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RFI Response - Noise

Job No.:	70B-22-0096	**Doc. No:**	78653-0-draft
Attention:	Gary Peacock	**Author:**	Patrick Drake
Company:	Outline Planning Consultants Pty ltd	**Reviewed by:**	N/A
Email:	gpeacock@outline.com.au	**Issued by:**	[Issuer's name will appear here]
Subject:	RFI Response - Noise		

Dear Gary,

The following letter is in response to the request for additional information issued on the 8th of May, 2024 by Gunnedah Shire Council in relation to the development application No. 2023/046 for the proposed lateral expansion of 'Bolgers Pit' (809 Oakey Creek Road, Piallaway). This letter should be read in conjunction with the revised Noise and Vibration Impact Assessment (report ref: 70B-22-0096-TRP-36720-4) dated 24th of June, 2024.

We trust this meets your requirements in addressing each item appropriately. Should you have any queries, please do not hesitate to contact Vipac.

Yours faithfully,

Vipac Engineers & Scientists Ltd

The issuer's signature will appear here once the document has been issued.

[Issuer's name will appear here]

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1. Noise Impact Assessment Items

Vipac provide the following commentary on each item raised by Gunnedah Shire Council.

> *a) The Noise Impact Assessment is to be updated to consider traffic noise generated along Denver Lane should it be included within the vehicle haul route.*

Although it is not part of the proposal, Denver Lane has been included in the haul route traffic noise assessment in Section 6 of the revised report. The associated Traffic Impact Assessment has not included Denver Lane as part of its survey, therefore appropriate assumptions surrounding expected AADT values have been used as a result. Haul route noise impacts along Denver Lane are predicted to comply with the relevant criteria without the need for acoustic mitigation.

> *b) The Noise Impact Assessment is to be updated to address noise impacts for operation of the site during hours 7:00am-8:00am Saturday, which are considered within the NSW EPA Noise Policy for Industry to be night period and required more constrained noise limits.*

This is incorrect. The notes below Table 2-2 in Section 2.4 of the Noise Policy for Industry states the following:

'Time of day is defined as follows:

- Day – the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays.
- Evening – the period from 6pm to 10pm
- Night – the remaining periods.

Consequently. 7:00am-8:00am on Saturday is during the 'Day' period. No further assessment required.

> *c) Was the operation of a Diesel Generator as an electrical power source considered within the Noise Impact Assessment? If not, the Noise Impact Assessment is to be updated to include the impacts on the surrounding environment and receivers.*

There is no Diesel Generator proposed to operate on the site and has not been assessed as a result.

> *d) The Noise and Vibration Impact Assessment indicated that during neutral weather conditions, exceedances are recorded at receivers NSR2 and NSR3. Provide mitigation measures that would ensure that there are no noise level exceedances occur during neutral weather conditions.*

This is incorrect. There are no predicted exceedances at any applicable receptor during neutral and worst case weather conditions across all scenarios. No further assessment or mitigation investigation is required.

> *e) Results of Table 8-2 of the Noise and Vibration and Impact Assessment appear to be considered incorrectly against the noise levels for Highways and Arterial Roads. The table should be updated to be assessed against the local roads within Table 4-3.*

Principal haulage routes are to be assessed against the criteria for arteria/sub-arterial roads in accordance with Section 2.2.2 of the New South Wales Road Noise Policy (RNP). The report also states this in Section 4.2. It is evident that the predicted traffic noise levels comply with both criteria (i.e. $L_{Aeq,1hr}$ 55 and $L_{Aeq,15hr}$ 60), irrespective of the road category classification.

> *f) 8.4 of the Noise and Vibration Impact Assessment indicates that total traffic noise level should be limited to 2dB(A) above that of the corresponding existing noise level at any residential property. However, Table8-2 indicates 5 receivers with a greater than 2db(A) difference existing to future. What mitigation measures are required to ensure that this increase is not experienced. This should also include any receivers considered along any additional roads for the haulage route (Denver Lane or Hogarth Street).*

This is incorrect. The aforementioned criteria is only applicable to receptors at which the existing traffic noise levels already exceed the criteria, of which there are none anticipated. No further assessment or mitigation assessment is required.

> *g) Provide comment as to why results of Table 7-2 and 7-3 are different for cumulative results. There is no explanation provided which explains the discrepancy.*

This comment appears to have been made in error. This is applicable to the Air Quality Assessment, not Noise.

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Outline Planning Consultants Pty ltd

Bolgers Pit

Noise and Vibration Impact Assessment

70B-22-0096-TRP-36720-4

24 June 2024

Job Title:	Bolgers Pit
Report Title:	Noise and Vibration Impact Assessment
Document Reference:	70B-22-0096-TRP-36720-4

Prepared For:	**Prepared By:**
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Reviewer:	Jackson Yu 9 February 2023	Principal Acoustic Consultant, Team Leader (B.I.E.)
Issued By:	Patrick Drake The issuer's signature will appear here once the document has been issued.	Senior Acoustic Consultant

Revision History:

Rev. #	*Comments / Details of change(s) made*	*Date*	*Revised by:*
Rev. 00	Original issue	9 Feb 23	
Rev. 01	Amends as per client comments on 24/02/2023	8 Mar 23	HM, PD
Rev. 02	Minor client comment update	14 Mar 23	PD
Rev. 03	Client comment	22 Mar 23	PD
Rev. 04	Minor Update	24 Jun 24	PD

Executive Summary

Vipac Engineers and Scientists Ltd was engaged by Outline Planning Consultants Pty Ltd on behalf of Gunnedah Shire Council (the Proponent) to prepare a noise and vibration impact assessment to support a development consent for the lateral expansion of an active quarry (the Project) at No. 809 Oakey Creek Road, Piallaway NSW 2342, known as 'Bolgers Pit'. The Proponent wishes to regularise the use of this quarry and to laterally expand the active quarry pit through the development approval process. The project site has an area of 2.71ha, which includes land proposed for lateral expansion of the quarry.

The purpose of this assessment is to evaluate the potential impacts of noise and vibration generated by the expansion and to provide recommendations to mitigate any potential impacts that might have an effect on any sensitive receptors.

Noise modelling has been undertaken using the SoundPLAN 8.2 computational noise modelling software package for three different operational scenarios supplied by Outline Planning Consultants (excavator only noise source, middle-west noise sources, and northeast noise sources scenarios).

Noise emissions have been calculated and are predicted to comply at all receptors during the middle west noise sources, and northeast noise sources scenarios for all weather condition scenarios. Noise levels are predicted to exceed at NSR2 and NSR3 during neutral weather conditions, with the addition of NSR4 during worst case weather conditions in the excavator only scenario.

Investigating predicted site-specific wind directions from wind roses generated from TAPM-CALMET modelling (Vipac AQ report: 70B-22-0096-TRP-47532-2), operational noise levels are predicted to comply for all receptors without the need for acoustic mitigation.

Traffic noise impacts along four designated haul routes are predicted to comply without the need for acoustic mitigation.

Vibration emissions during blasting are predicted to comply provided the MIC quantities outlined in this report are not exceeded. Vibration emissions during normal operation are predicted to comply largely due to the substantial distance between the site and the nearest receptors.

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1 Introduction

1.1 Overview

Vipac Engineers and Scientists Ltd was engaged by Outline Planning Consultants Pty Ltd on behalf of Gunnedah Shire Council (the Proponent) to prepare a noise and vibration impact assessment to support a development consent for the lateral expansion of an active quarry (the Project) at No. 809 Oakey Creek Road, Piallaway NSW 2342, known as 'Bolgers Pit'. The Proponent wishes to regularise the use of this quarry and to laterally expand the active quarry pit through the development approval process. The project site has an area of 2.71ha, which includes land proposed for lateral expansion of the quarry.

1.2 Study Objectives and Requirements

The NSW Environment Protection Authority (EPA) has considered the details of the proposals as provided by the Department of Planning, Industry and Environment (DPIE) and identified the information it requires to issue its general terms of approval[1]. The key requirements specified in relation to noise and vibration and how the requirements are addressed within this document are summarised in Table 1-1. Vipac have attempted to contact the EPA to further discuss the requirements below in order to approach each requirement appropriately.

The purpose of this assessment is to evaluate the potential impacts of noise and vibration generated from the Project which addresses the specific EPA requirements and provide recommendations to mitigate any potential impacts that might have an effect on nearby sensitive receptors.

Table 1-1 - Summary of EAR

Requirements	How Requirement is Addressed
4.1 Construction noise associated with the proposed development should be assessed using the *Interim Construction Noise Guideline* (DECC, 2009). These are available at: https://www.epa.nsw.gov.au/your-environment/noise/industrial-noise/interim-construction-noise-guideline	Construction noise associated with quarry and mining is not covered by the Interim Construction Noise Guideline (in accordance with Section 1.2 of the Guideline). Instead it states construction noise for quarries is assessed under the Noise Policy for Industry. Construction noise is addressed as the 'Excavator Only' scenario throughout the report.
4.2 Vibration from all activities (including construction and operation) to be undertaken on the premises should be assessed using the guidelines contained in the *Assessing Vibration: a technical guideline* (DEC, 2006). These are available at: https://www.epa.nsw.gov.au/your-environment/noise/industrial-noise/assessing-vibration	Vibration levels from the quarry road traffic movements along the surrounding road networks were assessed in Section 6 at the closest receivers along the haul routes. Vibration from Quarry operation is addressed in Section 7.1.
4.3 If blasting is required for any reasons during the construction or operational stage of the proposed development, blast impacts should be demonstrated to be capable of complying with the guidelines contained in *Australian and New Zealand Environment Council – Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration* (ANZEC, 1990). These are available at: https://www.epa.nsw.gov.au/your-environment/noise/industrial-noise/interim-construction-noise-guideline	Blasting impacts are addressed in Section 7.2.
4.4 Operational noise from all industrial activities (including private haul roads and private railway lines) to be undertaken on the premises should be assessed using the guidelines contained in the *NSW Noise Policy for Industry* (EPA, 2017). https://www.epa.nsw.gov.au/your-environment/noise/industrial-noise/noise-policy-for-industry-(2017)	Operational noise of the existing quarry operations (in current quarry stage, see Section 2.3.1), as well as the future quarry operations (in the future quarry pit stage, see Section 2.3.2) were modelled and illustrated under Section 5.2.1. Details of the modelling and methodology are shown in Section 5, results are shown in Section 8.1. Road traffic noise from existing quarry truck movements

	along the haul routes were also assessed in the road traffic noise impact assessment in Section 8.3.
4.5 Noise on public roads from increased road traffic generated by land use developments should be assessed using the guidelines contained in the *NSW Road Noise Policy* and associated application notes (EPA, 2011). https://www.epa.nsw.gov.au/your-environment/noise/transport-noise	A road traffic noise impact assessment was conducted for the potential increase in quarry truck movements along the haul routes in Section 8.3 at a number of closest receivers along the haul routes.

2 Project Description

'Bolgers Pit' is one of Council's larger borrow pits, located at No. 809 Oakey Creek Road, Piallaway NSW 2342, in the south-east portion of the Gunnedah Shire, located approximately 32km to the south-east of the Gunnedah township. The Proponent wishes to regularise the use of this quarry and to laterally expand the active quarry pit through the development approval process. The project site has an area of 2.71ha, which includes land proposed for lateral expansion of the quarry.

2.1 Site Location

Bolgers Pit site is located in the Gunnedah Shire in northern NSW. Gunnedah Shire is a largely rural area, with most of the population living in the township of Gunnedah and the villages of Breeza, Carroll, Curlewis, Mullaley and Tambar Springs. The nearest village, Breeza, lies approximately 29km to the south west.

The surrounding area comprises mainly rural properties on large agricultural holdings, with livestock grazing and the growing of grain the predominant land uses. Most of the land to the west is cleared and cultivated land, with forested land immediately to the east and to the north.

The Project Site location, approximate quarry footprint and proposed expansion are illustrated in Figure 2-1 and Figure 2-2.

Figure 2-1: Project Site Location

Figure 2-2: Proposed Expansion

2.2 Noise Sensitive Receptors

The locality is sparsely populated, with the nearest rural residences described in the following:

- NSR1 – The active quarry face is approximately 1150m to the south of a rural dwelling, located on the east side of Oakey Creek Road ('Iventure'), NSR1.
- NSR2 – The active quarry face is approximately 576m to the south-west of the nearest rural dwelling, located on the west side of Oakey Creek Road ('Coppins'), NSR2.
- NSR3 – The active quarry face is approximately 562m to the south of a rural dwelling, located on the east side of Oakey Creek Road ('Wyalla'), NSR3.
- NSR4 – The active quarry is approximately 592m to the north-east of a rural dwelling, located on the west side of Oakey Creek Road ('Yarralee'), NSR4.
- *NSR5 – The active quarry face is approximately 447m to the north-east of a rural dwelling, located on the east side of Okay Creek Road (Mimbil'), NSR5*

Note that the building at NSR5 ('Mimbil') was confirmed by Outline Planning Consultants (the Town Planner) to be the residence of the Quarry owner and is not considered to be a sensitive receptor for the purposes of this assessment.

The locations of the nearest potentially affected noise sensitive receivers to the quarry are shown in Figure 2-3.

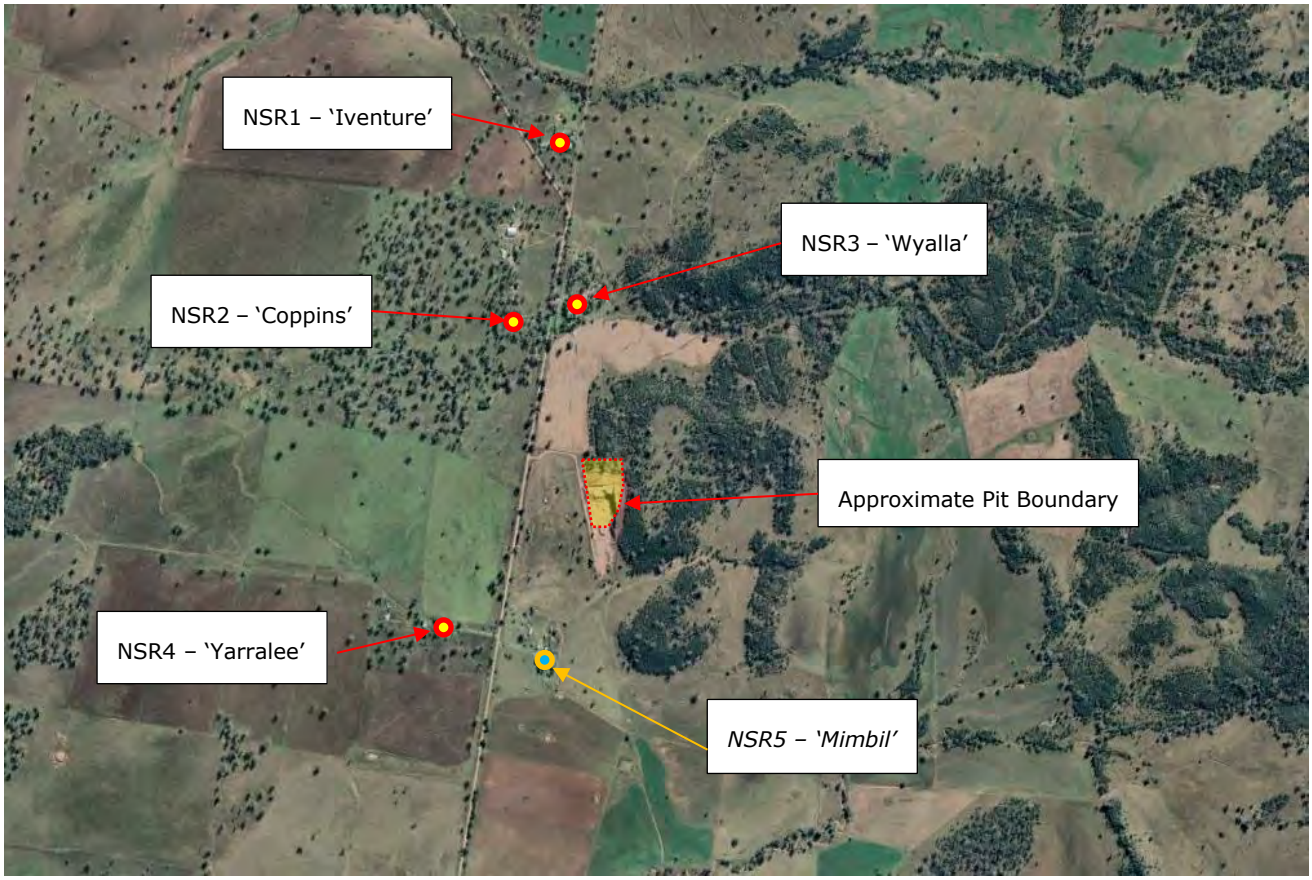


Figure 2-3: Sensitive Receptor Locations

2.3 Quarry Operation

2.3.1 Existing Operation

The existing operations involve extraction from the north-eastern section of the quarry pit, with processing of quarry products within the processing area and stockpiling of quarry products prior to dispatch by road via Oakey Creek Road.

The site does not contain any existing infrastructure, save for sediment ponds and road access back from the quarry pit to Oakey Creek Road. All quarry processing plant is brought into the site on a campaign basis, as required. To date, the quarry has produced up to 18,355 tonnes of quarry product in any one year (2018). The quarry material at this quarry is won by blasting of the quarry rock.

2.3.2 Proposed Operation

Council proposes to regularise the use of the site as a quarry at the same time as seek approval for a modest lateral extension of the quarry with a rate of extraction of up to 40,000 tonnes per annum and a total additional resource of just over 306,000 cubic metres (equivalent to about 734,000 tonnes). Table 2-1 summarises the key project components.

Table 2-1: Key Project Components

Quarry component	Summary description
Extraction Method	Excavator used to remove weathered sandstone, with drill and blast used for unweathered sandstone.
Resource	Weathered and unweathered sandstone, benched where required.
Disturbance area	2.715ha.
Processing	Crushing and screening of unweathered and weathered sandstone material.
Annual extraction	Up to 40,000 tonnes per annum.
Transport	Access to the quarry to be from Oakey Creek Road, the existing quarry haul route. A mix of 6-7 axle quarry trucks (24-30 tonnes carrying capacity) and truck and dog combination (32 tonnes), with smaller trucks may be used. It is anticipated that the quarry may generate up to 40 loaded quarry trucks per day.
Hours of operation	Limited to 7.00am to 6.00pm Monday to Friday (ie. 11 hours operation per day) and 7.00am to 1.00pm on Saturdays (ie. 6 hours operation). Hours of blasting are to be restricted to 9.00am to 3.00pm Monday to Friday.

3 Existing Noise Environment

3.1 Noise Monitoring

Environmental noise monitoring took place at two locations in proximity of the Bolgers Pit between June 7th and June 14th, 2022 with Rion NL-42 Noise Loggers. The noise monitoring locations are detailed in Figure 3-1. The noise loggers were configured to measure instantaneous noise levels with a 'Fast' time weighting and 'A' frequency weighting over 15 minute intervals. A field reference check was conducted for the microphone immediately before and after the measurement sequence and the microphone was appropriately fitted with a windshield.

Weather data was obtained from the Gunnedah Airport AWS (Station ID: 055202), with no adverse weather recorded during the logging period. The noise monitoring data graphs over the time period are provided in Appendix C.

Table 3-1: Equipment List

Instrument	Serial Number	Next Calibration Date
Rion NL-42 Type 2 Sound Level Meter/Logger	01186132	11/02/2024
Rion NL-42 Type 2 Sound Level Meter/Logger	01010767	13/04/2024
Nor139 Environmental Type 1 Sound Level Meter/Logger	1392998	9/05/2024
ONO SOKKi SC-2120 Acoustic Calibrator	35100926	8/02/2023

Table 3-2 presents a summary of the current noise levels at the monitoring locations (the location of the noise monitoring locations are shown in Figure 3-1).

Figure 3-1 - Noise Monitoring Locations

Table 3-2 – Unattended Noise Monitoring Results

Logger Location	Period	L_{Aeq}	L_{A90}	RBL
1 (North)	Day	46	33	27
	Evening	40	22	18
	Night	37	20	16
2 (South)	Day	44	33	26
	Evening	35	22	19
	Night	38	21	17

4 Criteria

The noise criteria are determined in accordance with the NSW Noise Policy for Industry (NPI, 2017), the NSW Road Noise Policy (RNP, 2011) and the NSW Interim Construction Noise Guideline (ICNG, 2009). Vibration criteria are determined in accordance with the NSW Assessing Vibration: A Technical Guideline (2006).

4.1 NSW EPA Noise Policy for Industry (NPI)

The project specific noise criterion limits the noise that a development can make in accordance with the *NSW Noise Policy for Industry 2017* (NPI) in order to limit the effects of the development on the existing noise sensitive receptors.

4.1.1 Project Specific Noise Criterion

The project specific noise criterion limits the noise that a development can make in accordance with the NSW Noise Policy for Industry (NPI) (2017) in order to limit the impact of the development on the existing noise sensitive receptors.

The NPI sets limits on the noise that may be generated by a wide array of facilities and includes guidance that is applicable for the assessment of potential noise impacts from the operational stages of developments. These limits are dependent upon the existing noise levels at the site and are designed to ensure changes to the existing noise environment are minimised and deal with the intrusiveness of the noise and the amenity of the environment. The most stringent of the limits is taken as the Project Specific Noise Level which is the most stringent of the amenity criteria or the intrusiveness criteria for the location.

The amenity criteria for this project are recommended acceptable $L_{Aeq,T}$ noise levels for residences in rural areas as provided in Table 2.2 of the NPI. Amenity criteria are formulated to protect against cumulative impacts.

The intrusiveness noise criterion requires that the $L_{Aeq,15minutes}$ for the noise source, measured at the most sensitive receiver under worst-case conditions, should not exceed the Rated Background Level (RBL) by more than 5dB, represented as follows:

- $L_{Aeq,15minutes}$ < RBL+ 5dB

Noise levels associated with the quarry at nearby noise sensitive receptors (located in the surrounding area) should not exceed the Project Specific Noise Levels detailed in Table 4-2 which have been determined from the lower of the amenity and intrusiveness criteria.

4.1.2 Amenity Noise Criterion

The amenity criterion is specific to land use and associated activities. It aims to limit continuing increases in noise levels. The maximum ambient noise level within an area should not exceed the acceptable noise levels specified in Table 4-1.

Table 4-1: Amenity Noise Levels

Receiver	Noise Amenity Area	Time of Day	L_{Aeq}, dB(A)
Residential	Rural	Day (7am-6pm)	50
		Evening* (6pm-10pm)	45
		Night* (10pm-7am)	40

*The Quarry proposes to operate under the existing operating hours (7am-6pm). Therefore, only the day period has been considered for assessment.

4.1.3 Intrusiveness Noise Criteria

The intrusiveness criterion states that the equivalent continuous noise level of the source should not be more than 5 decibels above the rated background level when measured over a 15 minute period. It aims to control intrusive noise impacts in the short term for residences.

$$L_{Aeq,\ 15\ minute} \leq \text{rating background level} + 5\ dB$$

4.1.4 Project Specific Noise Levels

The project specific noise criterion was determined in accordance with the NPI using the RBL from the results of the noise monitoring locations 1 and 2.

Table 4-2: Project Specific Noise Levels (dB (A))

Receptor	Time of Day	Rating Background Level (RBL)	Intrusiveness Criterion	Amenity Criterion	Project Specific Noise Level
All	Day	35*	40	50	**40**

*NSW NPI states that where the rating background noise level is found to be less than 35dB(A) for the daytime periods, then it is set to 35dB(A).

4.2 NSW Road Noise Policy (RNP)

The requirements of the *NSW Road Noise Policy 2011* (RNP) are applicable to this assessment. Table 4-3 summarises the road category to establish the noise assessment criteria based on the type of roads proposed for use. The criteria for the applicable categories of the roads surrounding the project site are detailed in Table 4-3.

Table 4-3 - Road Traffic Noise Assessment Criteria for Residential Land Uses

Road Category	Type of project / land use	Assessment Criteria/ Target Noise Level, dB(A)	
		Day (7am-10pm)	Night ** (10pm-7am)
Local Roads	Existing residences affected by additional traffic on existing local roads generated by land use developments.	**$L_{Aeq,\ (1\ hour)}$ 55 (external)**	*$L_{Aeq,\ (1\ hour)}$ 50 (external)*
Freeway/arterial/sub-arterial Road* (Clifton Rd, Hogarth St, Oakey Creek Rd, Howe St, Piallaway Rd)	Existing residences affected by additional traffic on existing local roads generated by land use developments.	**$L_{Aeq,\ (15\ hour)}$ 60 (external)**	$L_{Aeq,\ (9\ hour)}$ 50 (external)

Note: These criteria are for assessment against façade- corrected noise levels when measured in front of a building façade.
*Principal haulage routes are to be assessed against the criteria for arteria/sub-arterial roads in accordance with Section 2.2.2 of the RNP.
**The quarry only operates during the daytime period only, night-time criteria is therefore not applicable.

In addition to the criteria detailed in the table above, the magnitude of increase in the total traffic noise level at a location due to a proposed project or traffic-generating development must be considered. Residences experiencing increases in total traffic noise level above the relative increase criteria in Table 4-4 should also be considered for mitigation.

Table 4-4 Relative Increase Criteria for Residential Land Uses

Road Category	Type of project / land use	Total traffic noise level increase, dB(A)	
		Day (7am-10pm)	Night (10pm-7am)
Freeway/arterial/sub-arterial Road	New road corridor/redevelopment of existing road/land use development with the potential to generate additional traffic on existing road	**Existing traffic $L_{Aeq,\ (15\ hour)}$ + 12 dB (external)**	*Existing traffic $L_{Aeq,\ (9\ hour)}$ + 12 dB (external)*

A relative increase of 12 dB represents slightly more than an approximate doubling of perceived loudness (AS2659.1–1988) and is likely to trigger community reaction, particularly in environments where there is a low existing level of traffic noise.

4.3 Vibration Criteria

The NSW DEC guideline *Assessing Vibration: A Technical Guideline* (2006) is based on guidelines contained in British Standard BS 6472-2008 'Evaluation of human exposure to vibration in buildings (1-80Hz)'.

The guideline provides preferred and maximum vibration values for use in assessing human responses to vibration and provides recommendations for measurement and evaluation techniques. At vibration values below the preferred values, there is a low probability of adverse comment or disturbance to building occupants. Where all feasible and reasonable mitigation measures have been applied and vibration levels are still beyond the maximum level, it is recommended the operator negotiate directly with the affected community.

The guideline defines three vibration types and provides direction for assessing and evaluating the applicable criteria. Table 2.1 of the DEC guideline provides examples of the three vibration types and are summarised as continuous vibration, impulsive vibration and intermittent vibration. The relevant type of vibration for this project is intermittent vibration. Intermittent vibration (as defined in the DEC guideline) is assessed using the vibration dose concept which relates to vibration magnitude and exposure time. Intermittent vibration is representative of activities such as impact hammering, rolling or general excavation work (such as an excavator tracking). Section 2.4 of the guideline provides acceptable values for intermittent vibration in terms of vibration dose values (VDV) which requires the measurement of the overall weighted root mean square (rms) acceleration levels over the frequency range 1 Hz to 80 Hz; the criteria are presented in Table 4-5.

Table 4-5: Acceptable Vibration Dose Values (VDV) for Intermittent Vibration ($m/s^{1.75}$).

Location	Daytime (7am-10pm), VDV		Night time (10pm-7am), VDV	
	Preferred Value	Maximum Value	Preferred Value	Maximum Value
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60
Critical areas (e.g. hospital operating theatres)	0.10	0.20	0.10	0.20

Structural vibration criteria for building damage due to blasting is considered the same as that induced by transient groundborne vibration due to general construction activities. Vibration levels for potential building damage contained in *British Standard BS 7385-2:1993 Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration* are referenced in *British Standard BS 5228-2:2009* and *Australian Standard AS 2187.2:2006*. The vibration levels in BS 7385-2:1993 are adopted as building damage criteria from construction activities and are shown as follows:

TABLE J4.4.2.1

TRANSIENT VIBRATION GUIDE VALUES FOR COSMETIC DAMAGE (BS 7385-2)

Line	Type of building	Peak component particle velocity in frequency range of predominant pulse	
		4 Hz to 15 Hz	15 Hz and above
1	Reinforced or framed structures. Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Unreinforced or light framed structure. Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

NOTES:

1 Values referred to are at the base of the building.

2 For line 2, at frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) should not be exceeded.

5 Noise Modelling

Noise modelling has been undertaken using the SoundPLAN 8.2 computational noise modelling software package. The use of the SoundPLAN software and referenced modelling methodology is accepted for use in the State of NSW by the EPA for environmental noise modelling purposes. Vipac have undertaken numerous noise modelling and impact assessments previously using SoundPLAN for a range of projects, including infrastructure development and industrial projects.

5.1 Geographical Data

Outline Planning Consultants supplied topographical details of the current pit to Vipac and Table 5-1 below lists the drawings received and used in the noise prediction model and have been included in Appendix D.

Table 5-1 - Drawings Used

Drawing Title	Description	Date
Bolgers Pit Conceptual Design	2m Contours	22/04/2022
Bolgers Pit Conceptual Design Section	RL Cross Sections	22/04/2022
Bolgers Pit Conceptual Design Section	RL Cross Sections	04/05/2022

Terrain data of the surrounding areas extending to the nearest receptors was obtained from Google Earth and was spliced with the data from Table 5-1 to create a complete model of the pit and surrounding area.

5.2 Noise Sources

Details of the plant and equipment that will be used during the operation of the Quarry has been provided by the Quarry operator and is detailed in Table 5-2. Sound Power Levels (SWL) have primarily been taken from measurements conducted by Vipac of the machinery that were in operation at McCormack's Pit in Gunnedah, on the 7th of June 2022. It is Vipac's understanding that this equipment will rotate between quarries within the Gunnedah shire on an as needs basis, and that this equipment will be used at Bolgers Pit.

Table 5-2 - Sound Power Levels of Site Machinery Items (Lw).

Description	Sound Power levels, L_w (dB(A))
Machinery to be used at Quarry	
Terex Finlay I1312 Impact Crusher	114
Terex Finlay 683 Supertrak 12x5 Screen	121
Caterpillar IT6T2H Wheeled Loader	99
Komatsu PC300 Excavator	107[1]
Haul Truck[2]	91

[1]The Komatsu Excavator was not available at the time to conduct noise measurements, and specification information available online does not detail a specific SWL. The Sound Power Level has been derived from a recently approved assessment conducted by EMM for the Gunlake Quarry Continuation Project (report ref: SSD-12469087).

[2]Measurement conducted by Vipac from previous noise surveys of a Kenworth Rigid Tipper driving at low speeds.

All noise sources have been modelled as operating simultaneously for 100% of the time over the 15 minute assessment period.

Predicted octave band results (shown in Appendix B) show no tonality at any receptor. Additionally, no intermittency characteristics were observed when conducting the attended measurements of the Quarry plant and equipment on site. As a result, noise from the Quarry:

- Does not exhibit any prominent (tonal) sound frequency that would have the potential to result in greater annoyance;
- Does not exhibit any notable, intermittent fluctuations (i.e. does not increase rapidly by 5-10dB, depending on time of day, on at least two occasions during a 30 minute period, then maintaining that noise level for at least 60 seconds) that would have the potential to result in greater annoyance; and
- Does not exhibit any impulsive characteristics that would have the potential to result in greater annoyance, with the exception of the excavator.

5.2.1 Noise Source Scenarios & Locations

A total of three scenarios were modelled to represent the different operational stages of the quarry and are detailed below. The excavator only scenario represents the excavator stripping a very small section of land in the north east corner (0.09ha) and transferring material that has been blasted from the top of the quarry footprint to the haul trucks and equipment at the bottom of the pit. The other two scenarios represent the processing of the existing quarry face material using the combination of the loader, crusher, and screen equipment on the bottom of the quarry pit. The middle-west noise sources scenario represents the operation of the equipment to the current existing quarry façade to be extracted and the current worst-case distances to NSR4. The northeast noise sources scenario represents the final stages of the quarry extraction phase, the worst-case distance to the northern receivers (NSRs 1 – 3), and worst-case line of sight to the southwestern receiver (NSR 4). Note that the haul truck is operational in all scenarios.

1. North Excavator Only Scenario
    a. Excavator only operation on top of the existing northern unexcavated quarry section.
2. Middle-West Noise Sources
    a. Screen, loader, and crusher noise sources at the bottom of the pit (321RL) near the existing quarry façade to be excavated (middle section), on the western boundary of the pit.
3. North East Noise Sources
    a. Screen, loader, and crusher noise sources at the bottom of the pit (321RL) near the final quarry façade to be excavated (north eastern section).

Locations of quarry equipment for reach noise source scenarios are shown in Figure 5-1 through to Figure 5-3.

5.2.1.1 North Excavator Only Scenario

Figure 5-1 - North Excavator Only - Noise Sources Location

5.2.1.2 Middle-West Noise Sources

Figure 5-2 – Middle-West Noise Sources - Noise Sources Location

5.2.1.3 North East Noise Sources

Figure 5-3 - North East Noise Sources - Noise Sources Location

5.3 Weather Conditions

Noise propagation over long distances can be significantly affected by the weather conditions, mainly source-to-receiver winds and temperature inversions, as both these conditions can increase noise levels at sensitive receptors.

The CONCAWE methodology can predict to one of six meteorological categories (CAT). To determine which category is modelled, the Pasquill Stability Classes need to be determined for the Quarry. For this assessment the weather conditions, including stability class frequencies at the Quarry have been obtained from The Air Pollution Model (TAPM). TAPM is a three-dimensional prognostic model developed and verified by Commonwealth Scientific and Industrial Research Organisation (CSIRO). TAPM data was generated for the air quality assessment has been used for uniformity. The wind parameters were compared for the Bureau of Meteorology (BOM) and TAPM data and were found to be very similar.

Atmospheric stability refers to the tendency of the atmosphere to resist or enhance the motion of noise. The Pasquill-Gifford Stability Classes define the amount of turbulence in the air, of which the most widely used categories are Classes A-F. The TAPM generated meteorology determined the stability class for each hour of the year. The frequency of each stability class occurrence is shown in Table 5-3. Temperature inversions are defined as Class F. These conditions only occur with clear and calm conditions during the evening and night time periods. During temperature inversions noise emissions from distant sources can be amplified.

Table 5-3: Annual Stability Class Distribution Predicted [TAPM, 2019]

Stability Class	Description	Frequency of Occurrence (%)	Average Wind Speed (m/s)
A	Very unstable low wind, clear skies, hot daytime conditions	2.8	1.3
B	Unstable clear skies, daytime conditions	14.3	2.2
C	Moderately unstable moderate wind, slightly overcast daytime	19	3.7
D	Neutral high winds or cloudy days and nights	29.9	6.0
E	Stable moderate wind, slightly overcast night-time conditions	13	4.1
F	Very stable low winds, clear skies, cold night-time conditions	21	1.9

The long term wind roses recorded daily at the Gunnedah station at 9am and 3pm are provided in Figure 5-4. Winds are shown to be primarily from the southeast at 9am and from the northwest and southeast directions at 3pm. Stronger winds (>40km/hr or >11.1m/s) are extremely rare.

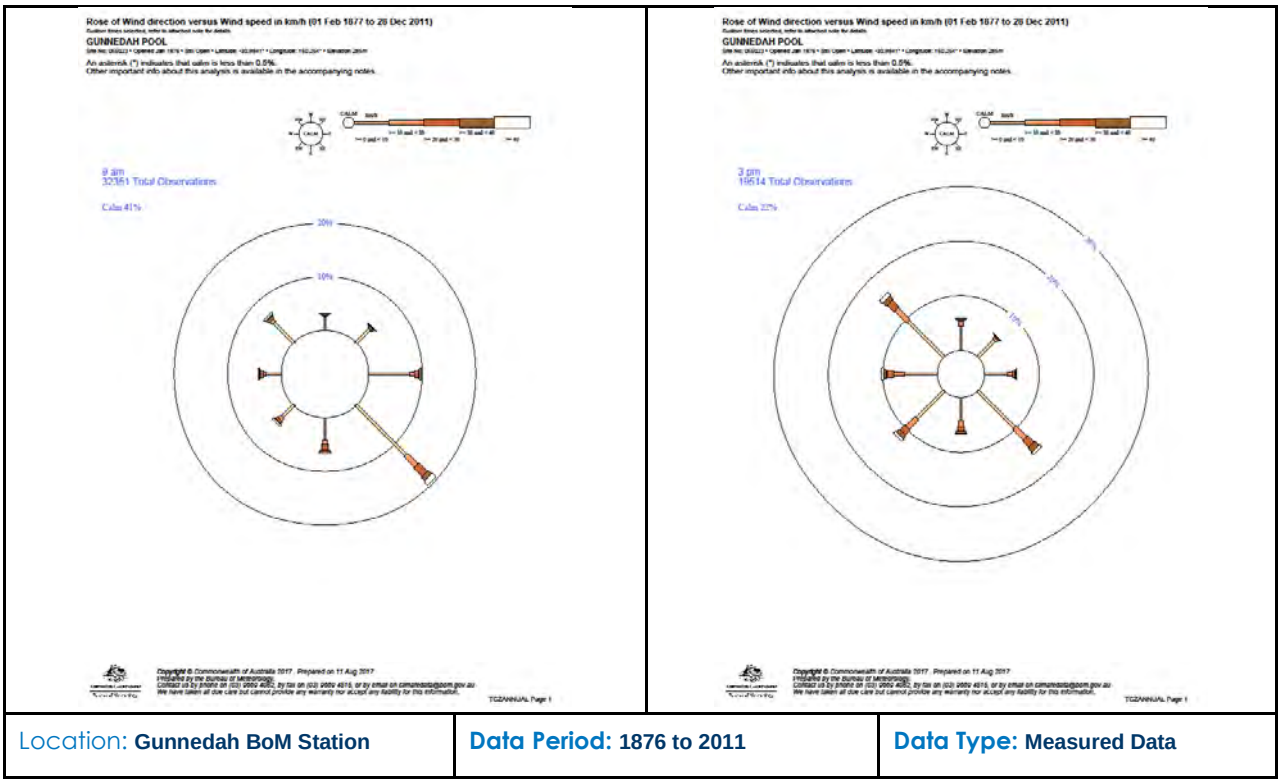
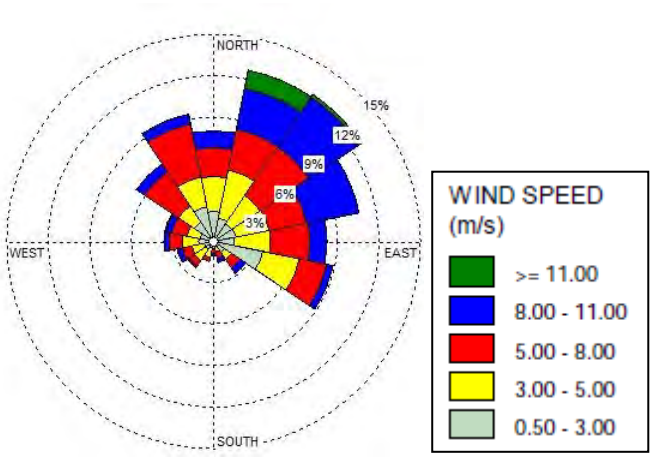
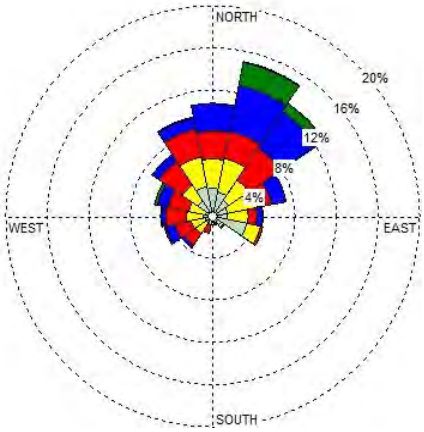


Figure 5-4: Annual Wind Roses for Gunnedah Weather Station (1876 to 2011)

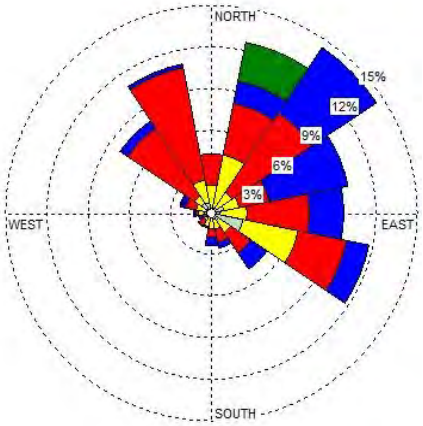
Wind roses generated from previous TAPM-CALMET modelling (Vipac AQ report: 70B-22-0096-TRP-47532-0) have been included and reproduced in Figure 5-5, which shows the dominant wind directions is north-easterly for all seasons.



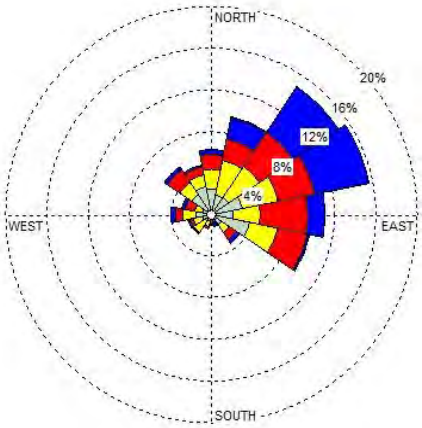
Annual (Calm – 3.2 %)



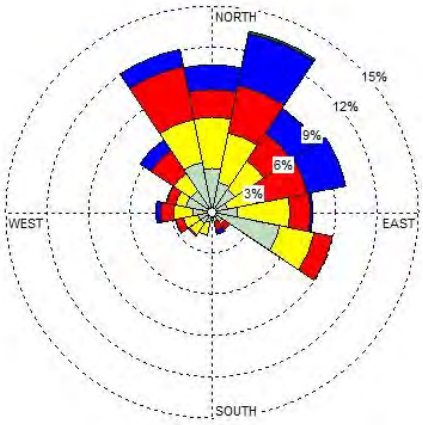
Spring (Calm – 3.3 %)



Summer (Calm – 1.3 %)



Autumn (Calm – 3.7 %)



Winter (Calm – 4.3 %)

Figure 5-5: Site-Specific Wind Roses by Season for the TAPM-CALMET Derived Dataset, 2016

5.3.1 Modelled Weather Scenarios

Taking into consideration the time of day the Quarry currently operates and is proposing to operate, the following weather scenarios have been assessed:

Average/Neutral Climatic Conditions:

- Class D (average/neutral) conditions occur for more than 29.9% of the time. Class D has been modelled for the average climatic condition scenarios for day, with 0m/s wind speeds.

Worst Case Climatic Conditions:

- Worst case climatic conditions during the day period have been assessed as per Class D, but with 2.9m/s wind speeds blowing towards the receivers.

North Easterly Winds Case Climatic Conditions:

- Climatic conditions based on calculated TAPM-CALMET wind directions (as per Figure 5-5) during the day period have been assessed as per Class D, but with 2.9m/s wind speeds blowing from the dominant direction (i.e. NE).

Stability classes A, B, and C are associated with an unstable atmosphere and are generally unfavourable for noise propagation. Condition D is a neutral condition for noise propagation while conditions E and F are unfavourable as stable conditions further facilitate noise propagation.

6 Traffic Noise Impact Assessment

6.1 Traffic Noise Impact Methodology

The Calculation of Road Traffic Noise (CoRTN) method of traffic noise prediction has been used, which is a method approved by the EPA. The traffic data presented in the Traffic Impact Assessment (by StreetWise Road Safety & Traffic Services) demonstrates the expected AADT volumes on the surrounding road networks and have been used in this traffic noise impact assessment.

The assessment considers two worst-case scenarios:

- All (i.e. existing and proposed increase = 40 laden trucks) quarry truck movements on the existing haul routes.
- The existing traffic (current AADT volumes) on the haul routes.

Existing and future traffic volumes are currently below the minimum threshold for CoRTN to predict road traffic noise levels reliably. Section 2, paragraph 30 of CoRTN stipulates that a minimum of 1,000 vehicles in an 18-hour period are required to predict noise levels (inclusive of a low traffic flow correction). Calculations using traffic flow data that is below 1,000 vehicles in an 18-hour period are considered unreliable, and CoRTN recommends noise measurements be conducted when evaluating such cases.

Noise measurements of the surrounding road network have not been undertaken, however, as a proof of concept, the low traffic flow correction that results from calculating noise impacts from a road with a minimum AADT of 1,100 (18-hour volume of 1,034) has been applied to the predicted results for this assessment.

It is noted that this correction is conservative, as a low traffic flow correction decreases as traffic flow numbers increase. For example:

- The low traffic flow correction is applicable to roads with 1000 to 4000 vehicles in an 18-hour period.
- The low traffic flow correction for 1,034 vehicles (mentioned above) equates to a -2dB(A) correction.
- As the traffic flow increases, the correction reduces i.e. 4,000 vehicles equates to no correction required.
- As the existing and future numbers are below 1,000, it is expected that should a correction be applied for these numbers, it would be greater than a -2dB(A) correction, and therefore a -2dB(A) correction applied to these values is considered conservative.

The existing AADT on each highway running through Breeza, Carroll, and Currabubula, with the existing traffic volumes on side roads (haul routes 1 to 3) (as per Section 4.1 of the Streetwise report) has been reproduced below in Table 6-1, the haul routes are shown in Figure 6-1. The nearest sensitive receptors along the haul routes are outlined in Section 6.1.1.

As a conservative assessment, an additional 80 truck movements per day (i.e. laden and unladen) were assumed as a 'worst case'.

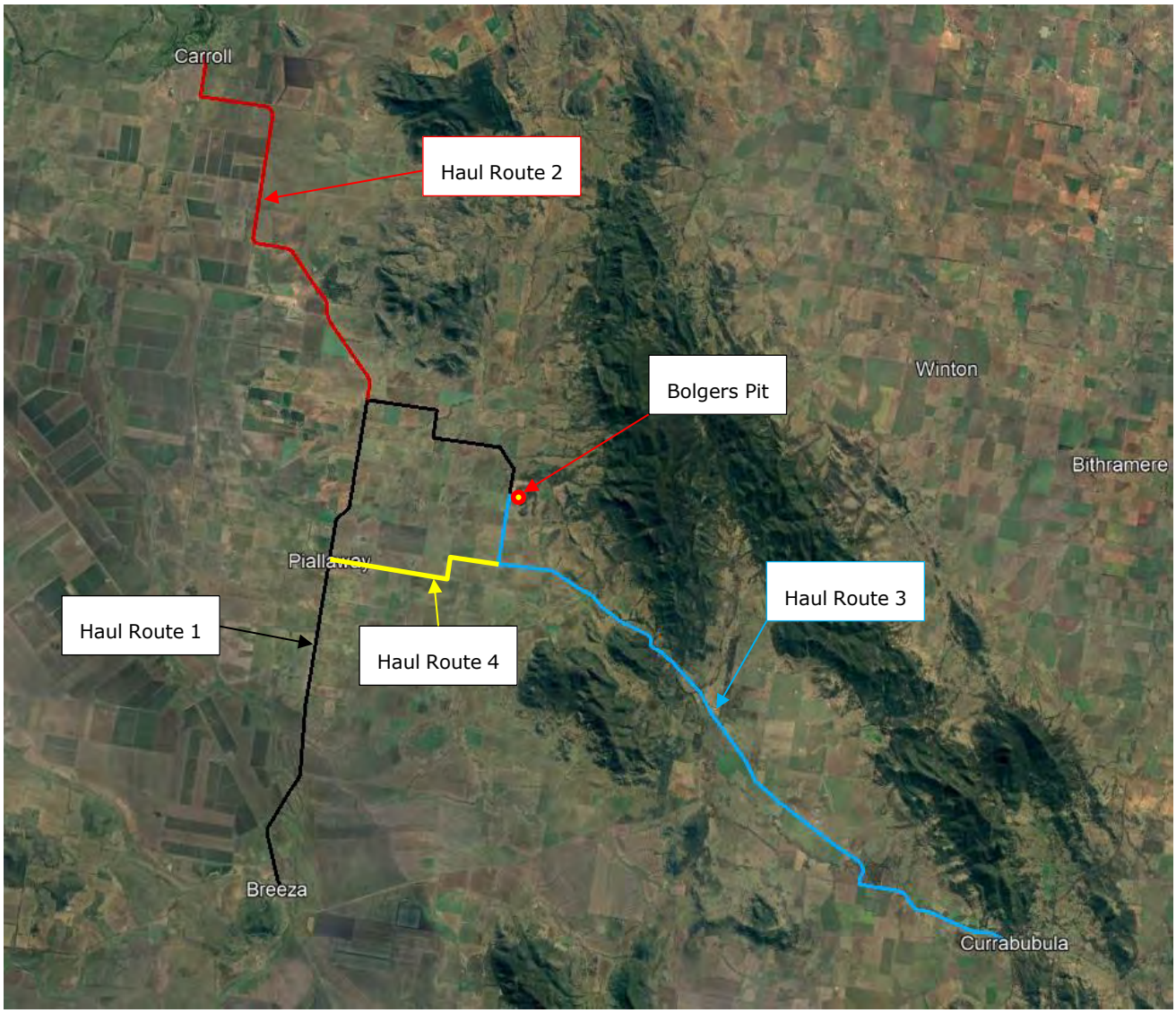


Figure 6-1 - Haul Routes

Table 6-1 – Current Traffic Volumes Alongside Additional Quarry Truck Movements Per Day from the Quarry

Haul Route	Road	Existing AADT on Highway	Existing AADT on Haul Routes	Additional Total Quarry Truck Movements per Day	Future AADT Volumes (Existing + Additional)
1	Access to and from Kamillaroi Hwy at Breeza via Clifton Rd, Hogarth St, and Oakey Creek Rd	1240	149 [1]	80	229
2	Access to and from Oxley Hwy at Carroll via Clifton Rd, Howe St, and Oakey Creek Rd	- [2]	200 [2]		280
3	Access to and from Werris Creek Rd at Currabubula via Oakey Creek Rd and Piallaway Rd	1920	115 [3]		195
4*	Denver Lane	-[4]	200[4]		280

[1] Approximately 12% of all vehicle movements turned in or out of the side road (Hogarth St) from Kamillaroi Hwy.
[2] No manual traffic count at this intersection was completed by StreetWise, however, traffic volumes on the side road (Howe St) were estimated to be very low (less than 20 movements per hour). A conservative 200 expected existing AADT on Haul Route 2 was assumed.
[3] Approximately 6% of all vehicle movements turned in or out of the side road (Piallaway Rd) from Werris Creek Rd.
[4]No manual traffic count at this section was completed by Streetwise, however, traffic volumes assumptions on this road were provided by Streetwise on the 21st of June 2024, which indicated none of the local minor roads in the vicinity of the site would have current volumes exceeding 200 vehicles per day.
*Denver Lane is not proposed as an official haul route for the project but has been included at the request of Gunnedah Shire Council as per their request for additional information on the 8th of May 2024.

6.1.1 NSRs Along Haul Routes

The nearest NSRs to the three haul routes have been illustrated below in Table 6-2.

Table 6-2 - NSRs to the 3 Haul Routes

Haul Routes	NSRs	Aerial Imagery
Haul Route 1	R1	

R2

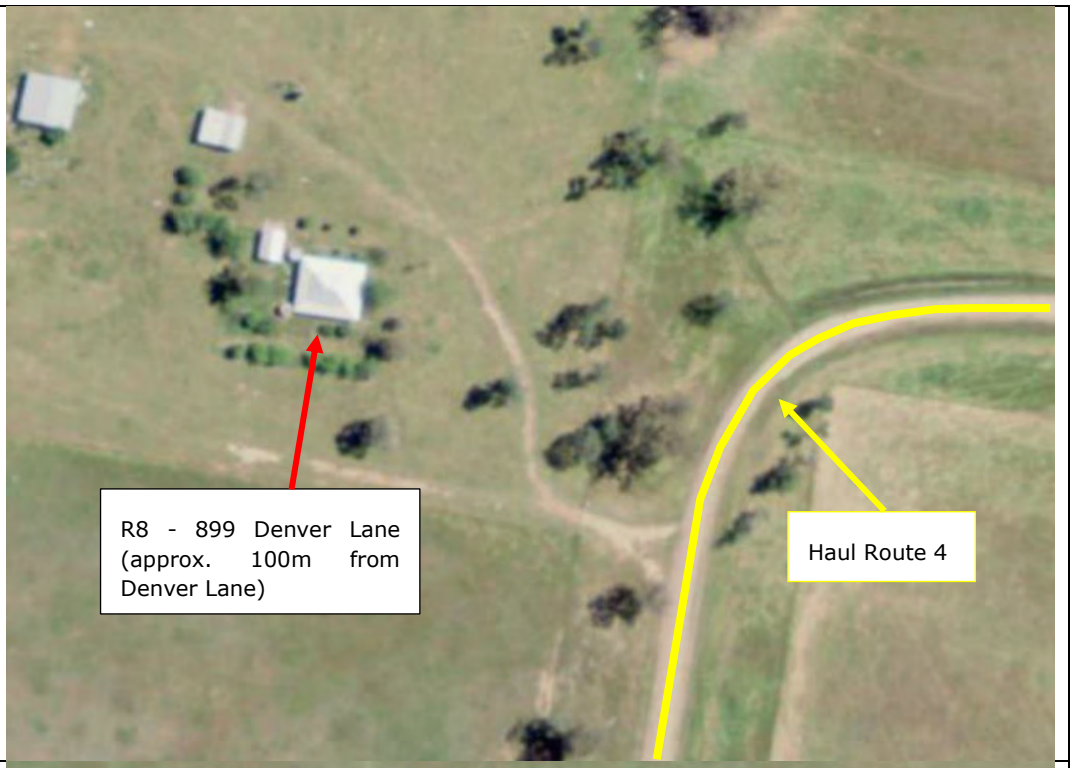
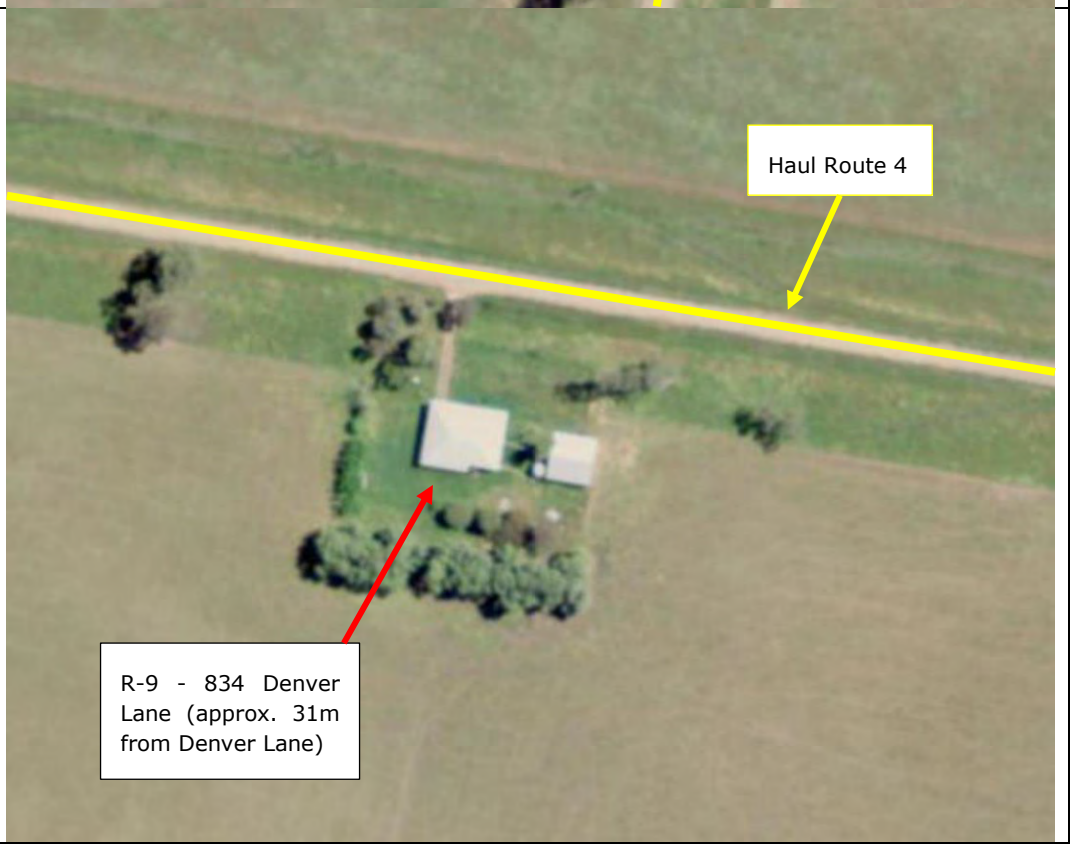

Oakey Creek Rd
Oakey Creek Rd
Oakey Creek Rd
R2 – 'Iventure' (approx. 26m from Oakey Creek Rd)
Haul Route 1

R3


Oakey Creek Rd
Oakey Creek Rd
Haul Route 1
R3 – Residence along Oakey Creek Rd (approx. 46m from Oakey Creek Rd)

Haul Route 2	R4	
	R5	

Haul Route 3	R6	
	R7	

Haul Route 4	R8	
	R9	

6.1.2 Traffic Noise Impact Calculation Parameters

The worst-case scenario of a maximum of 80 additional truck (i.e. laden and unladen) movements has been assessed under four scenarios:

- All trucks using Haul Route 1,
- All trucks using Haul Route 2,
- All trucks using Haul Route 3, and
- All trucks using Haul Route 4.

Assessing these four scenarios where 100% of the truck movements pass by any given sensitive receptor on any haul route (whichever haul routes they take), is considered worst case because the movements in and out of the quarry will likely be split across all four haul routes as the quarry truck movements would be dictated by supply location, effectively dispersing the movements more evenly. This displacement is likely to reduce potential noise impacts on the nearest sensitive receptors, when compared to the worst-case predictions used in this assessment.

Vipac has conducted initial noise calculations for the two worst-case scenarios detailed above. The traffic noise assessment has also considered the following assumptions:

- L_{Aeq} values were calculated from the L_{A10} values predicted by the CoRTN algorithms using the well-validated approximation of $L_{Aeq} = L_{A10} - 3$.
- Previous research in Australia has established a negative correction to the CoRTN predictions of -1.7dB for façade-corrected levels. This correction for Australian conditions has been included in this assessment.
- A low traffic flow correction (mentioned previously) of -2dB(A) to the existing and predicted results.
- A conservative assumption of 94% of the AADT values to occur within the 15-hour daytime period.
- Calculated speed limits of the following:
    - Hogarth St – 40km/hr (assumed lower speed due to close distance to intersection),
    - Oakey Creek Rd – 80km/hr (assumed from Oakey Creek Rd 80km/hr posted speed limit),
    - Clifton Rd – 80km/hr (assumed from Oakey Creek Rd 80km/hr posted speed limit),
    - Howe St – 40km/hr (assumed lower speed due to close distance to intersection),
    - Piallaway St – 80km/hr (assumed from Oakey Creek Rd 80km/hr posted speed limit), and
    - Denver Lane – 80km/hr (assumed from Oakey Creek Rd posted speed limit).
- A heavy vehicle percentage of approximately:
    - 12.3% on Haul Route 1 (as per Traffic Impact Assessment),
    - 11% on Haul Route 2 (as per Traffic Impact Assessment),
    - 6.6% on Haul Route 3 (as per Traffic Impact Assessment), and
    - 20% on Haul Route 4 (conservative assumption).
- Distance attenuation to the nearest sensitive receptors to each road shown in Table 6-2 and below:
    - R1 - approx. 19m from the nearest road edge.
    - R2 - approx. 26m from the nearest road edge.
    - R3 - approx. 46m from the nearest road edge.
    - R4 - approx. 37m from the nearest road edge.
    - R5 – approx. 51m from the nearest road edge.
    - R6 – approx. 20m from the nearest road edge.
    - R7 – approx. 15m from the nearest road edge.
    - R8 – approx. 100m from the nearest road edge.
    - R9 – approx. 31m from the nearest road edge.
- An angle of view of 160 degrees (except for R1, 270 degrees).
- A conservative assumption of 50% soft ground absorption.
- No correction of grade or road surface.
- Sensitive receptors are assumed to have direct, unobstructed line of sight to the roads, with no shielding from intervening structures applicable.
- Receptor heights modelled at 1.8m above ground, 1m from the façade (i.e. façade-corrected).

Potential vibration levels from quarry truck movements are likely to be less than 0.5 mm/s PPV (Peak Particle Velocity) for receptors along the adjacent public roads, which is well below all accepted criteria for structural damage and human comfort from ground borne vibration.

7 Vibration Impact Assessment

7.1 Construction/Operational Vibration (Non-Blasting)

Both continuous/quasi-continuous and intermittent vibration has been considered. Most machinery items are likely to generate some continuous or quasi-continuous vibration during their operation, and some intermittent or transient vibration could be caused by machinery during start-up compaction (and possibly during loading of trucks).

Ground-borne vibration resulting from activities on site are compared against the applicable criteria relating to human comfort and potential structural damage (usually in terms of Peak Particle Velocity, PPV). The recommended limits or guide values (refer Section 4.3) for transient vibration to ensure minimal risk of cosmetic damage to residential buildings (and community buildings) are in the range 15 to 20 mm/s PPV (depending on the frequency), with higher limits of 50 mms/ for industrial buildings. The stipulated human comfort criterion (lower limit) for vibration is typically 1 mm/s PPV (to an upper limit of 2 mm/s).

The ground vibration predictions for machinery were based on previously measured data by Vipac or sourced data for construction machinery from various vibration databases and literature references (Ref: *Ground Vibration Engineering* (Srbulov, 2010), *Construction Vibrations* (Dowding, 2000), CALTRANS *Construction Vibration Manual* (US CALTRANS, 2013), US FTA *Transit Noise & Vibration Manual* (2018)).

The calculation formulae used for ground vibration predictions (in terms of Peak Particle Velocity, V_{PPV} in mm/s) for vibratory compaction rollers are given as follows (Ref: BS 5228-2; Hiller & Crabb, 2000):

Table 7-1 :Ground Vibration Prediction Formulae

Normal compaction passes:	$V_{PPV} = ks * n^{0.5} * (A/(x+w))^{1.5}$	[mm/s]	ks	75	50% exceedance probability
			ks	143	33% exceedance probability
			ks	276	5% exceedance probability
Transient startup/shutdown:	$V_{PPV} = kt * n^{0.5} * (A^{1.5}/(x+w)^{1.3})$	[mm/s]	kt	65	50% exceedance probability
			kt	106	33% exceedance probability
			kt	177	5% exceedance probability
	x	distance along ground from roller to receiver (m)			
	n	number of vibrating drums in roller			
	A	nominal amplitude of vibrating roller (mm)			
	w	width of vibrating drum (m)			

** Note: The exceedance probability represents the level of conservatism in the predictions, where a 5% predicted level would be the most conservative or worst case situation (higher prediction) to represent the maximum level predicted for 95% of possible cases and therefore only 5% of cases likely to exceed the predicted level.*

A conservative prediction of the potential ground-borne vibration impacts associated with the proposed equipment on site has been made (primarily quasi-continuous vibration). Ground vibration levels (in mm/s PPV) from other construction machinery items (e.g. excavator, crusher) are typically in the range of 0.1 to 1 mm/s at distances of 25 to 50 m. Truck traffic (over rough/irregular road surfaces) will typically generate ground vibration levels of 0.1 to 0.5 mm/s (or less) at distances of 25 to 50 m. Considering the nearest sensitive receptors are at far greater distances (>400m) away, predicted vibration levels would meet the human comfort criteria and are well below structural damage criteria for all nearby buildings.

7.2 Blasting Vibration and Airblast Overpressure

Ground vibration and airblast overpressure are two common environmental effects of blasting that can cause human discomfort and damage to buildings and other structures. The quarry is proposing to operate between 7am and 6pm Monday to Friday and 7am and 1pm on Saturdays, however blasting is only proposed between 9am and 3pm Monday to Friday.

Due to the discontinuous nature of the geology encountered during the soil study (*Banks, Robert G. 2001, Soil Landscapes of the Tamworth 1:100 000 Sheet, Department of Land and Water Conservation, Sydney*), it is difficult to accurately model potential blast impacts. The soil study states the following:

SOILS **Variation and Distribution**

Soils are extremely diverse and variable over tens of metres. Soil type and position in landscape cannot be predicted except on a site-by-site basis due to the high variability of parent materials. Due to high diversity and unpredictability of soil type, no soil material information or distribution information has been provided for this landscape. Development proposals in this landscape need to consider special purpose site-specific investigations of soil properties.

Soil types found in within this landscape included Black, Grey, Red and Brown Vertosols; Red, Brown and Black Dermosols; Red, Brown and Yellow Kurosols; Red, Brown and Black Chromosols; sandy Tenosols, Rudosols, Calcarosols, Red Ferrosols and Red, Yellow and Brown Sodosols.

Since this soil landscape is too variable and complex to make statements about soil patterns, there is no soil distribution diagram for this landscape.

Figure 7-1 - Excerpt from Soil Study

Considering the extreme diversity of soil types that vary frequently throughout the landscape, it is considered more appropriate to rely on previous blast monitoring results conducted for the quarry in 2019 and 2020.

As shown in Table 7-2 below, vibration and overpressure monitoring has been conducted at the two nearest sensitive receptors (NSR5 'Mimbil' to the south and NSR3 'Wyalla' to the north) of blasting operations with a Maximum Instantaneous Charge (MIC) of between 105kg to 200kg.

Table 7-2 - Previous Measured Blasting Results at Bolgers Pit

Criteria	**Blasting 30th Jan 2019** **MIC 200kg**	**Blasting 27th August 2019** **MIC 105kg**	**Blast 23rd July 2020** **MIC 197kg**
Airblast Overpressure 115dB Linear Peak (Maximum of 120dB Linear Peak)	Not triggered (i.e. below applicable criteria)		112.7dB Linear Peak measured at NSR 3 Not triggered at NSR 5
Ground Vibration 5mm/second (Maximum 10mm/second)			1.05mm/s measured at NSR 3 Not triggered at NSR 5.

It is expected that the reason for the for the low/nil readings measured above may be as a result of the above mentioned complex geology and the discontinuous nature of rock types over a very small area encountered throughout the landscape.

As a result, it will be recommended for all future blasting to remain at or below an MIC of 200kg and for monitoring to occur with all future blasting operations to ensure compliance is achieved at the closest receptors.

8 Results

8.1 Predicted Operational Quarry Noise Levels

Noise prediction modelling has been carried out to assess the potential impact associated with the Quarry operations at the nearest noise sensitive receptors for the proposed operational scenario.

The predicted noise levels representative of each of the operational scenarios for neutral conditions, worst-case conditions, and north easterly winds case weather conditions during the day period are presented in Table 8-1. These results have been reproduced graphically as Noise Contour Maps and are shown in Appendix A.

Table 8-1 – Predicted Noise Levels: Daytime (dB $L_{Aeq\ 15min}$)

Rec #	Criteria	*Excavator Only**			**Middle-West Noise Sources**			**Northeast Noise Sources**		
		Neutral	*Worst Case*	*North Easterly Winds Case*	**Neutral**	**Worst Case**	**North Easterly Winds Case**	**Neutral**	**Worst Case**	**North Easterly Winds Case**
NSR1	40	*24.5*	*29.4*	*17.5*	17.7	22.5	12.1	18.3	23.1	12.3
NSR2		*33.5*	*37.7*	*28.6*	26.7	30.7	22.4	27.4	31.4	23.3
NSR3		*33.9*	*38.1*	*27.7*	26.7	30.7	21.5	28.2	32.1	23.0
NSR4		*30.2*	*34.7*	*34.7*	33.6	37.8	37.7	32	36.4	36.4
*NSR5***		*31.4*	*35.8*	*35.8*	*47.9*	*51.9*	*51.9*	*45.6*	*49.8*	*49.7*

**The Excavator Only scenario is a very small aspect of the operations at the quarry, expected to take half a day to finalise the stripping of the north east corner.*

***NSR5 is owned by the Quarry land owner and is not considered as a sensitive receptor for the purposes of this assessment.*

Noise levels are predicted to comply at all receptors in all scenarios during all modelled weather conditions.

8.2 Operational Noise Results Discussion

With information provided by Outline Planning Consultants Pty Ltd staff (via email correspondence on Thursday 2nd February 2023), the quarry was confirmed to operate on a campaign basis for short periods of time during any one year. With the total extraction rate of 40,000 tonnes per annum, 32 tonne load carrying trucks (with a maximum of 40 trucks per day), the quarry would supply material for a total of just over 6 (5 day) weeks in any one year, with the quarry lying dormant for the remainder of that year.

Based on the predicted results above for the operational scenarios located in the Middle-West and Northeast, noise levels are predicted to comply without the need for additional acoustic attenuation measures.

8.3 Haul Route Traffic Noise Assessment Results

Calculations were conducted to assess the potential noise impacts associated with the additional quarry truck movements on the proposed haul routes.

Road traffic noise monitoring was not conducted as part of this traffic noise assessment, therefore validation of a traffic noise model used to predict noise levels at the nearest receivers cannot be undertaken, however, it is anticipated that existing traffic noise levels for all other receptors are below the current criteria for both local roads and principal haulage routes.

Table 8-2 below presents the traffic noise predictions for existing traffic, alongside future predicted traffic volumes at the nearest residential receptors.

Note that because noise levels of the existing traffic are unknown, the results are intended to provide a conservative indication based on a worst-case scenario of the sole use of heavy vehicles travelling to and from the site.

Table 8-2 – Cumulative Indicative Traffic Noise Impact Predicted Results

Noise Levels, $L_{Aeq,\ 15\ hour}$ dB(A)– façade corrected					
Receptor	**Predicted Existing Traffic**	**Predicted Future Traffic**	**Criteria**	**Predicted Compliance?**	*Maximum Difference* (Existing v Future) ≤2dB(A)*
R1	44.3	46.9	60	✓	*2.6*
R2	44.5	46.9		✓	*2.4*
R3	42.7	43.4		✓	*0.7*
R4	39.4	41.9		✓	*2.5*
R5	42.1	43.5		✓	*1.4*
R6	42.5	45.5		✓	*3*
R7	43.9	46.8		✓	*2.9*
R8	39.8	41.2		✓	*1.4*
R9	45.7	47.1		✓	*1.4*

*Only applicable for receptors where it is anticipated existing traffic noise levels already exceed the criteria.

8.4 Haul Route Traffic Noise Results Discussion

As stated in Section 3.4 of the Road Noise Policy, with regard to existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use development, any increase in total traffic noise level should be limited to 2dB above that of the corresponding existing noise level at any residential property. Considering the predicted existing traffic noise levels for each of the closest receptors on each road is below the criteria, this assessment is not applicable, although the increase has been included for transparency.

It can be seen in Table 8-2 that existing and future traffic noise levels at existing residential receptors are predicted to comply with the criteria without the need for acoustic mitigation.

Given the increase in noise levels between existing and future traffic flow are also well below the relative increase criteria detailed in Table 4-4 (existing traffic + 12dB), the increased traffic from the proposed development is predicted to comply with the relevant road traffic noise criteria.

Therefore, traffic noise associated with the additional quarry truck movements on the proposed haul routes associated with the quarry are predicted to comply with the criteria without the need for acoustic mitigation measures.

9 Mitigation Recommendations

Noise levels for the proposed operational scenarios have been predicted to comply with the criteria outlined in Section 4.1.4 in neutral, worst case, and north easterly winds case weather conditions for most receivers.

Predicted noise levels from the traffic noise impact assessment complied with the criteria outlined in Section 4.2, therefore, no noise mitigations are required for haul route noise emissions.

Blasting impacts are predicted to comply with the inclusion of the below recommendations.

9.1 Vibration – Blasting

As stated in Section 7.2, accurate modelling of future blasting cannot be undertaken given the complexity of the surrounding soil landscape. As previous monitored blasting at the site has measured compliance with MIC quantities of 200kg and below, the following is recommended:

- All future blasting to remain at or below an MIC of 200kg and for monitoring to occur with all future blasting operations to ensure compliance is achieved at the closest receptors.
- Should larger explosive quantities be required in the future, a detailed assessment may be required accompanied by further blast monitoring.

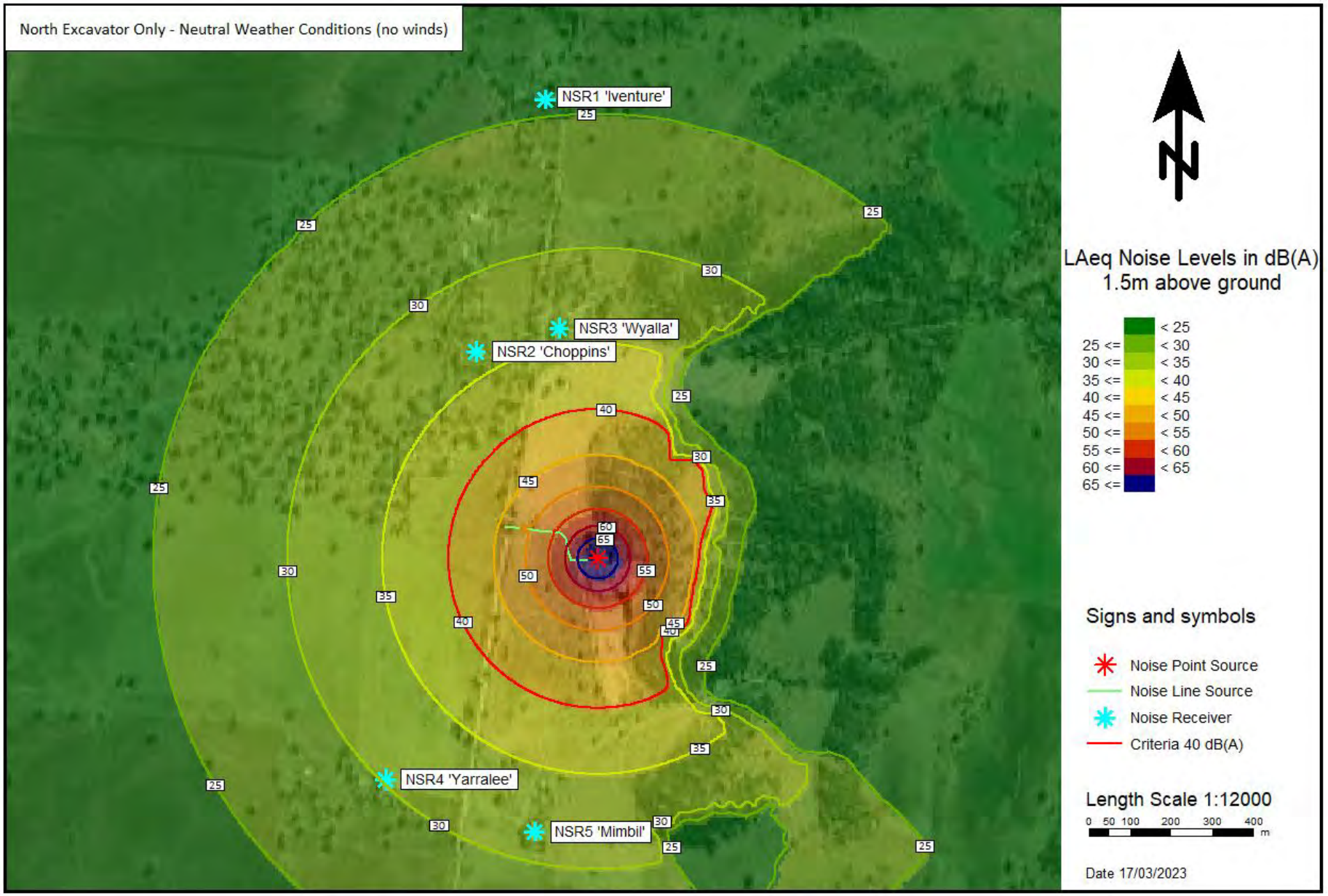
10 Conclusion

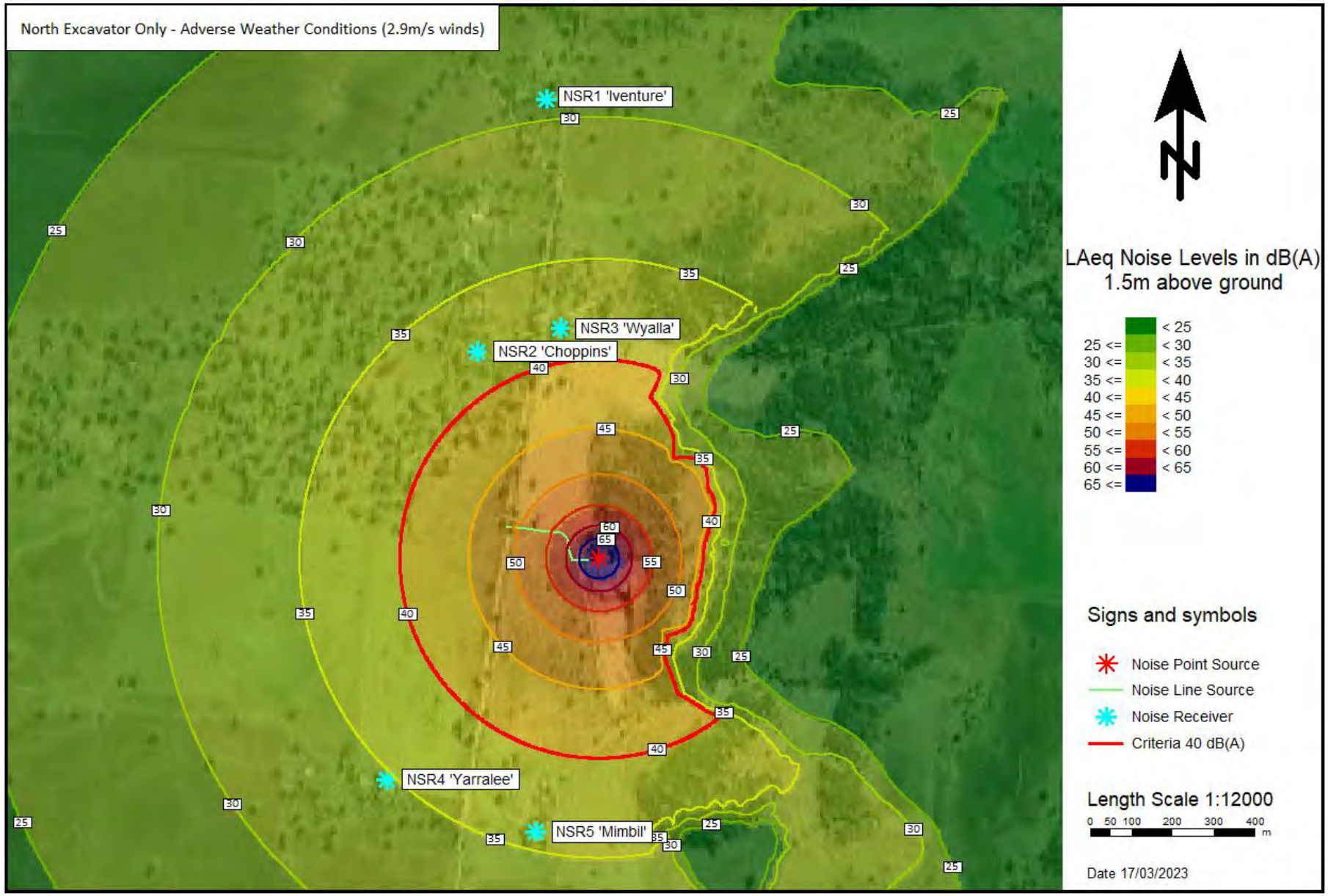
A noise and vibration impact assessment has been carried out in support a to support a development consent for the lateral expansion of an active quarry at No. 809 Oakey Creek Road, Piallaway NSW 2342, known as 'Bolgers Pit'. The Proponent wishes to regularise the use of this quarry and to laterally expand the active quarry pit through the development approval process. The project site has an area of 2.71ha, which includes land proposed for lateral expansion of the quarry.

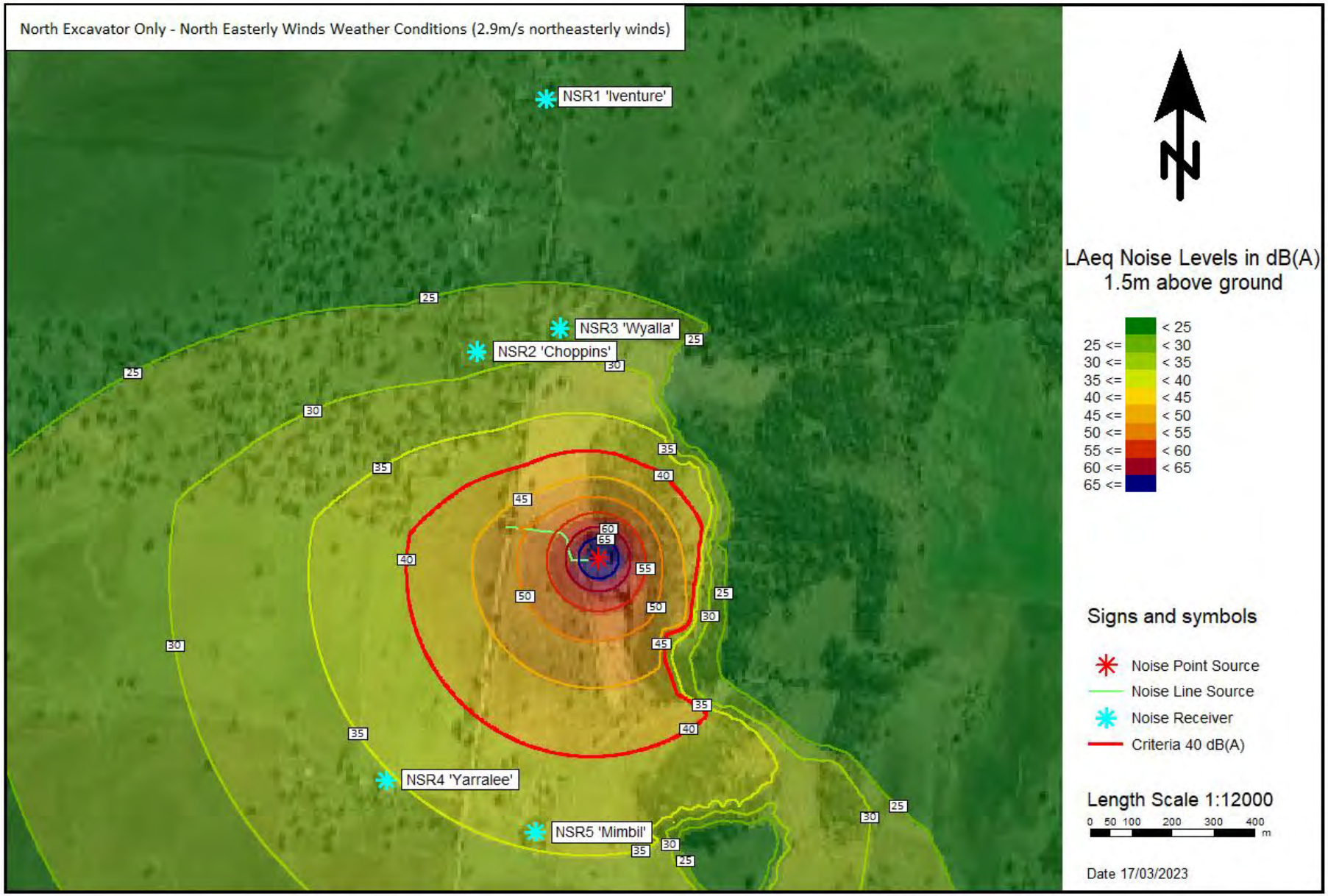
Future noise levels were predicted using SoundPLAN modelling software for the proposed scenarios where crushing and ancillary equipment would operate during existing hours of operation during the day periods.

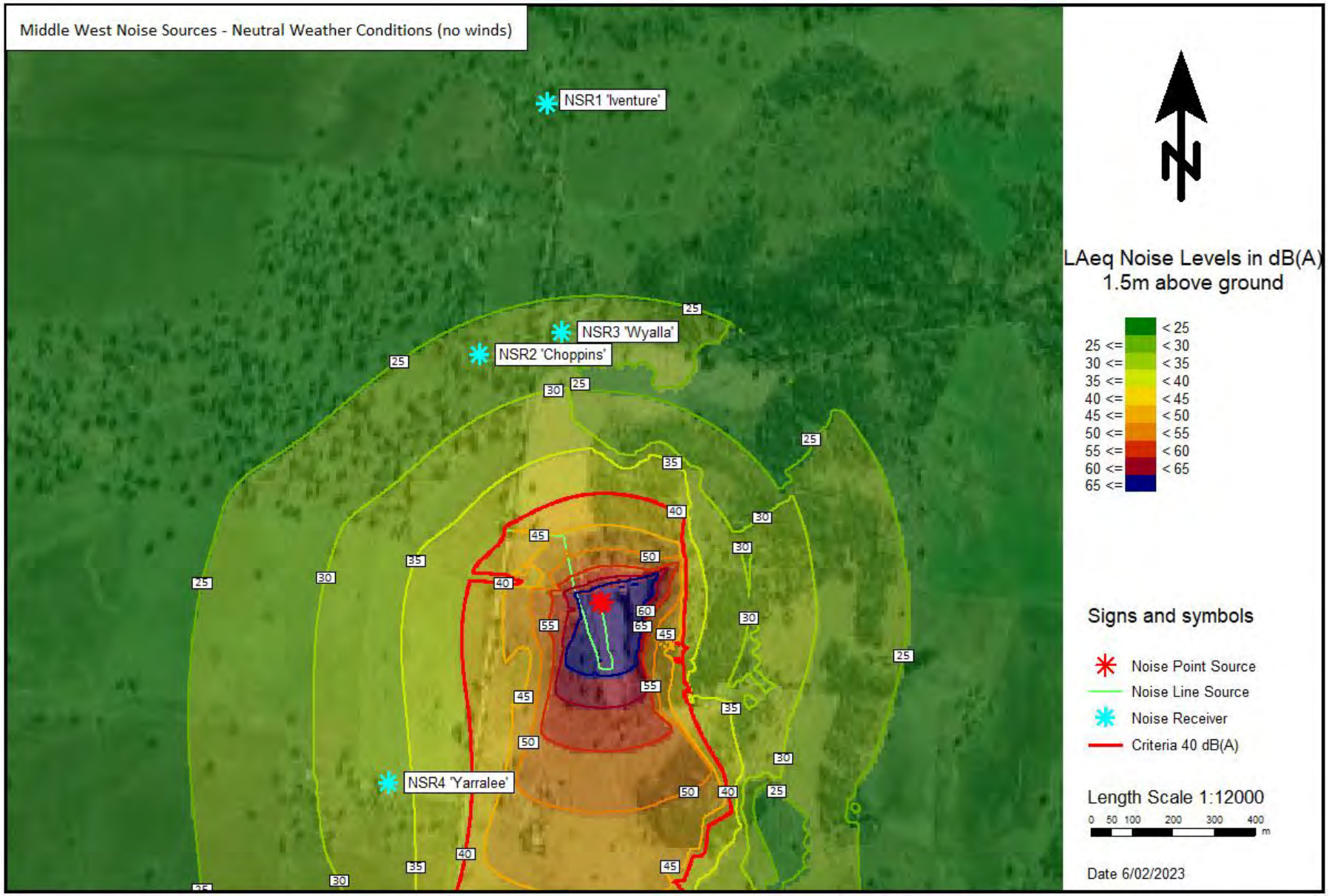
Mitigation measures have been recommended within this report and it is expected that noise and vibration emissions from the Quarry during operation can be adequately managed at the nearest noise sensitive receptors.

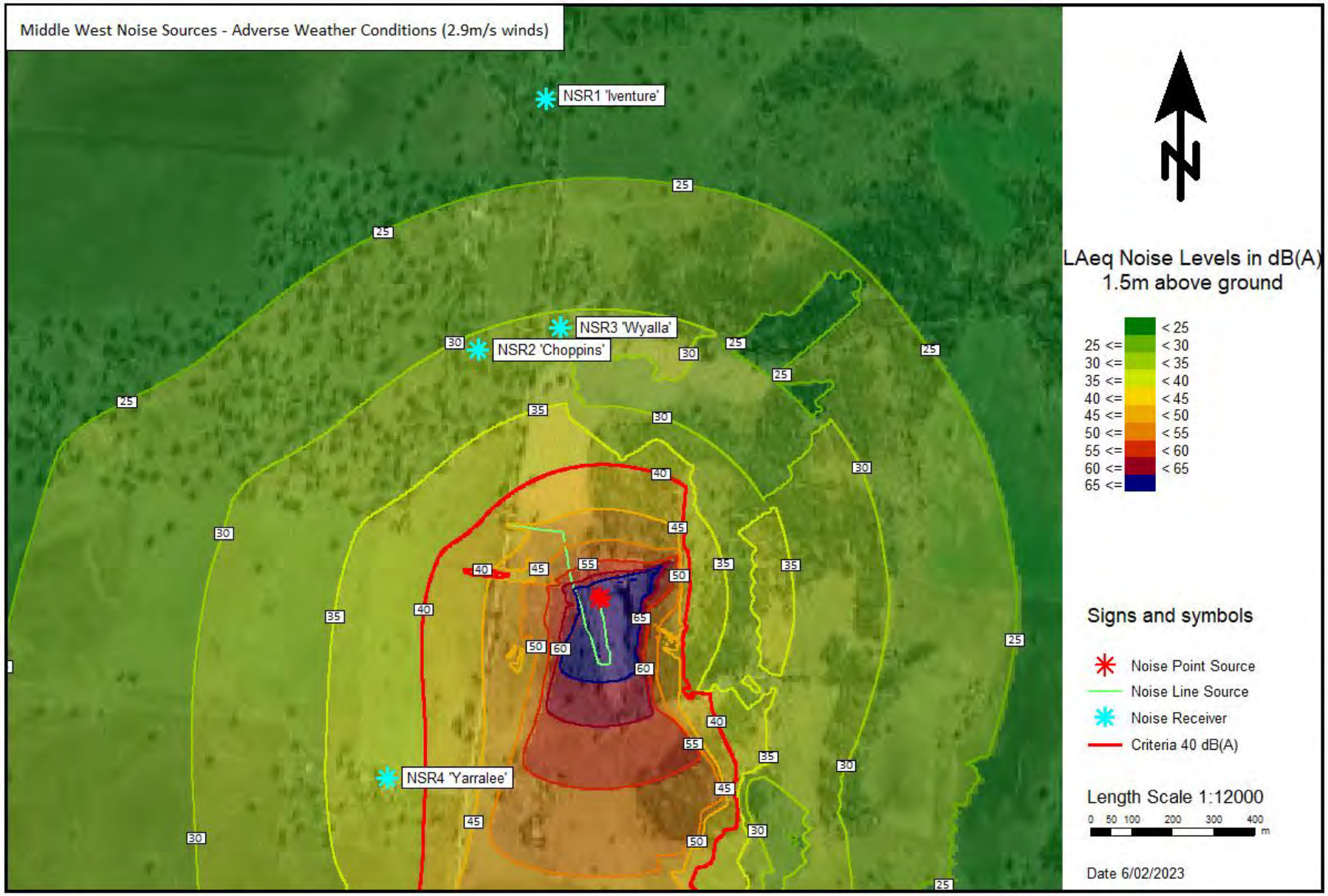
Appendix A Noise Contours

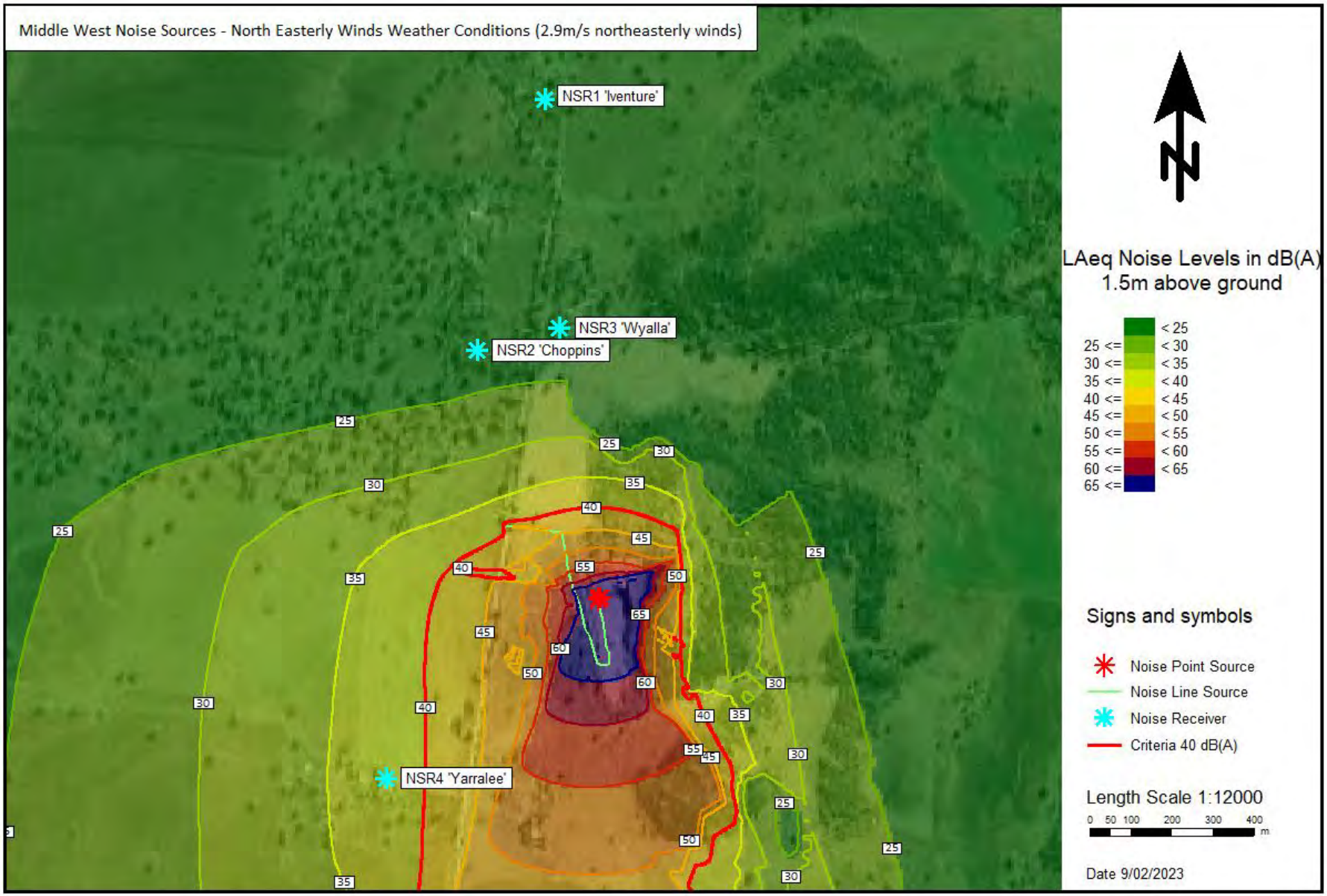

North Excavator Only - Neutral Weather Conditions (no winds)
NSR1 'Iventure'
NSR2 'Choppins'
NSR3 'Wyalla'
NSR4 'Yarralee'
NSR5 'Mimbil'
LAeq Noise Levels in dB(A)
1.5m above ground
< 25
25 <= < 30
30 <= < 35
35 <= < 40
40 <= < 45
45 <= < 50
50 <= < 55
55 <= < 60
60 <= < 65
65 <=
Signs and symbols
Noise Point Source
Noise Line Source
Noise Receiver
Criteria 40 dB(A)
Length Scale 1:12000
0 50 100 200 300 400 m
Date 17/03/2023

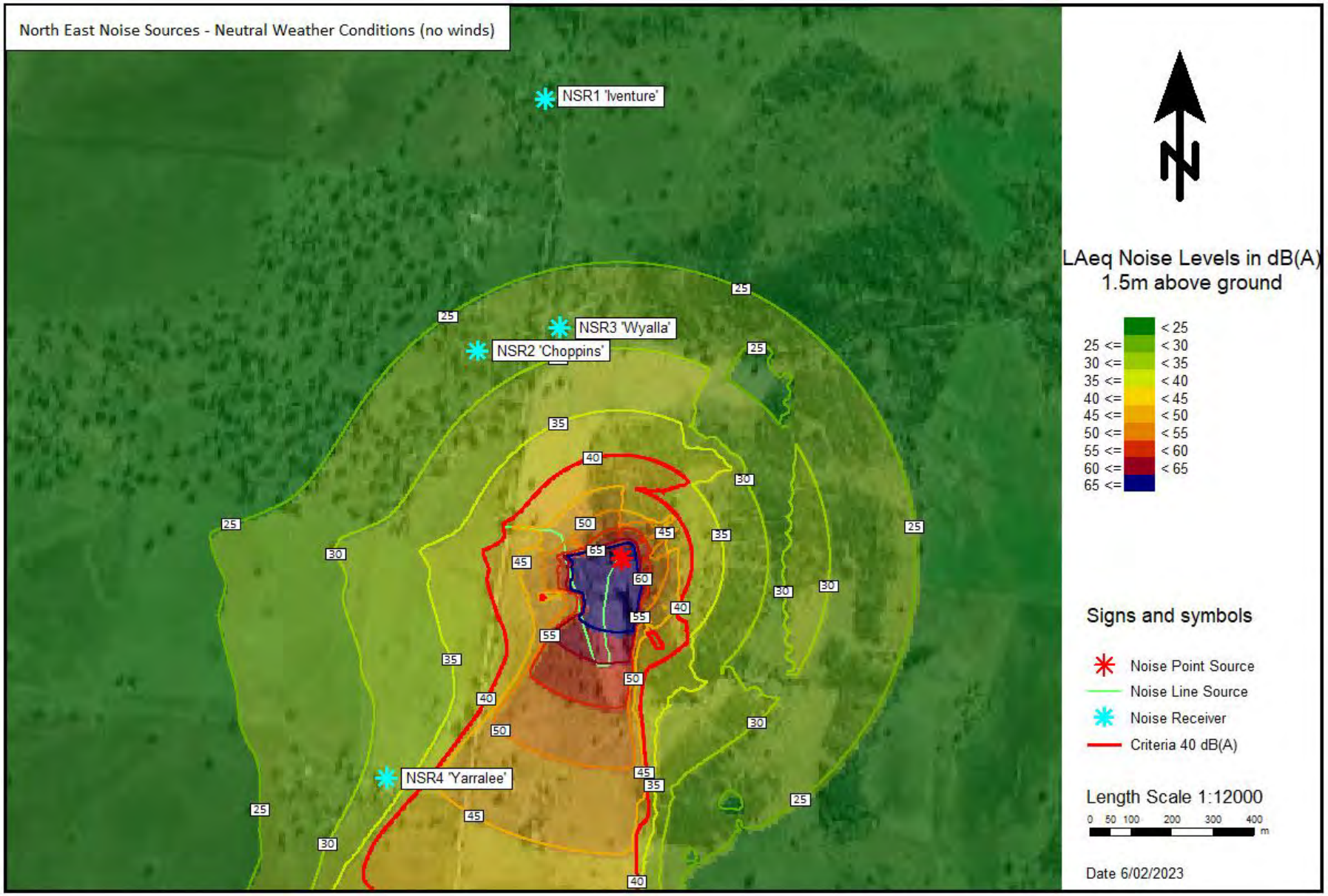

North Excavator Only - Adverse Weather Conditions (2.9m/s winds)
NSR1 'Iventure'
NSR2 'Choppins'
NSR3 'Wyalla'
NSR4 'Yarralee'
NSR5 'Mimbil'
LAeq Noise Levels in dB(A)
1.5m above ground
25 <= < 25
30 <= < 30
35 <= < 40
40 <= < 45
45 <= < 50
50 <= < 55
55 <= < 60
60 <= < 65
65 <=
Signs and symbols
Noise Point Source
Noise Line Source
Noise Receiver
Criteria 40 dB(A)
Length Scale 1:12000
0 50 100 200 300 400 m
Date 17/03/2023

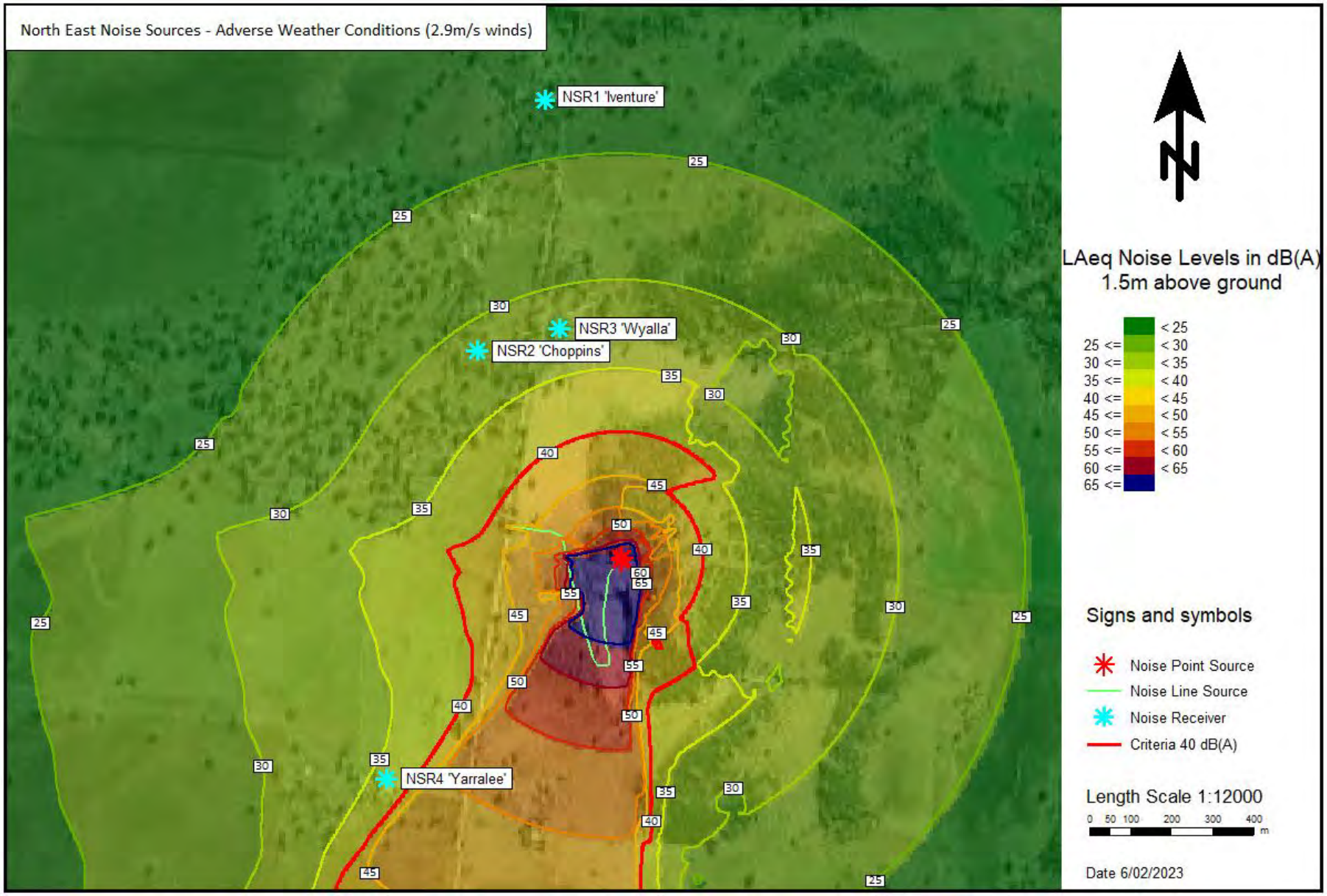

North Excavator Only - North Easterly Winds Weather Conditions (2.9m/s northeasterly winds)
NSR1 'Iventure'
NSR3 'Wyalla'
NSR2 'Choppins'
NSR4 'Yarralee'
NSR5 'Mimbil'
LAeq Noise Levels in dB(A)
1.5m above ground
25 <= < 25
30 <= < 30
35 <= < 35
40 <= < 40
45 <= < 50
50 <= < 55
55 <= < 60
60 <= < 65
65 <=
Signs and symbols
Noise Point Source
Noise Line Source
Noise Receiver
Criteria 40 dB(A)
Length Scale 1:12000
0 50 100 200 300 400 m
Date 17/03/2023

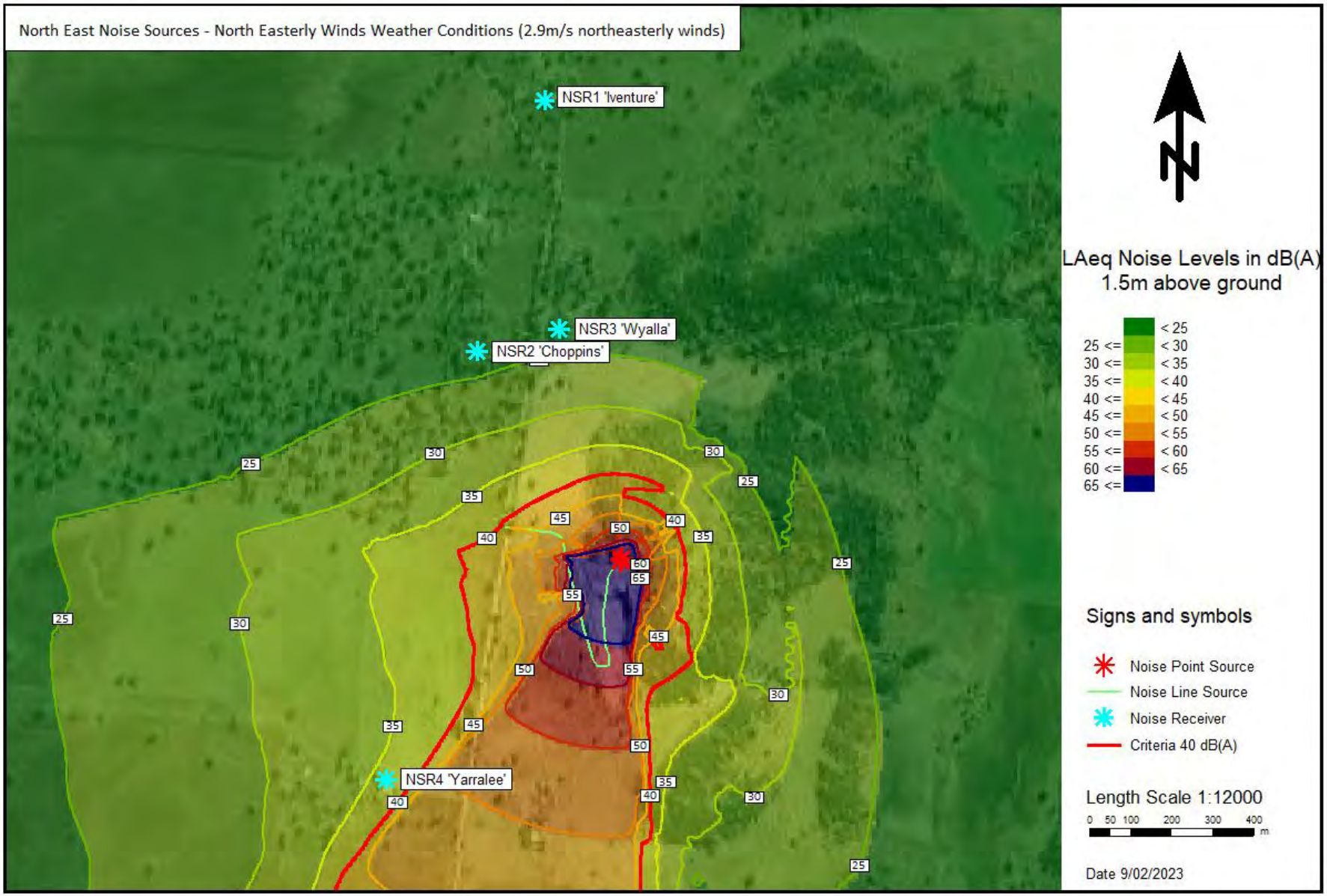

Middle West Noise Sources - Neutral Weather Conditions (no winds)
NSR1 'Iventure'
NSR2 'Choppins'
NSR3 'Wyalla'
NSR4 'Yarralee'
LAeq Noise Levels in dB(A)
1.5m above ground
< 25
25 <= < 30
30 <= < 35
35 <= < 40
40 <= < 45
45 <= < 50
50 <= < 55
55 <= < 60
60 <= < 65
65 <=
Signs and symbols
Noise Point Source
Noise Line Source
Noise Receiver
Criteria 40 dB(A)
Length Scale 1:12000
0 50 100 200 300 400 m
Date 6/02/2023


Middle West Noise Sources - Adverse Weather Conditions (2.9m/s winds)
NSR1 'Iventure'
NSR3 'Wyalla'
NSR2 'Choppins'
NSR4 'Yarralee'
LAeq Noise Levels in dB(A)
1.5m above ground
< 25
25 <= < 30
30 <= < 35
35 <= < 40
40 <= < 45
45 <= < 50
50 <= < 55
55 <= < 60
60 <= < 65
65 <=
Signs and symbols
Noise Point Source
Noise Line Source
Noise Receiver
Criteria 40 dB(A)
Length Scale 1:12000
0 50 100 200 300 400 m
Date 6/02/2023


Middle West Noise Sources - North Easterly Winds Weather Conditions (2.9m/s northeasterly winds)
NSR1 'Iventure'
NSR3 'Wyalla'
NSR2 'Choppins'
NSR4 'Yarralee'
LAeq Noise Levels in dB(A)
1.5m above ground
25 <= < 25
30 <= < 30
35 <= < 35
40 <= < 45
45 <= < 50
50 <= < 55
55 <= < 60
60 <= < 65
65 <= < 65
Signs and symbols
Noise Point Source
Noise Line Source
Noise Receiver
Criteria 40 dB(A)
Length Scale 1:12000
0 50 100 200 300 400 m
Date 9/02/2023


North East Noise Sources - Neutral Weather Conditions (no winds)
NSR1 'Iventure'
NSR3 'Wyalla'
NSR2 'Choppins'
NSR4 'Yarralee'
LAeq Noise Levels in dB(A)
1.5m above ground
< 25
25 <= < 30
30 <= < 35
35 <= < 40
40 <= < 45
45 <= < 50
50 <= < 55
55 <= < 60
60 <= < 65
65 <=
Signs and symbols
Noise Point Source
Noise Line Source
Noise Receiver
Criteria 40 dB(A)
Length Scale 1:12000
0 50 100 200 300 400 m
Date 6/02/2023


North East Noise Sources - Adverse Weather Conditions (2.9m/s winds)
NSR1 'Iventure'
NSR3 'Wyalla'
NSR2 'Choppins'
NSR4 'Yarralee'
LAeq Noise Levels in dB(A)
1.5m above ground
< 25
25 <= < 30
30 <= < 35
35 <= < 40
40 <= < 45
45 <= < 50
50 <= < 55
55 <= < 60
60 <= < 65
65 <=
Signs and symbols
Noise Point Source
Noise Line Source
Noise Receiver
Criteria 40 dB(A)
Length Scale 1:12000
0 50 100 200 300 400 m
Date 6/02/2023


North East Noise Sources - North Easterly Winds Weather Conditions (2.9m/s northeasterly winds)
NSR1 'Iventure'
NSR3 'Wyalla'
NSR2 'Choppins'
NSR4 'Yarralee'
LAeq Noise Levels in dB(A)
1.5m above ground
25 <= < 25
30 <= < 30
35 <= < 35
40 <= < 40
45 <= < 45
50 <= < 55
55 <= < 60
60 <= < 65
65 <=
Signs and symbols
Noise Point Source
Noise Line Source
Noise Receiver
Criteria 40 dB(A)
Length Scale 1:12000
0 50 100 200 300 400 m
Date 9/02/2023

Appendix B 1/3 Octave Results

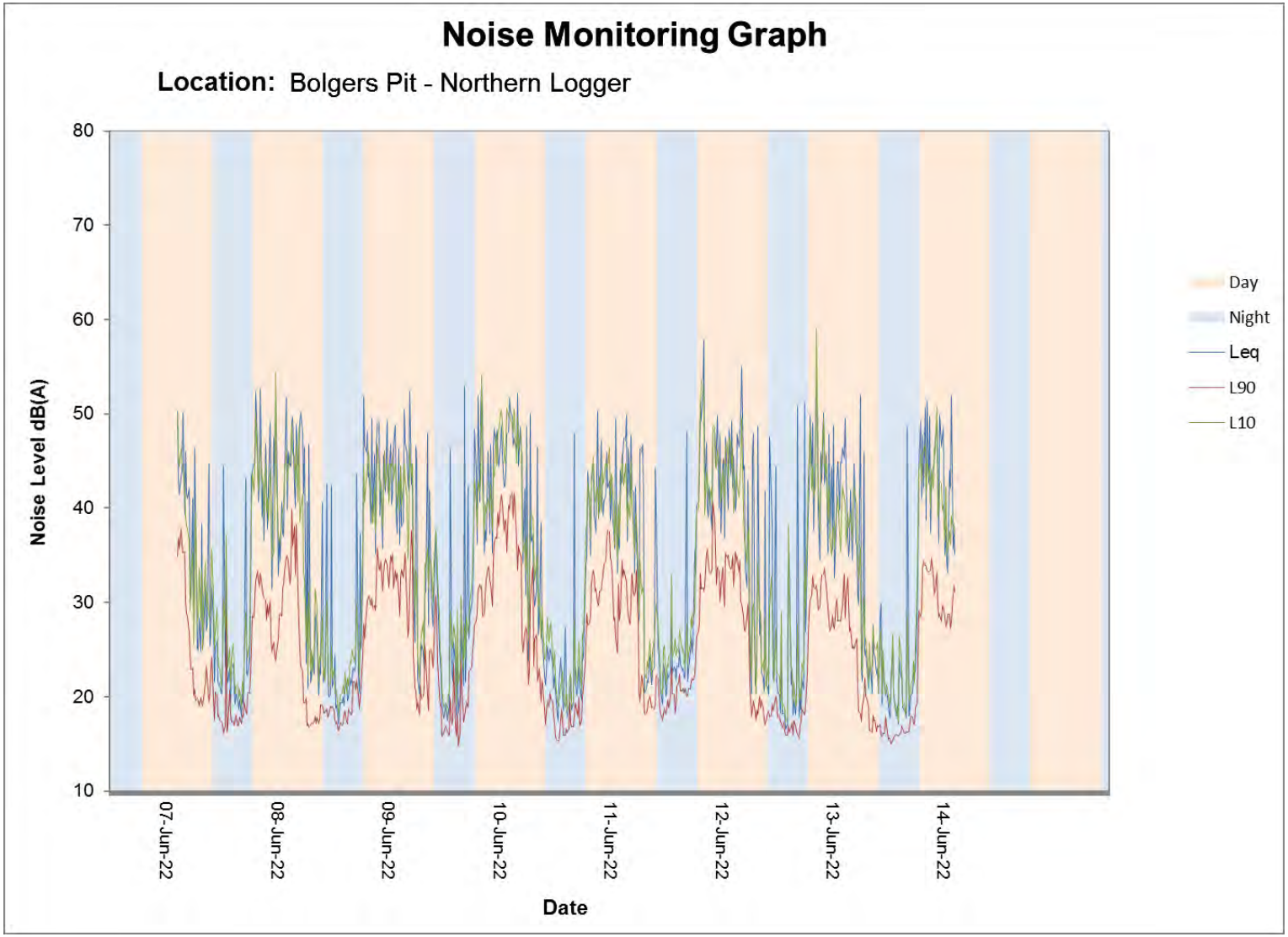
Bolgers Pit
Assessed receiver spectra in dB(A) - Quarry Operations North East Noise Sources Adverse Weather **7**

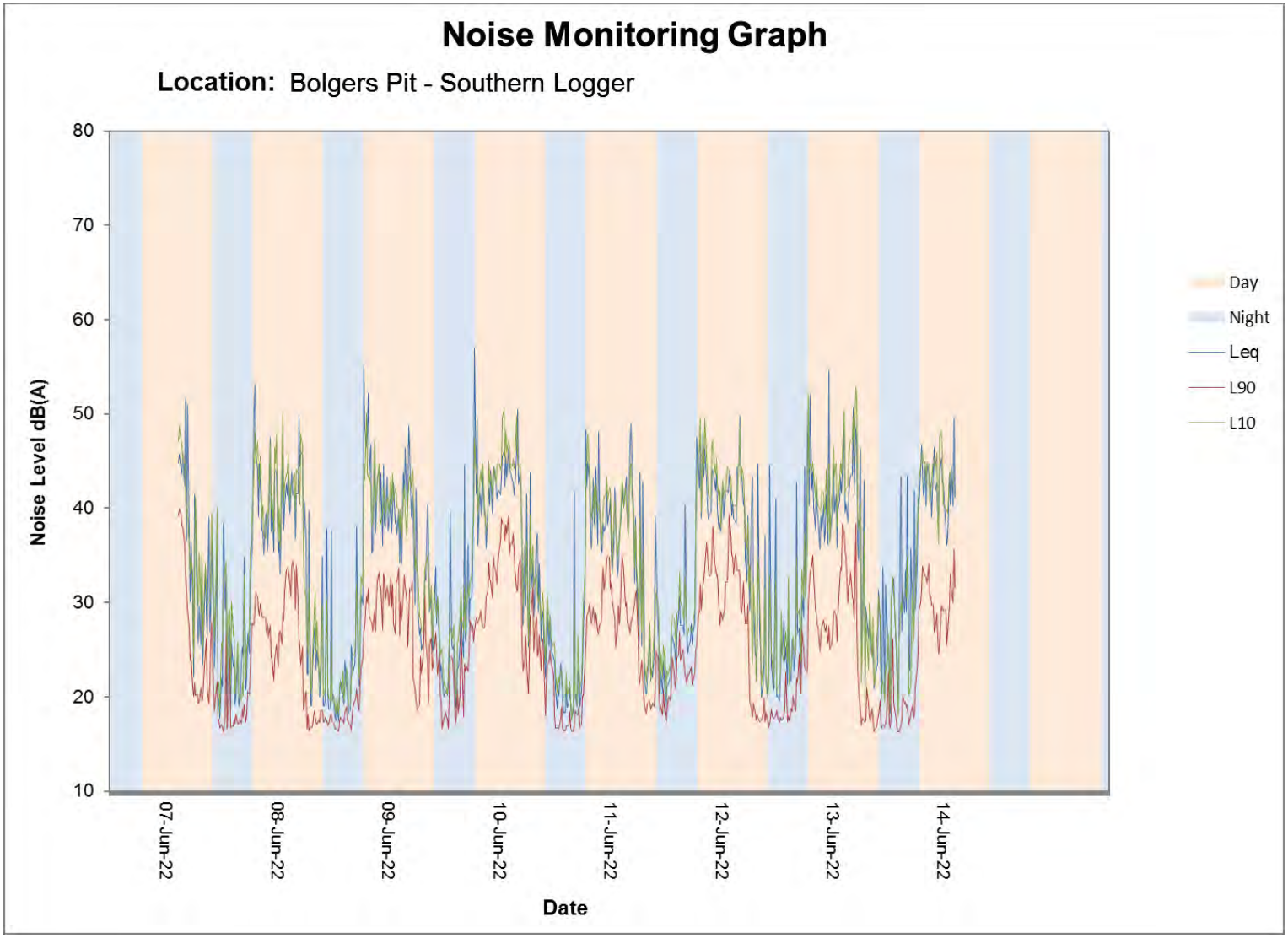
50Hz dB(A)	63Hz dB(A)	80Hz dB(A)	100Hz dB(A)	125Hz dB(A)	160Hz dB(A)	200Hz dB(A)	250Hz dB(A)	315Hz dB(A)	400Hz dB(A)	500Hz dB(A)	630Hz dB(A)	800Hz dB(A)	1kHz dB(A)	1.25kHz dB(A)	1.6kHz dB(A)	2kHz dB(A)	2.5kHz dB(A)	3.15kHz dB(A)	4kHz dB(A)	5kHz dB(A)	6.3kHz dB(A)	8kHz dB(A)	10kHz dB(A)
Receiver NSR1 'Iventure' LrD 23.1 dB(A)																							
-4.3	2.6	-1.3	0.1	-1.4	4.3	2.6	2.9	5.4	16.0	13.4	12.0	13.5	15.4	14.0	13.2	8.6	3.5	-1.3	-13.8	-23.9	-45.0	-74.7	
Receiver NSR3 'Wyalla' LrD 32.1 dB(A)																							
4.3	11.2	7.3	9.1	7.6	13.3	11.3	11.8	14.5	22.4	20.1	18.9	21.5	23.9	23.2	24.5	21.5	18.7	17.4	10.1	3.7	-8.7	-25.9	-51.5
Receiver NSR4 'Yarralee' LrD 36.4 dB(A)																							
10.2	17.7	14.5	16.7	15.8	21.9	19.4	19.3	21.5	30.0	26.9	24.9	26.3	27.7	25.9	25.5	21.0	16.5	13.1	3.0	-5.7	-22.1	-43.7	-75.9
Receiver NSR4 'Yarralee' LrD 31.4 dB(A)																							
4.4	11.3	7.5	9.1	7.7	13.4	10.7	11.1	13.7	21.9	19.5	18.4	20.9	23.2	22.5	23.7	20.5	17.6	16.2	8.5	1.9	-11.1	-29.0	-55.6
Receiver NSR5 'Mimbil' LrD 49.8 dB(A)																							
16.4	24.3	21.7	24.9	24.4	30.9	28.9	29.4	32.1	40.8	38.4	37.2	39.5	41.8	41.0	41.8	38.5	35.2	33.4	25.0	17.9	3.7	-16.0	-45.4

Vipac Engineers & Scientists Pty Ltd 1

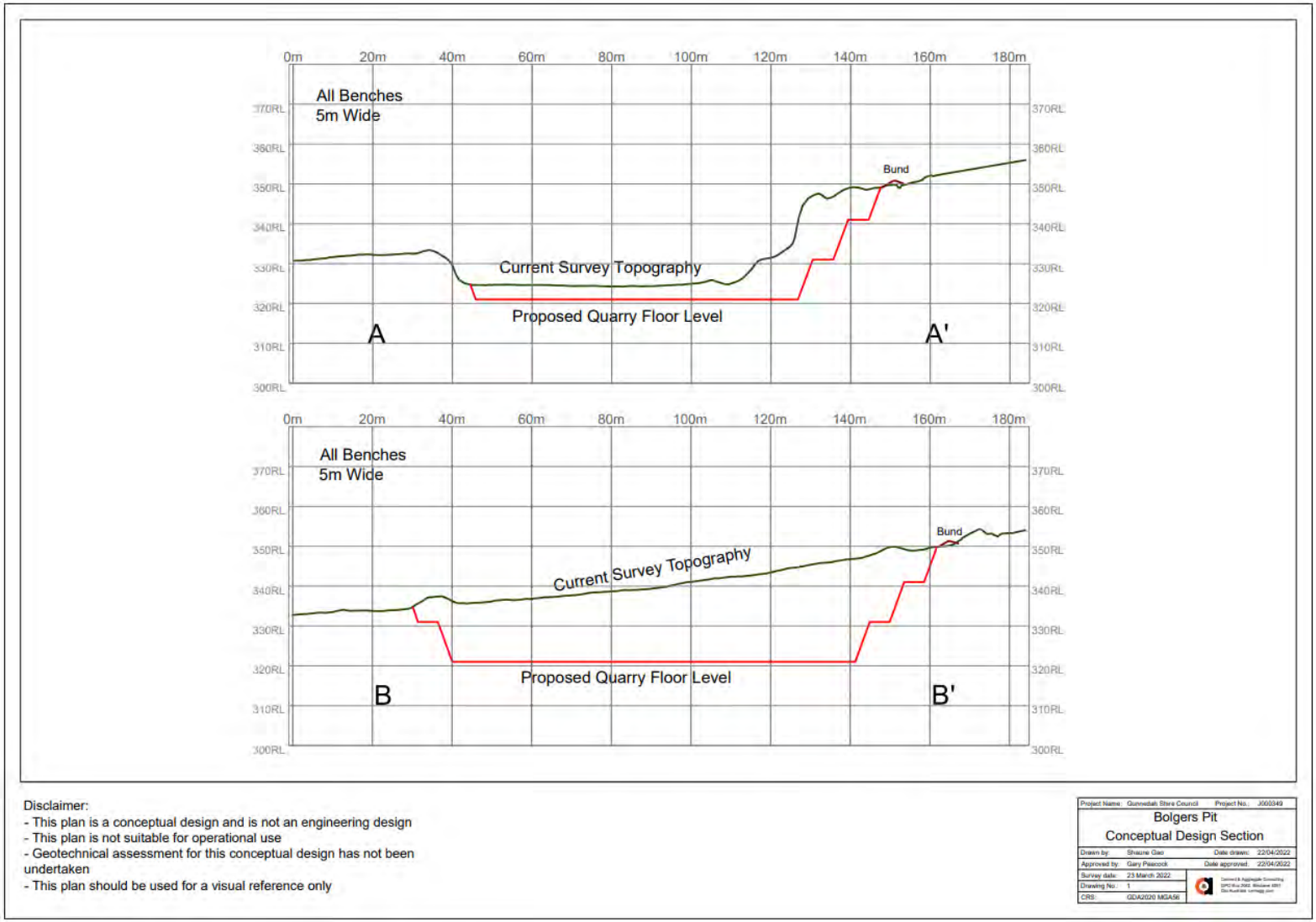
SoundPLAN 8.2

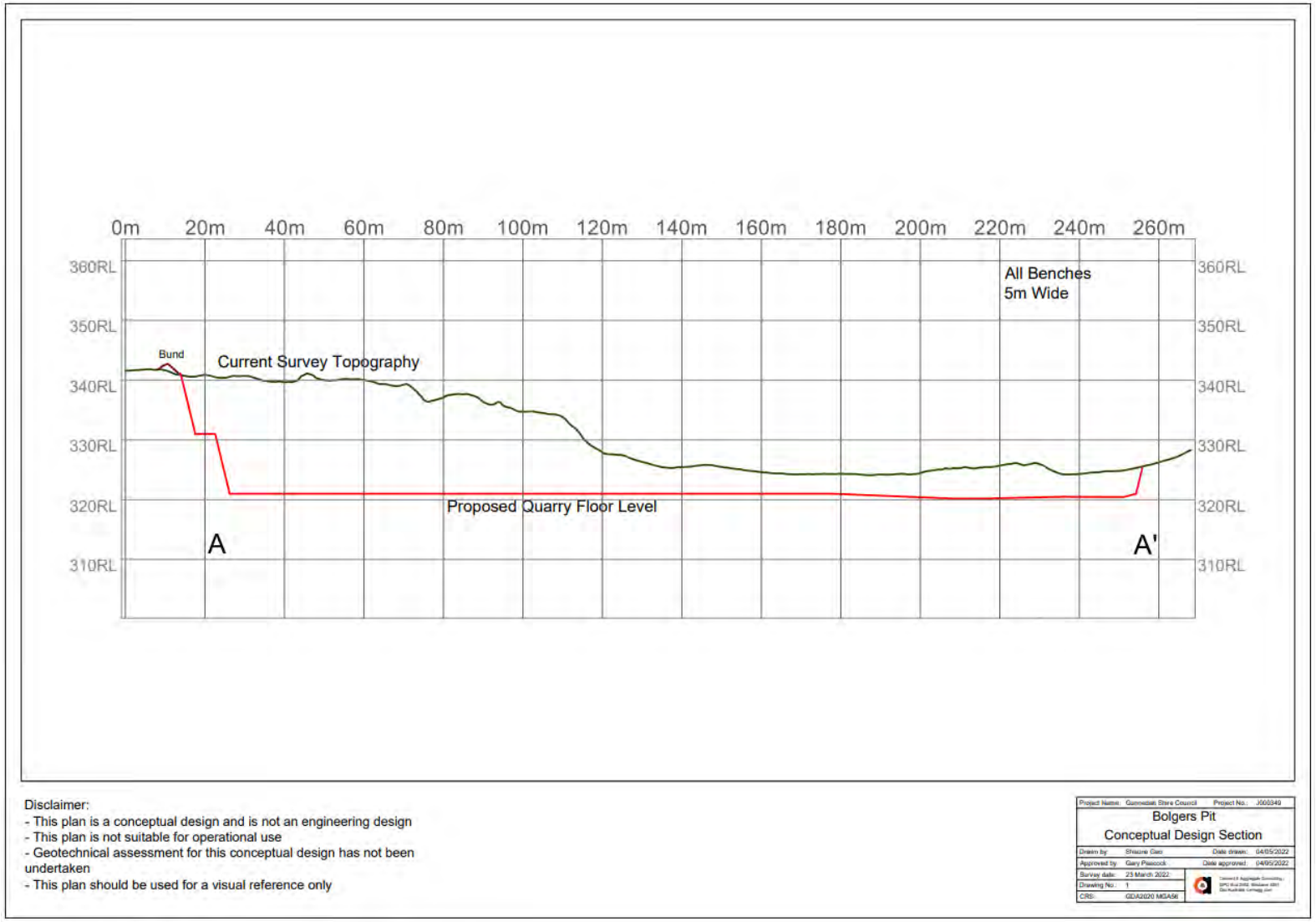
Appendix C Noise Monitoring Graphs

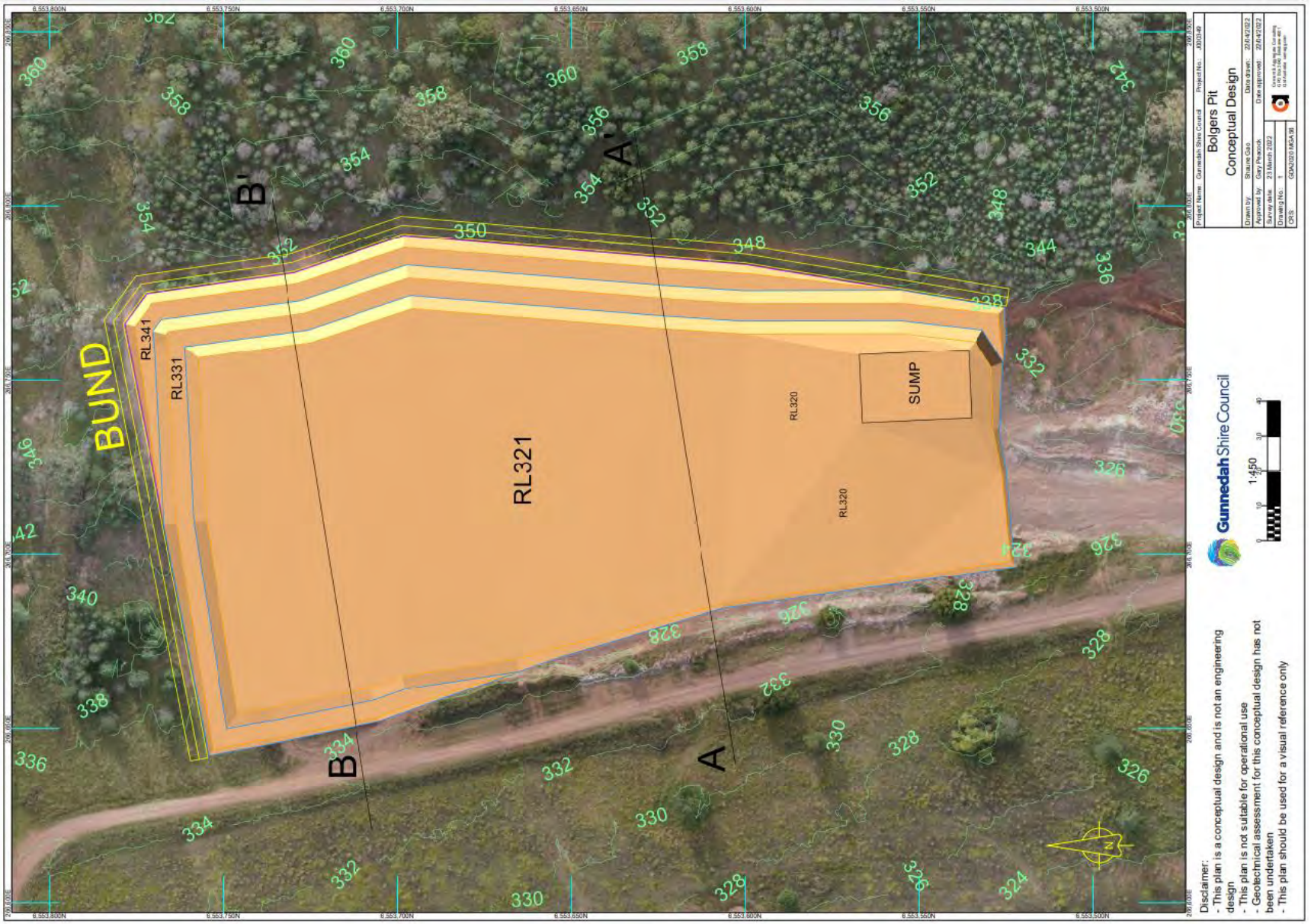



Noise Monitoring Graph
Location: Bolgers Pit - Southern Logger
Noise Level dB(A)
80
70
60
50
40
30
20
10
07-Jun-22
08-Jun-22
09-Jun-22
10-Jun-22
11-Jun-22
12-Jun-22
13-Jun-22
14-Jun-22
Date
Day
Night
Leq
L90
L10

Appendix D Topographical Drawings Received by Outline Planning Consultants Pty Ltd




0m
20m
40m
60m
80m
100m
120m
140m
160m
180m
200m
220m
240m
260m
360RL
350RL
340RL
330RL
320RL
310RL
All Benches
5m Wide
Bund
Current Survey Topography
Proposed Quarry Floor Level
A
A'
Disclaimer:
- This plan is a conceptual design and is not an engineering design
- This plan is not suitable for operational use
- Geotechnical assessment for this conceptual design has not been undertaken
- This plan should be used for a visual reference only
Bolgers Pit
Conceptual Design Section


BUND
RL341
RL331
RL321
RL320
RL320
SUMP
A
A'
B
B'
Bolgers Pit
Conceptual Design
Gunnedah Shire Council
1:450
Disclaimer:
- This plan is a conceptual design and is not an engineering design
- This plan is not suitable for operational use
- Geotechnical assessment for this conceptual design has not been undertaken
- This plan should be used for a visual reference only