of this report, Menangle Sand and Soil have not negotiated any agreements with any landowners or residents. As per Condition B5 of Schedule 2, Menangle Sand and Soil will advise the relevant authorities in writing of the terms of any negotiated agreements.

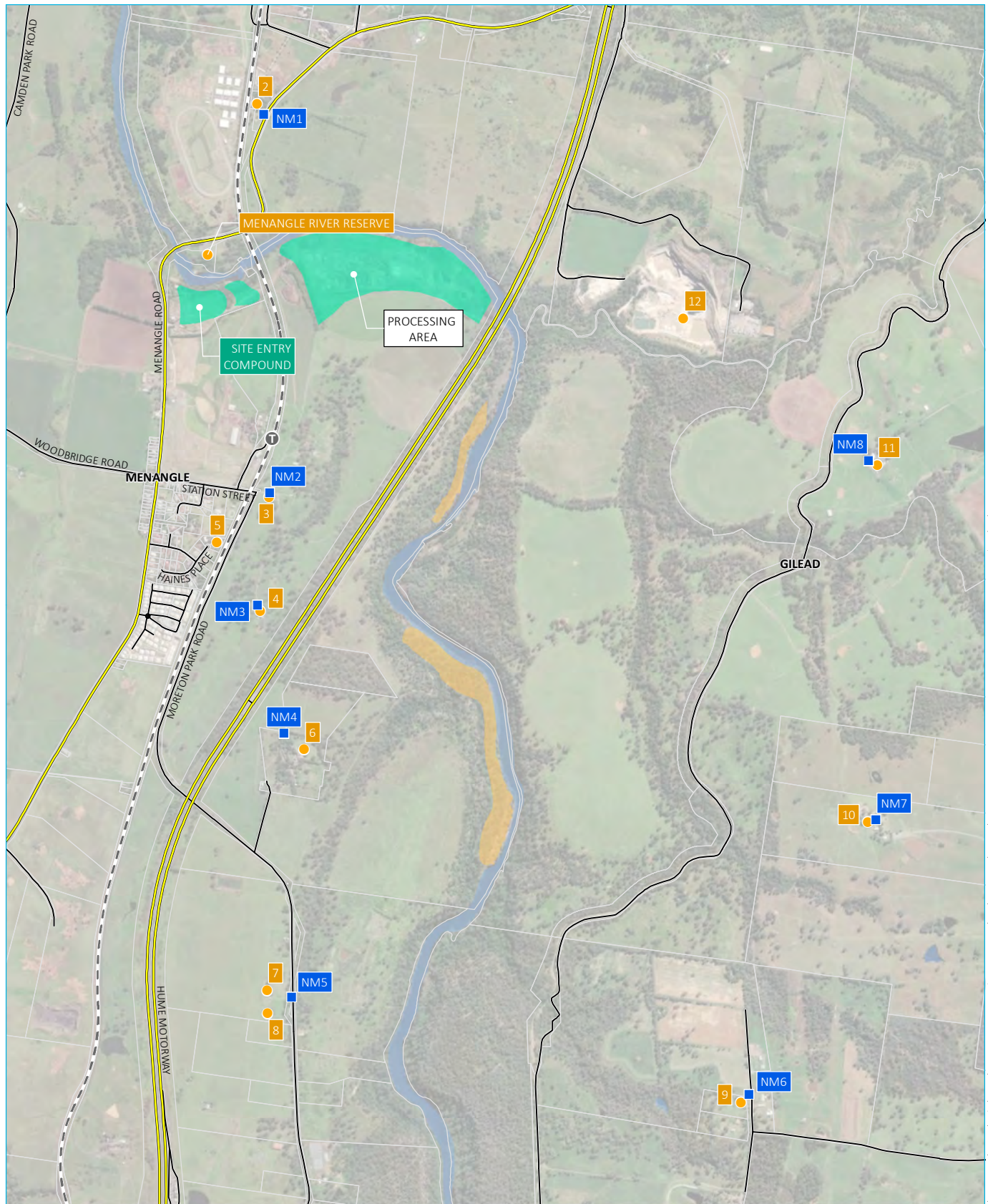
Compliance monitoring will adhere to the requirements of the EPA’s policies and guidelines.

As per Condition 3 of Appendix 4, a noise compliance assessment will be undertaken within two months of commencement of Quarrying Operations in the Stage 8 Area, with a report provided to the EPA within 1 month of the assessment. The assessment will be conducted by a suitably qualified and experienced acoustical practitioner and will assess compliance with noise criteria outlined in Table 3.1.

### 3.1 Sensitive receivers

The nearest noise sensitive receivers most likely to be affected by operational noise from the site is long-term living accommodation approximately 700 m to the south-west/west of the Stage 8 extraction area. There are also surrounding industrial premises including the Camden Coal Seam Gas (CSG) plant (no longer operational) and the Hi-Quality Menangle Park Quarry, which is approximately 300 m to the north-east of Stage 8 operations. Menangle River Reserve is approximately 1.3 km west of Stage 8 operations.

Figure 3.1 shows the site boundary, the nearest sensitive receivers and the attended noise monitoring locations.



## KEY

- Monitoring location
- Assessment location
- T Train station
- Rail line
- Main road
- Local road
- Nepean River
- Cadastral boundary
- Extractive operations
- Stage 8

Site boundary, sensitive receivers  
and noise monitoring locations

Menangle Sand and Soil  
Noise management plan  
Figure 3.1

# 5 Noise monitoring

## 5.1 Objective

The following conditions related to noise monitoring were included in the project consent under Condition B6 and have been reproduced below:

B6. The Applicant must:

- (c) carry out regular attended noise monitoring (every three months unless otherwise agreed with the Planning Secretary) to determine whether the development is complying with the relevant conditions of Schedule 2; and
- (d) regularly assess the noise monitoring data and modify or stop operations on the site to ensure compliance with the relevant conditions of Schedule 2.

The noise monitoring program is designed to verify that noise emissions from the quarry complies with the relevant noise criteria at the most affected residential receivers.

## 5.2 Noise monitoring standards

Noise monitoring will be undertaken in accordance with the relevant Australian standards and EPA guidelines including:

- AS 1055.1-2018 Acoustics – Description and Measurement of Environmental Noise – General Procedures;
- AS IEC 61672.1-2019 ‘Electroacoustics – Sound Level Meters – Specifications’;
- INP (EPA 2000) and Application Notes; and
- NPfI (EPA 2017).

It is noted that the INP has been replaced by the NPfI. However, the INP continues to apply in accordance with the EPA’s *Implementation and Transitional Arrangements for the Noise Policy for Industry* (EPA 2017) where the INP is referenced in existing statutory instruments, as is the case from Menangle Quarry).

Further, the INP Application Notes state that Section 4 of the INP has been withdrawn and the modifying factor adjustments outlined in Fact Sheet C of the NPfI are to be used when assessing potentially annoying characteristics of a noise source. Fact sheet C of the Npfl (EPA 2017) provides guidelines for applying corrections to account for annoying noise characteristics such as tonal noise and low frequency noise.

The INP and Fact Sheet C of the Npfl have been adopted for the purpose of this NMP.

All acoustic instrumentation proposed for monitoring under the noise monitoring program will have current NATA or manufacturer calibration certificates as per the relevant Australian standards.

## 5.3 Noise monitoring locations

Quarterly attended monitoring locations will be representative of the nearest privately owned receptors to active operations at the time of monitoring. The pool of attended monitoring locations are listed in Table 5.1 and shown on Figure 3.1. A selection of attended monitoring locations will be used each quarter from a pool of eight locations to represent the nearest affected privately-owned residences.



In order to satisfy Conditions B4 and B6, Menangle Sand and Soil will conduct quarterly attended noise monitoring at a representative sample of the points identified in Table 5.1 and shown in Figure 3.1. Data used for determining meteorological conditions will be sourced from the on-site meteorological station.

**Table 5.1 Pool of attended noise monitoring locations**

ID	Description	Easting (MGA)	Northing (MGA)	Representative residences	Representative direction
NM1	Menangle Road North	291937	6223124	R2	NW
NM2	Station Street North	291964	6221374	R3, R5	W
NM3	Station Street East	291907	6220855	R4	W
NM4	Morton Park Road North	292028	6220262	R6	SW
NM5	Morton Park Road South	292064	6219045	R7, R8	SW
NM6	Bulli Appin Road South	294179	6218595	R9	SE
NM7	Bulli Appin Road North	294766	6219863	R10	E
NM8	Appin Road	294732	6221523	R11	NE

## 5.4 Noise monitoring program

The attended noise monitoring will be completed on a quarterly basis to verify that noise emissions from the facility satisfy the relevant noise criteria at representative residential receivers. The attended noise monitoring program will be used to:

- estimate the site noise contribution from the measured noise levels;
- determine the individual noise sources contributing to the ambient noise environment wherever possible;
- determine whether a correction for annoying noise characteristics should be applied to the site noise level before comparison with the relevant noise criteria in accordance with the Npfl; and
- gain an understanding of the effects of meteorological conditions on the propagation of noise from site to surrounding residential receivers.

The attended noise monitoring will be completed during the morning shoulder (6 am–7 am) and day (7 am–6 pm) periods.

During the morning shoulder period, attended noise monitoring will only occur at NM4, as NM4 is the only assessment location with a more stringent morning shoulder noise criteria compared with daytime noise criteria.

During the day period, the noise monitoring locations selected for each monitoring event will be dependent on the location of quarrying operations and the meteorological conditions present on the day of the noise monitoring. As such, the quarterly noise monitoring events will target the worst affected noise monitoring locations from the pool detailed in Table 5.1.

In summary, each quarterly monitoring event will entail:

- attended noise monitoring at NM4 during the morning shoulder period (6 am–7 am); and



- attended noise monitoring at the predicted worst-case noise monitoring locations (selected based on quarry operations and meteorological conditions) during the day period (7 am–6 pm).

For each 15-minute attended noise measurement, the following information will be recorded:

- name of monitoring personnel;
- monitoring location;
- date(s) and time(s) at which the monitoring measurement started and ended at each location;
- height of the microphone above the ground and, if relevant, distances to building facades or property boundaries (if monitoring cannot be completed within the property boundary);
- quantitative meteorological data such as wind speed (including the height above ground at which the measurement was taken), wind direction, temperature and humidity;
- qualitative meteorological information such as cloud cover, fog or rainfall;
- instrument type and in-field calibration details before and after the monitoring period;
- the  $L_{Aeq,15min}$  noise level for the 15-minute period;
- statistical noise level descriptors over the 15-minute interval:  $L_{Amin}$ ,  $L_{A90}$ ,  $L_{A10}$ ,  $L_{A1}$  and  $L_{Amax}$ ;
- notes that identify the noise sources that contribute to the overall noise environment;
- an estimate of the noise contribution from the facility and from other identifiable noise sources;
- measurement in one-third octave bands from 10 Hz to 8 kHz inclusive (or a broader range of bands) for the 15-minute interval to assess if site noise exhibit tonal characteristics that may require the application of a correction for annoying noise characteristics in accordance with Fact Sheet C of the NPfI. The method for determining if a correction for tonal noise is applicable is presented in Section 5.8.1;
- measurement of C-weighted and A-weighted site noise levels to identify the likely presence of low frequency noise in accordance with Fact Sheet C of the NPfI. The method for determining if a correction for low frequency noise is applicable is presented in Section 5.8.2;
- data suitable for assessing the relative contribution of site noise to the overall noise level being measured by using a low-pass filter, which will be developed during the first round of monitoring (eg with a low-pass frequency of 630 Hz); and
- recommendations or comments where considered appropriate.

In accordance with the methodology outlined in Section 3 of the INP (EPA 2000), if any of the data in a 15-minute period is affected by rain or wind speeds in excess of 3 m/s, and where possible, another entire 15-minute period of data unaffected by rain or adverse wind conditions shall be undertaken.

## 5.5 Instrumentation

All noise monitoring instrumentation will meet the requirements of AS IEC 61672.1-2019 and carry current NATA or manufacturer calibration certificates. Instrument in-field calibration will be checked before and after each survey, with the variation in calibrated levels not exceeding  $\pm 0.5$  dB.

The sound level meter will be programmed to record statistical noise level indices continuously for each 15-minute interval, including  $L_{A1}$ ,  $L_{A10}$ ,  $L_{A90}$ ,  $L_{Amin}$ ,  $L_{Aeq}$  and  $L_{Amax}$ , using 'fast' time response.

## 5.6 Meteorological monitoring

Condition B17 of the development consent relates to the establishment of a meteorological monitoring station in the vicinity of the quarry and states the following:

Prior to the commencement of Quarrying Operations in the Stage 8 Area, and for the life of the development, the Applicant must ensure that there is a suitable meteorological station operating in close proximity to the site that:

- (a) complies with the requirements in the Approved Methods for Sampling and Analysis of Air Pollutants in New South Wales (DEC 2007); and
- (b) is capable of measuring meteorological conditions in accordance with the NSW Industrial Noise Policy (EPA 2000),

unless a suitable alternative is approved by the Planning Secretary following consultation with the EPA.

The meteorological station at the quarry will be located to the east of the site entry compound and will satisfy requirements of the NSW Industrial Noise Policy and Australian Standard AS 3580.14-2014 *Methods for sampling and analysis of ambient air Part 14: Meteorological monitoring for ambient air quality monitoring applications*.

## 5.7 Meteorological parameters

Consent Condition B4 states:

Noise generated by the development must be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy (EPA 2000). Appendix 4 sets out the meteorological conditions under which these criteria apply and the requirements for evaluating compliance with these criteria.

The meteorological conditions during the noise monitoring will be recorded including wind speed (including the height above ground at which the measurement was taken), wind direction, temperature, humidity, cloud cover and the presence of fog and rain (if any).

The meteorological conditions will be used to determine if the noise criteria (refer to Table 3.1) apply in accordance with the INP. Condition 1 of Appendix 4 states that:

The noise criteria in condition B4 of Schedule 2 are to apply under all meteorological conditions except the following:

- (a) where  $3^{\circ}\text{C}/100$  metres (m) lapse rates have been assessed, then:
  - (i) wind speeds greater than 3 metres/second (m/s) measured at 10m above ground level;
  - (ii) temperature inversion conditions between  $1.5^{\circ}\text{C}$  and  $3^{\circ}\text{C}/100\text{m}$  and wind speeds greater than 2m/s measured at 10m above ground level; or

- (iii) temperature inversion conditions greater than 3°C/100m.
- (b) where Pasquill Stability Classes have been assessed, then:
  - (i) wind speeds greater than 3m/s at 10m above ground level;
  - (ii) stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or
  - (iii) stability category G temperature inversion conditions.

## 5.8 Corrections for annoying noise characteristics

The INP application notes state that Section 4 of the INP has been withdrawn and the corrections outlined in Fact Sheet C of the NPfI are to be used when assessing the characteristics of a noise source. The NPfI specifies corrections for noise with annoying characteristics such as tonal noise and low frequency noise. These are discussed in the following sections.

### 5.8.1 Tonal noise

Tonal noise can be defined as noise levels containing a prominent frequency and characterised by a definite pitch. Examples of tonal noise sources include ventilation fans, reversing beepers or alarms. The method for assessing the presence of tonal noise involves comparing differences in noise levels between neighbouring one-third octave centre frequency bands.

Fact sheet C of the NPfI provides guidelines for applying a correction to account for tonal noise emissions. The NPfI specifies that a 5 dB positive adjustment is applicable where the level of any of the one-third octave bands exceeds the level of both adjacent bands by:

- 5 dB or more if the centre frequency of the band containing the tone is in the range 500–10,000 Hz;
- 8 dB or more if the centre frequency of the band containing the tone is in the range 160–400 Hz; or
- 15 dB or more if the centre frequency of the band containing the tone is in the range 25–125 Hz.

### 5.8.2 Low frequency noise

Low frequency noise can be characterised as noise containing dominant energy within the low frequency range (ie less than 200 Hz). Examples of low frequency noise sources can include screens and centrifuges in coal washeries, as well as pumps, fans, boilers, ventilation plant, electrical installations and wind turbines.

Fact sheet C of the NPfI provides guidelines for applying a correction to account for low frequency noise emissions. The NPfI specifies that a difference of 15 dB or more between site 'C-weighted' and site 'A-weighted' noise emission levels identifies the potential for an unbalanced spectrum and potential increased annoyance. Where a difference of 15 dB or more between site 'C-weighted' and site 'A-weighted' noise emission levels is identified, the measured one-third octave noise levels should be compared to the values in Table C2 of the NPfI, which has been reproduced in Table 5.2.

**Table 5.2 One-third octave low-frequency noise thresholds**

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

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

- where any of the one-third octave noise levels in Table 5.2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2 dB positive adjustment to measured A-weighted levels applies for the evening/night period; or
- where any of the one-third octave noise levels in Table 5.2 are exceeded by more than 5 dB and cannot be mitigated, a 5 dB positive adjustment to measured A-weighted levels applies for the evening/night period and a 2 dB positive adjustment to measured A-weighted levels applies for the day period.

Hence, where possible throughout each survey the difference between site 'C-weighted' and site 'A-weighted' noise emission levels will be estimated by the operator by matching audible sounds with the response of the analyser ( $L_{Ceq}-L_{Aeq}$ ). Where this is deemed to be 15 dB or greater, the measured one-third octave frequencies will be compared to the values in Table 5.2 to identify the relevant correction (if applicable). It is of note that the NPfI states that low frequency noise correction does not apply during adverse meteorological conditions, including during wind speeds above 3 m/s at 10 m above ground level, stability category F with wind speeds above 2 m/s at 10 m above ground level, or during stability category G.

## 5.9 Data analysis

The  $L_{Aeq,15min}$  noise level contribution from the facility as well as the overall ambient noise levels together with the weather and site operating conditions will be reported on a quarterly basis.

The contributed noise emissions from operations at the facility will be evaluated and assessed against the noise level criteria given in Table 2 of development consent Condition B4 (refer to Table 3.1) during each quarterly noise monitoring event. Compliance may be determined by:

- post analysis of data (including through the review of audio recordings);
- direct measurement against the  $L_{Aeq,15min}$  criteria;
- operator estimated  $L_{Aeq,15min}$  contribution;
- by calculation from near field measurements;
- by measurement at a representative location; or
- a combination of any or all the above methods as approved by the EPA or in accordance with the INP or NPfI as relevant.

## 5.10 Noise exceedance protocol

If attended noise monitoring identifies that the noise criteria as per Table 3.1 have been exceeded, the person conducting the attended noise monitoring will follow the noise exceedance protocol presented in Figure 5.1.

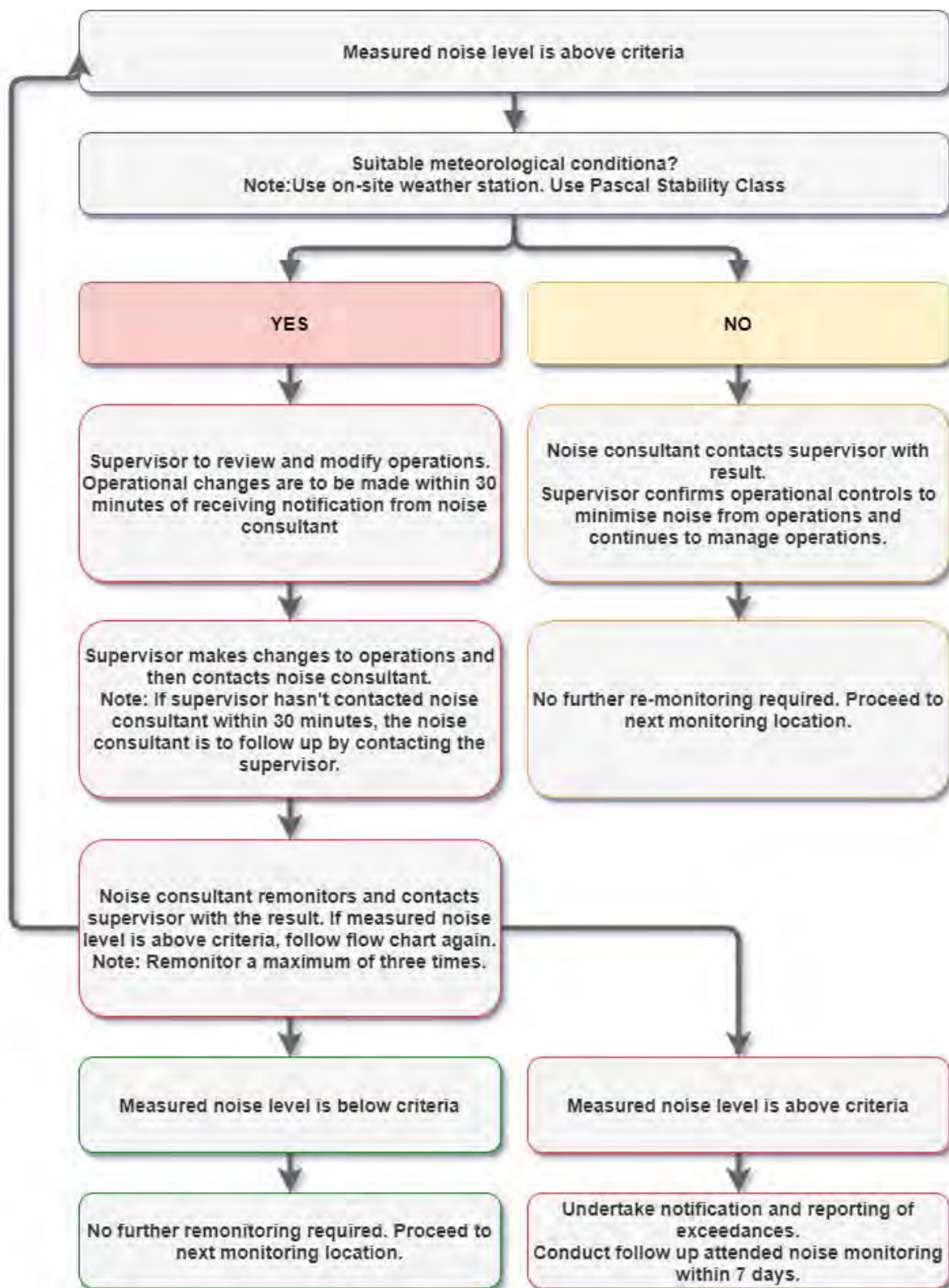


Figure 5.1 Noise exceedance protocol



The relevant supervisor will document and report to the Quarry Manager any actions implemented following the notification of the exceedance. The exceedance is required to be reported to DPE and EPA by the Quarry Manager (or delegate) immediately upon Menangle Sand and Soil becoming aware of the exceedance. An additional attended noise monitoring survey will be completed within one week if the exceedance could not be effectively reduced below the relevant criteria on the night of noise monitoring.

Within 7 days of detecting an exceedance of the noise criteria as per Table 3.1, Menangle Sand and Soil shall provide a written report of the exceedance to DPE. This report must:

- describe the date, time, and nature of the exceedance/incident;
- identify the cause (or likely cause) of the exceedance/incident;
- describe what action has been taken to date; and
- describe the proposed measures to address the exceedance/incident.

Any exceedance above the noise limits identified in Table 3.1 will be reported in the annual noise compliance assessment report required under Condition R4.3 of EPL and noise monitoring reports will be available upon request.

### 5.11 Noise monitoring report

All routine monitoring results will be documented and reported initially on a quarterly basis.

Quarterly reports will consist of the following information:

- summary of all attended noise monitoring results;
- measured, calculated and/or operator estimated site  $L_{Aeq,15min}$  contributed noise levels for each monitoring location;
- statement of compliance/non-compliance; and
- details of any complaints relating to noise and their state of resolution.

The noise monitoring contractor undertaking the monitoring on behalf of Menangle Sand and Soil will provide the site representative with a monitoring report outlining the results and outcome of the survey.

The site representative will review the monitoring report provided by the contractor to assess compliance with the criteria outlined in Table 2 of development consent Condition B4 (refer to Table 3.1). A summary of quarterly noise monitoring results will be published on the Menangle Sand and Soil website, as per Condition D15.

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# Appendix C

## Calibration certificates

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**Acoustic  
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# Sound Level Meter

## IEC 61672-3:2013

# Calibration Certificate

Calibration Number C23471

<b>Client Details</b>		EMM Consulting Ground Floor Suite 01, 20 Chandos Street
<b>Equipment Tested/ Model Number :</b>		Type 2250
<b>Instrument Serial Number :</b>		3008201
<b>Microphone Serial Number :</b>		2888134
<b>Pre-amplifier Serial Number :</b>		16037
<b>Firmware Version :</b>		N/A
<b>Pre-Test Atmospheric Conditions</b>		<b>Post-Test Atmospheric Conditions</b>
<b>Ambient Temperature :</b> 23.1 °C		<b>Ambient Temperature :</b> 24.3 °C
<b>Relative Humidity :</b> 44 %		<b>Relative Humidity :</b> 44.1 %
<b>Barometric Pressure :</b> 101.6 kPa		<b>Barometric Pressure :</b> 101.3 kPa
<b>Calibration Technician :</b> Max Moore		<b>Secondary Check:</b> Rhys Gravelle
<b>Calibration Date :</b> 12 Jul 2023		<b>Report Issue Date :</b> 17 Jul 2023
<b>Approved Signatory :</b> 		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	Pass
15: Long Term Stability	Pass	20: Overload Indication	Pass
16: Level linearity on the reference level range	Pass	21: High Level Stability	Pass

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

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

		<b>Uncertainties of Measurement -</b>	
		<b>Environmental Conditions</b>	
Acoustic Tests		<i>Temperature</i>	$\pm 0.1$ °C
125Hz	$\pm 0.13$ dB	<i>Relative Humidity</i>	$\pm 1.9$ %
1kHz	$\pm 0.13$ dB	<i>Barometric Pressure</i>	$\pm 0.014$ kPa
8kHz	$\pm 0.14$ dB		
Electrical Tests	$\pm 0.13$ dB		

*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.

# CERTIFICATE OF CALIBRATION

CERTIFICATE No: **C36957**

EQUIPMENT TESTED : Sound Level Calibrator

Manufacturer: Svantek

Type No: SV36 Serial No: 138019

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

Tests Performed: Measured Output Pressure level, Frequency & Distortion

Comments: See Details overleaf. All Test Passed.

Parameter	Pre-Adj	Adj Y/N	Output: (dB re 20 µPa)	Frequency (Hz)	THD&N (%)
Level1:	NA	N	93.94 dB	999.97 Hz	0.63 %
Level2:	NA	N	113.97 dB	999.97 Hz	0.40 %
Uncertainty			±0.11 dB	±0.05%	±0.20 %
Uncertainty (at 95% c.i.) k=2					

## CONDITION OF TEST:

Ambient Pressure 1012 hPa ±1 hPa  
Temperature 23 °C ±1° C  
Relative Humidity 40 % ±5%

Date of Receipt : 28/07/2023  
Date of Calibration : 01/08/2023  
Date of Issue : 01/08/2023

Acu-Vib Test AVP02 (Calibrators)

Procedure: Test Method: AS IEC 60942 - 2017

CHECKED BY: .....

AUTHORISED  
SIGNATURE: .....

*Hein See*

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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